**2018** / volume 30 / number 2

# ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

The magazine of the Orthopaedic Section, APTA

**FEATURE:**

## Quantifying Forward Head Posture Based on Practicing Physical Therapists' Opinions and CROM Measurements

APTA
American Physical Therapy Association

# ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

The magazine of the Orthopaedic Section, APTA


## In this issue


76 Quantifying Forward Head Posture Based on Practicing Physical Therapists' Opinions and Cervical Range of Motion Measurements
**Emma White, Ashely Barnette, April Phillips, Sara Migliarese**

82 Patient Outcomes With and Without Implementation of a Neck Pain Classification System: A Preliminary Analysis
**Kevin P. Farrell, Katherine E. Lampe**

92 Differential Diagnosis for Management of Lateral Hip Pain: A Case Report
**Kristen Simeone, Jason A. Craig**

98 How to Use Scientific Evidence at the Point of Care: Guidelines-based Physical Therapy for a Patient with Acute Lateral Ankle Sprain
**Justin Fischer, Todd E. Davenport**

106 Introduction to Efforts of the Newly Established Council, Frontiers in Rehabilitation Science and Technology (FiRST)
**Dan White, PT, ScD, MSc, NCS**

108 Orthopaedic Section Award Winners


## Regular features


71 President's Corner

72 Editor's Note

110 Finance Report

111 Wooden Book Reviews

112 Occupational Health SIG Newsletter

117 Performing Arts SIG Newsletter

121 Foot & Ankle SIG Newsletter

123 Pain Management SIG Newsletter

126 Imaging SIG Newsletter

127 Orthopaedic Residency/Fellowship SIG Newsletter

131 Animal Rehabilitation SIG Newsletter

134 Index to Advertisers


## 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


**Managing Editor & Advertising**
Sharon L. Klinski
Orthopaedic Section, APTA
2920 East Ave So, Suite 200
La Crosse, Wisconsin 54601
800-444-3982 x 2020
608-788-3965 FAX
Email: sklinski@orthopt.org

**Editor**
Christopher Hughes, PT, PhD, OCS

**Associate Editor**
Rita Shapiro, PT, MA, DPT

**Book Review Editor**
Rita Shapiro, PT, MA, DPT

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.

# ORTHOPAEDIC SECTION DIRECTORY

2018 / volume 30 / number 2


## OFFICERS

**President:**
**Stephen McDavitt, PT, DPT, MS, FAAOMPT, FAPTA**
207-396-5165 • scfmpt@earthlink.net
2nd Term: 2016-2019

**Vice President:**
**Lori Michener, PT, PhD, SCS, ATC, FAPTA**
804-828-0234 • lmichene@usc.edu
1st Term: 2017-2020

**Treasurer:**
**Kimberly Wellborn, PT, MBA**
615-465-7145 • wellborn@comcast.net
2nd Term: 2018-2021

**Director 1:**
**Aimee Klein, PT, DPT, DSc, OCS**
813-974-6202 • Aklein1@health.usf.edu
2nd Term: 2018-2021

**Director 2:**
**Duane "Scott" Davis, PT, MS, EdD, OCS**
304-293-0264 • dsdavis@hsc.wvu.edu
1st Term: 2016-2019

Explore the **Orthopaedic Section** website at: orthopt.org

Explore all the indepdendent study courses (ISCs) the Orthopaedic Section has to offer at: orthoptlearn.org

## 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

**Leah Vogt, Executive Assistant**
x2090.....lvogt@orthopt.org

**Sharon Klinski, Managing Editor**
x2020.....sklinski@orthopt.org

**Laura Eichmann, Publishing Assistant**
x2050..... leichmann@orthopt.org

**Brenda Johnson, ICF-based CPG Coordinator**
x2130..... bjohnson@orthopt.org

## CHAIRS

**MEMBERSHIP**
**Megan Poll, PT, DPT, OCS**
908-208-2321 • meganpoll@gmail.com
1st Term: 2018-2021

***Members:*** *Christine Becks (student), Thomas Fliss, Molly Baker O'Rourke, Nathaniel Mosher*

**EDUCATION PROGRAM**
**Nancy Bloom, PT, DPT, MSOT**
314-286-1400 • bloomn@wustl.edu
1st Term: 2016-2019

**Vice Chair:**
**Emmanuel "Manny" Yung, PT, MA, DPT, OCS**
203-416-3953 • yunge@sacredheart.edu
1st Term: 2016-2019

***Members:*** *Neena Sharma, Valerie Spees, Cuong Pho, John Heick, Kate Spencer*

**INDEPENDENT STUDY COURSE & ORTHOPAEDIC PRACTICE**
**Editor:**
**Christopher Hughes, PT, PhD, OCS, CSCS**
724-738-2757 • chughes42@zoominternet.net
Term ISC: 2007-2019
Term OP: 2004-2019

**ISC Associate Editor:**
**Gordon Riddle, PT, DPT, ATC, OCS, SCS**
gordoncriddle@hotmail.com
2nd Term: 2017-2020

**OP Associate Editor:**
**Rita Shapiro, PT, MA, DPT**
Shapiro.rb@gmail.com
1st Term: 2017-2020

**PUBLIC RELATIONS/MARKETING**
**Jared Burch, PT**
908-839-5506 • jareddburch@gmail.com
1st Term: 2018-2021

***Members:*** *Tyler Schultz, Carol Courtney, Jared Burch (student)*

**RESEARCH**
**Dan White, PT, ScD, MSc, NCS**
302-831-7607 • dkw@udel.edu
1st Term: 2016-2019

**Vice Chair:**
**Amee Seitz PT, PhD, DPT, OCS**
1st Term: 2016-2019

***Members:*** *Joshua Stefanik, Marcie Harris-Hayes, Sean Rundell, Arie Van Duijn, Alison Chang, Louise Thoma*

**ORTHOPAEDIC SPECIALTY COUNCIL**
**Pam Kikillus, PT, DHSc, OCS, CHT, FAAOMPT**
253-709-8684 • pkikilus@greenriver.edu
Term: Expires 2019

***Members:*** *Hilary Greenberger, Grace Johnson, Judith Geller*

**PRACTICE**
**Kathy Cieslak, PT, DScPT, MSEd, OCS**
507-293-0885 • cieslak.kathryn@mayo.edu
2nd Term: 2018-2021

***Members:*** *James Spencer, Marcia Spoto, Mary Fran Delaune, Mike Connors, Molly Malloy, Elizabeth Bergman, Jim Dauber*

**FINANCE**
**Kimberly Wellborn, PT, MBA**
(See Treasurer)

***Members:*** *Doug Bardugon, Penny Schulken, Judith Hess*

**AWARDS**
**Lori Michener, PT, PhD, ATC, FAPTA, SCS**
(See Vice President)

***Members:*** *Kevin Gard, Marie Corkery, Murray Maitland*

**JOSPT**
**Guy Simoneau, PT, PhD, FAPTA**
guy.simoneau@marquette.edu

**Executive Director/Publisher:**
**Edith Holmes**
877-766-3450 • edithholmes@jospt.org

**NOMINATIONS**
**Carol Courtney, PT, PhD, ATC**
cacourt@uic.edu
1st Term: 2018-2021

***Members:*** *Brian Eckenrode, Michael Bade*

**APTA BOARD LIAISON –**
Robert Rowe, PT, DPT, DMT, MHS

**2018 House of Delegates Representative –**
Kathy Cieslak, PT, DSc, OCS

**ICF-based CPG Editor –**
Guy Simoneau, PT, PhD, FAPTA
414-288-3380 • guy.simoneau@marquette.edu
1st Term: 2017-2020

**ICF-based CPG Editor –**
Christine McDonough, PT, PhD
603-653-3565 • cmm@bu.edu
2nd Term: 2016-2019

## Special Interest Groups

**OCCUPATIONAL HEALTH SIG**
Lorena Pettet Payne, PT, MPA, OCS
406-581-3147 • lpettet@aol.com
2nd Term: 2016-2019

**FOOT AND ANKLE SIG**
Christopher Neville, PT, PhD
315-464-6888 • nevillec@upstate.edu
1st Term: 2016-2019

**PERFORMING ARTS SIG**
Annette Karim, PT, DPT, OCS, FAAOMPT
626-815-5020 ext 5072 • neoluvsonlyme@aol.com
2nd Term: 2017-2020

**PAIN MANAGEMENT SIG**
Carolyn McManus, MSPT, MA
206-215-3176 • carolynmcmanus24@gmail.com
1st Term: 2017-2020

**IMAGING SIG**
Charles Hazle, PT, PhD
606-439-3557 • crhazl00@uky.edu
1st Term: 2016-2019

**ORTHOPAEDIC RESIDENCY/FELLOWSHIP SIG**
Matthew Haberl, PT, DPT, OCS, ATC, FAAOMPT
608-406-6335 • matthaberl@hotmail.com
1st Term: 2018-2021

**ANIMAL REHABILITATION SIG**
Kirk Peck, PT, PhD, CSCS, CCRT
402-280-5633 • kpeck@creighton.edu
2nd Term: 2016-2019

## Education Interest Groups

**PTA**
Jason Oliver, PTA
lsu73lsu73@yahoo.com

# President's Corner

# The Agreement to Develop Orthopaedic Modules Within the APTA Physical Therapy Outcomes Registry is Signed at CSM

The *mission* of the Orthopaedic Section is *to promote excellence in orthopaedic physical therapy.* Excellence in orthopaedic physical therapist practice requires accountability achieved by addressing care through evidence, patient preference, expertise, interprofessional collaboration, and innovation while demonstrating value. Assessing patient outcomes enables the systematic demonstration of value. It engages characteristics of both a reflective and forward feed system that frames the direction for employing best evidence and achieving outcomes relevant to patient preferences and value. Excellence in practice requires the health care provider to view the patient management landscape, identify relevant waypoints, and navigate with a transforming agenda involving evidence, clinical experience, patient preferences, and collaboration with other stakeholders including payers, other practitioners and families. The outcome data acquired defines quality and value.

One of the greatest challenges in promoting excellence in orthopaedic physical therapy practice is managing the multi-faceted demands in the practice landscape of our current health care system. None of us knows exactly what the future in health care will look like however, what we do know currently is that we need to;

1. be more efficient and evidence based;
2. appreciate that payment systems will in part prescribe effectiveness;
3. reconcile and understand relationships of health care providers to manage team based inter-professional care, especially in the domain of rehabilitation with recognition of baby boomer needs;
4. appreciate the need to meet the requirements for developing innovative, collaborative and nimble EBP models; and
5. appreciate that 3rd parties, surgeons, physicians, other payment and referral sources are creating rehabilitation constructs that provide value and decrease downstream costs.

In recognition of these challenges, one commitment the Section has made in sponsoring excellence in orthopaedic physical therapist practice nationally and globally is by providing elements of evidence-based practice through the development and implementation of our published clinical practice guidelines. To date, the Section has published 10 clinical practice guidelines with 6 undergoing revisions and has 12 in development (https://www.orthopt.org/content/practice/clinical-practice-guidelines/cpg-framework-history).

To further assist our Section members and other orthopaedic physical therapists in endorsing excellence in practice, the Section with its depth of member experts has been and will be developing and providing the framework for orthopaedic data elements within the APTA Physical Therapy Outcomes Registry. The APTA Physical Therapy Outcomes Registry collects and aggregates participating practices' electronic health record data on patient function and other clinically important measures for patients receiving physical therapist services. The APTA Registry will satisfy quality reporting requirements, promote research, and inform future payment for physical therapist services

*(Continued on page 73)*

**Left to right: Karen Chesbrough, MPH, Director, Physical Therapy Outcomes Registry American Physical Therapy Association, James Irrgang, PT, PhD, ATC, FAPTA, Director Scientific Advisory Panel for the Physical Therapy Outcomes Registry and Stephen McDavitt, PT, DPT, MS, FAAOMPT, FAPTA, President, Orthopaedic Section, American Physical Therapy Association.**

# Editor's Note

## "Where's the Beef!"

**Christopher Hughes, PT, PhD, OCS, CSCS**

This commercial was an 80's classic! For those of you who were around then, you may recall the Wendy's commercial where actress Clara Peller receives a burger with a massive bun from a make believe competitor. The accompanying small patty prompts Ms. Peller to passionately yell, "Where's the beef?" For those who are too young or cannot remember, just do a search on YouTube for the clip. It still resonates with me almost as forthright and direct as the first time I heard it.

Shortly after the commercial aired, this catchphrase became commonly associated with directly questioning the substance of an idea, product, or opinion. Fast forward to the current health care environment and I believe the phrase still has relevance, especially to physical therapy. Various entities in health care are still asking, "Where's the beef?" Today, can we justify and defend what we do and stand on stable ground when answering such a question?

Payers continue to ask for justification of visits, employers want workers back quicker to save money, patients want results right away, and our medical colleagues also depend on us to deliver the results in our areas of practice. At times we are asked unrealistically to do more and get paid less and still achieve optimal patient outcomes. Still we have to persevere and get the job done. No longer do we have 7 months to be reimbursed for postsurgical anterior cruciate ligament rehabilitation. We no longer have the luxury of extending care based on subjective outcomes and patient preferences. Thus, there is an implied accountability. This means doing your job and being confident that it is done to the satisfaction under the critical eye of others.

Good decision-making never goes out of style but I doubt there is not a clinician out there who desires that we have evidence to support what we do even on the simplest levels of care. Our biggest ally and competitor is time. We desire time to treat, time to care, time to teach, and time to prepare our patients for the best possible outcome. Time is an advantage and disadvantage. We want more time with our patients but the passage of time alone may ironically be a significant factor in the healing of an injury. Would patients have gotten better anyway regardless of physical therapy? A priority or goal should always be that we NOT get in the way of the healing process but that we facilitate the healing process. Is it possible that the cheaper cost of not seeing us also leads to a better outcome? We have to ask this question.

Can we fit how many visits it takes someone to get better into today's health care model? In my experience, I have never had patients say they healed too fast! Most of the time our patients misstep and misread their bodies and ramp up activities too early. Then they are astonished when their symptoms return. Today's medicine does not allow for missteps and miscues with time, service, or money. Probably the most valued service we deliver is education on guiding the patient toward health. Sometimes we save patients from themselves by educating and making sure they listen to their bodies and do not ignore warning signs of overload or tissue strain! Or we give them an appreciation of how slow healing can really be. Unfortunately this vital role of education is still one activity we cannot directly bill for!

Now let's turn the microscope on therapy related treatments…Are they all bun and no meat? Where is the overwhelming evidence to support modalities, braces, taping, manual therapy, and even the administration of specific exercises for a particular pathology?

Taking into account all of these facets and forces of health care, we now have a cascade of less-than-ideal circumstances—less insurance coverage, a finicky public, skeptical payers, and an ever-varied level of competent clinicians (from what patients say). Oh, and let's not forget the struggles in limited funding for research and proliferation of schools and a lack of quality sites for clinical education. Stir all this in a pot and we wonder why the patient is commonly asking "can I just come for this one visit and get the exercises and do them on my own? My co-pay is too high." Our patients sometimes erroneously think, how hard can it be to self-treat and do it themselves?

We have to face the fact that public perception may not be as envious of our skill set as we are! How do we respond when they ultimately ask in various context…Where's the beef? It is common nature for us as clinicians and movement specialists to view ourselves as the premier health care provider. However, in the eyes of the public we are not always the first choice especially in an evolving system that is moving toward wellness. It seems like other occupations get the nod, for example, the personal trainer, the chiropractor, the athletic trainer, or the massage therapist.

Is it time for us to show the beef and get out of the comfort of the clinic and meet the public in venues where our skills or "beef" can be evident? I know many practices have done just that and have benefited. They have stepped out of the "come see us model" and moved into the "we will come to you" model. Whether it is in warehouses, emergency rooms, YMCAs, or specialty businesses we fit! I am confident we can bring it like no other, especially when it comes to education and injury prevention strategies. My experience has been that once the public experiences our versatility outside the clinic walls, we take on a whole new respect and relevance. The flip side is also that therapists themselves get a better appreciation for what they know and do not know. We also get a chance to work in a multidisciplinary environment that can be energizing. I think it is a winning situation all the way around. So maybe it is time to answer the question from all perspectives and say, **Here's the Beef!!!**

### Meeting Minutes & Reports

For your information, all CSM meeting minutes and Section leadership reports can be found at the Orthopaedic Section website: https://www.orthopt.org/content/education/csm-2018

# President's Corner

*(Continued from page 71)*

(http://www.ptoutcomes.com/AboutUs/). The APTA Registry is overseen by a scientific advisory panel who provides direction to the registry on matters of scientific integrity, clinical application, quality, public policy, and research. The panel ensures that the registry fulfills its goals related to information on payment for physical therapist services, improving practice, fulfilling quality reporting requirements, and promoting research (http://www.ptoutcomes.com/SDR/SAP/).

To enhance the registry as it applies to orthopaedic practice, the Orthopaedic Section has been involved in the development of orthopaedic practice specific modules within the registry. Modules focus on a condition or disease specific set of data elements to describe and risk-adjust process of care and clinical outcomes for a defined patient population. The Orthopaedic Section has developed a set of data elements and a module for the classification, diagnosis, and interventions for neck pain. Currently, the shoulder pain module has been completed and is ready for implementation. Substantial progress has been made on a knee pain module and low back pain module. Other modules will also be forthcoming. The core foundation of the modules created by the Orthopaedic Section have been and will be derived from our clinical practice guidelines.

It is the Section's desire that members will find value in participating in the registry. Wide participation will produce greater volumes of physical therapy outcomes registry episodes of care and allow for the development of strong risk-adjusted modules to make accurate judgments about the effectiveness of physical therapist care for specific [orthopaedic] patient populations (http://www.ptoutcomes.com/Modules/).

The Orthopaedic Section provides many tools to promote excellence in orthopaedic physical therapist practice across practice, education, research, and advocacy (www.orthopt.org). The combination of providing clinical practice guidelines and implementing them into the data elements of the APTA Physical Therapy Outcomes Registry is a powerful combination that will not only promote but deliver excellence in orthopaedic physical therapist practice. Please join us in our celebration of this signing and partnership with the APTA Physical Therapy Outcomes Registry.

*Sincerely,*
*Stephen McDavitt, PT, DPT, MS*
*Fellow, Academy of Orthopaedic Manual Physical Therapist*
*Catherine Worthingham Fellow, APTA*
*President, Orthopaedic Section, APTA*

# 2018 Annual Orthopaedic Section Meeting

## Renaissance Baltimore Harborplace Hotel | Baltimore, MD

**Don't miss this opportunity to learn from the experts in both pain science and movement science!** Given the vision of APTA related to the movement system and the explosion of information related to pain science, what could be more cutting edge?

Please join us in **Baltimore, Maryland,** for the 6th Annual Orthopaedic Section Meeting, April 27 - 28, 2018. Physical Therapists and Physical Therapist Assistants will have an opportunity to learn from and engage with experts in the field of pain science and movement science. In addition, participants will be able to spend time with the leadership of the Orthopaedic Section.

We have made a slight change to the format of our 2018 meeting, as we will now be kicking off our meeting on Friday morning, April 27th. Our "welcome reception" will now take place on Friday night, in hopes that all registrants will be able to attend!

The focus of this 2-day conference will be the integration of the most current knowledge of **pain science** with movement science applied to the **low back, hip, knee, and shoulder.** Each day begins with a general session attended by all participants, followed by smaller breakout sessions led by the speakers. These sessions are intended to allow case-based, advanced application, and hands-on experiences related to the topics presented. New this year is a panel discussion at the end of both days to discuss, debate, and integrate the content delivered at the course.


## Program Information

# Friday, April 27, 2018

**Friday Schedule: 8:00AM – 5:30PM | General Session: 8:00AM – 10:30AM**

***Structuring Non-Pharmacological Pain Management Delivered by Physical Therapists***
Speakers: Steven Z. George, PT, PhD, FAPTA; Kathleen Sluka, PT, PhD, FAPTA; Stephen T. Wegener, PhD, ABPP

### Concurrent Breakout Sessions:

Following the general session on Friday, **three** concurrent breakout sessions will be offered. The registrant will attend **all three breakout sessions** following the morning general session, based on order of preference indicated on the registration form. Note, individuals registering early will receive priority with selecting their order of attending these breakout sessions.

***Breakout Session 1***
***Identification of Pain Mechanisms in Patient Populations***
Speaker: Kathleen A. Sluka, PT, PhD, FAPTA

***Breakout Session 2***
***Put Psychologically Informed Practice in Action – Tips for Exercise and Activity Prescription***
Speaker: Steven Z. George, PT, PhD, FAPTA

***Breakout Session 3***
***Patient Engagement Skills: Improving Engagement, Improving Outcomes'***
Speaker: Stephen T. Wegner, PhD, ABPP

## Learn More

The 2018 Annual Orthopaedic Section Meeting will be held at the beautiful Renaissance Baltimore Harborplace Hotel in Baltimore, Maryland. Visit the following link for full meeting details, to register, and to reserve your guestroom: *https://www.orthopt.org/content/s/2018-annual-orthopaedic-section-meeting*

ORTHOPAEDIC SECTION

# Saturday, April 28, 2018

**Saturday Schedule: 8:00AM – 5:30PM | General Session: 8:00AM – 10:30AM**

***Addressing Pain Problems Through the Use of Movement Science***
Speakers: Skulpan Asavasopon, PT, PhD, OCS; Marcie Harris-Hayes, PT, DPT, MSCI; Phil McClure, PT, PhD, FAPTA; Linda Van Dillen, PT, PhD, FAPTA

### Concurrent Breakout Sessions:

Following the general session 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.

### *Breakout Session 4*

***Classification that Drives Rehabilitation with Consideration of Relationships between Pain, Movement, and Muscle Activation: Practical Strategies and Techniques for Management of Common Shoulder Problems***
Speaker: Phil McClure, PT, PhD, FAPTA

### *Breakout Session 5*

***Intra-articular, Prearthritic Hip Disorders and the Movement System***
Speaker: Marcie Harris-Hayes, PT, DPT, MSCI

### *Breakout Session 6*

***A Cognitive-Biomechanical Approach to Knee and Low Back Pain – How to Do It?***
Speaker: Skulpan Asavasopon, PT, PhD, OCS

### *Breakout Session 7*

***Implementing Skill Training in the Treatment of People with Low Back Pain: The Why and the How***
Speaker: Linda Van Dillen, PT, PhD, FAPTA

# Quantifying Forward Head Posture Based on Practicing Physical Therapists' Opinions and Cervical Range of Motion Measurements

**Emma White, PT, DPT, OCS**
**Ashley Barnette, DPT, ATC**
**April Phillips, DPT**
**Sara Migliarese, PT, PhD, NCS**

*Department of Physical Therapy, Winston-Salem State University, Winston-Salem, NC*

## ABSTRACT

**Background and Purpose:** Currently there is no agreed upon quantifiable standard for forward head posture (FHP). This study aimed to identify agreement among clinicians as to what visually constitutes FHP and correlate it to the cervical range of motion measurements using the cervical range of motion (CROM) device. **Methods:** Subjects were positioned in various cervical alignments from neutral to progressively more forward head. Photographs were taken at each position and measured using the CROM. North Carolina Physical Therapy Association (NCPTA) members were surveyed on the photographs and asked to indicate whether FHP was present or absent. **Findings:** The study found agreement that < 20.5 cm using the CROM is considered the absence of FHP, and ≥ 20.5 cm is the presence of FHP. **Conclusion:** We believe this is the first step to quantifying FHP and promoting standardized classification. The study suggests that CROM measurement ≥ 20.5 cm is classified as FHP by visual observation among physical therapists in North Carolina.

**Key Words:** neck pain, alignment, visual postural assessment

## INTRODUCTION

Neck pain is a common ailment affecting the majority of adults at least once in their lifetime with many seeking physical therapy consultation for their symptoms.[1] Epidemiological studies have shown the prevalence of neck pain in the adult population varies from 22% to 70%.[1,2] Neck pain is commonly attributed to stress, faulty posture, muscle impairment, temporomandibular dysfunction, and trauma such as whiplash.[1,3] Many health care practitioners include postural assessment as part of a routine examination of patients presenting with neck pain.[2,4-7] This postural assessment is believed to be an important part of the examination. In addition it often impacts the musculoskeletal diagnosis and affects the design of the treatment plan. According to Silva et al[2] abnormal posture can adversely affect biomechanical function of the cervical spine and cause other physiological impairments of the surrounding tissues.

A common postural fault of the cervical spine has been referred to as forward head posture (FHP). This postural fault is characterized by the flexion of the lower cervical spine and extension of the upper cervical spine.[4] Bergqvist et al[8] state that "musculoskeletal pain occurs due to changes in muscle length when assuming a poor posture for a prolonged period." Specifically, the deep cervical flexors are lengthened and weakened which compromises their ability to hold the head in proper alignment.[1] This mechanical change has been theorized by many researchers as a major contributor leading to neck pain.[1,2,3,9] Along with neck pain, FHP has been associated with cervicogenic and migraine headaches,[3] abnormal scapular movement,[10,11] temporomandibular joint disorders,[12] and myofascial pain syndrome.[13] In most physical therapy practices, we rely on the postural assessment including FHP as a measure from which treatment decisions are based. Physical therapists need to have an objective measure that is standardized and quantifiable when analyzing this postural abnormality.

There are several methods of assessing posture including visual inspection, use of a plumb line,[14] craniovertebral angle measurement,[15] and use of the cervical range of motion (CROM) device.[5] Some combination of visual inspection and use of a plumb line assessment[14] appears to be the method commonly used by physical therapists for postural assessments. This is a subjective visual interpretation made comparing the alignment of structures from head to toe with an invisible plumb line. Kendall et al[14] describes correct posture as the plumb line passing just posterior to the lateral malleolus, slightly anterior to the midline of the knee, through the greater trochanter, bodies of the lumbar vertebrae, acromion process, bodies of the cervical vertebrae, and through the external auditory meatus.

Forward head posture is described as "a condition in which the head (specifically the external auditory meatus) is positioned anteriorly to the vertical postural line."[5,14] Visual assessment of posture has been shown to have poor interrater reliability,[6,7,16] thus posing the question of whether this should be the assessment of choice for health care clinicians. Yip et al[6] explains, "a decision regarding normality is then based on a clinician's experience and perception of what constitutes as normal or 'ideal' posture, and is therefore considered to be a potential source of error." Garrett et al[5] evaluated the effectiveness of using the CROM to measure FHP. Although this method is considered a reliable and objective measurement, no standard values associated with FHP in an individual have been determined. The aim of this study was to determine the agreement among physical therapists for the classification of FHP using visual assessment and relate this to the measurements from the CROM associated with each posture.

## METHODS

### Subjects

Twelve participants agreed to be photographed in varying degrees of FHP. Participants were recruited from the university faculty, staff, and students (6 men, 6 women). All participants were between the ages of 23 and 65 years and were informed of the procedures, experimental risks, and rationale. An informed consent was signed prior to the procedure. Participants were excluded if they had a resting tremor of the head/neck or any neurological impairments causing an inability to hold their head upright without assistance. The sample of practicing physical therapists included licensed physical therapists who were members of the North Carolina Physical Therapy Association (NCPTA).

### Procedure

The researchers used the CROM instrument to manipulate the amount of forward head in the photographed participants (Figure 1). These photographs were then evaluated by NCPTA physical therapy mem-

**Figure 1. Forward head posture measurement using cervical range of motion measurements.**

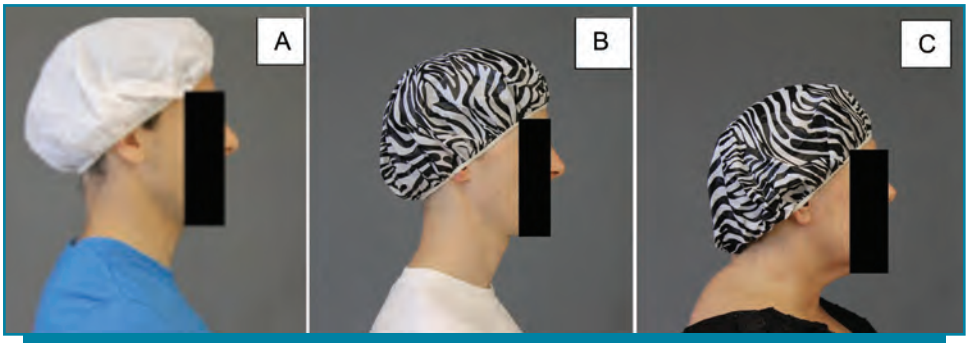



**Figure 2. Sample photographs in varying degrees of forward head posture used in survey. 2A, CROM measure-17 cm. 2B, CROM measure-19.5 cm. 2C, CROM measure-20.5 cm.**

bers to obtain their opinion about the presence or absence of FHP.

Each volunteer model was seated in a stable, backed chair without armrests. The researchers placed the participants in 90° of knee flexion, 90° of hip flexion, and neutral position of the ankle. The participants were positioned with their right side facing the camera. A Cannon EOS Rebel T3 camera with an 18-55 mm lens attached to a Bower tripod was used and was placed approximately two feet from each participant.

Participants' heads were covered with a shower cap for the photographs and all identifying facial features were obscured before the image was uploaded to Survey Monkey (Figure 2). The CROM instrument was used to position the subjects in various positions of forward head and was removed prior to taking the photographs in order to reduce bias in the survey. Neutral sagittal and vertical alignment for the head and neck was determined following the CROM instructions.[5] Each participant started in a neutral position and was moved forward in 2 cm increments up to 4 times (or to end range for their personal motion) and a photograph was taken at each position. The order of pictures were then randomized. The standardized neutral position of the head was as described by Kendall et al[14] in which the external auditory meatus is aligned with the acromion of the shoulder.

Fifteen photographs were randomly selected to create the survey, which was designed in an electronic survey provider. The first page of the survey consisted of demographic background questions for the volunteers to complete, including information regarding age, gender, years of therapist experience, and specialist certification. The survey question for each picture asked, "Would you classify the person in the photograph as demonstrating forward head posture?" The answer choices of "yes" or "no" appeared below the image. The survey was formatted so that each question had to be answered before progression to the next photo. Participants were only able to view one image at a time, so as not to allow comparison between images.

The surveys were emailed in an attached link from the NCPTA Executive Director to all licensed physical therapists in the state of North Carolina. The email included a statement to notify volunteers that by completing the survey they are volunteering and providing consent to participate in this study. The survey was kept open for 3 weeks.

### Statistical Analysis

All results were analyzed using IBM SPSS Statistics (version 22). Years of experience were divided into 4 categories: 1-5 years, 5-10 years, 10-15 years, and 15+ years of experience. Frequency and percentages were calculated for years of experience, gender, specialty, and responses to each posture question. A "yes" was categorized as 1 and a "no" as 2, to facilitate analyses. Chi square analyses were used to compare frequency of response for each question by years of experience (Table 1) and by specialty certification (Table 2).

## FINDINGS

The survey link was sent to 2,824 NCPTA member email accounts, of these 1,077 opened the email and 245 clicked the link to open the survey. While 204 began the study, only 186 physical therapists completed the full survey. The 18 incomplete results were excluded from the statistical analysis.

Agreement on FHP for each photograph ranged from a low of 54% to a high of 100%. Figure 3 demonstrates the agreement for head posture with a 95% confidence interval. The graph shows overall agreement designating FHP between the measurements of 27.0 cm to 20.5 cm. However, greater variability in agreement is demonstrated by a longer vertical line at positions 24.5 cm and 20.5 cm. Values below 20.5 cm showed more agreement toward the absence of FHP, though slightly greater variability for this as compared to the values designating FHP.

The Chi Square analyses for designation of FHP by years of experience (Table 1) or specialty (Table 2) showed no statistical significance. As with the overall results, these tables illustrate the variability in agreement by head position (CROM measure) within some ranges, and reduced variability among other ranges. We attribute the variability among respondents at position 24.5 secondary to lack of a baseline since it was the first photograph of the survey. The cut-off that was determined to represent FHP by practicing physical therapists in North Carolina that completed the survey was 20.5 cm when using the CROM. Additionally, Figure 3 shows overall agreement of the absence of FHP at the measurements of 17.0 cm to 20.0 cm. The photographs that caused the greatest degree of disparity were at measurements 19.5 cm and 18.5 cm as measured using the CROM. At these ranges, percent agreement between both specialists and years of experience were closer to 50%.

### Discussion

Effective treatment is dependent upon the reliability and accuracy of assessment

**Table 1. Frequencies of Agreement on Identification of Forward Head Posture by Years of Experience**

| Head Position in cm | 0-5 years of experience | 5-10 years of experience | 10-15 years of experience | 15+ years of experience |
|---|---|---|---|---|
| 17.0 cm | No (98.4%) | No (100%) | No (100%) | No (95.2%) |
| 18.5 cm | No (55.7%) | Yes (65%) | No (54.2%) | No (59.1%) |
| 18.5 cm | No (86.7%) | No (85%) | No (75%) | No (68.7%) |
| 18.5 cm | No (85.3%) | No (80%) | No (70.8%) | No (68.7%) |
| 19.5 cm | No (73.8%) | No (65%) | No (62.5%) | No (57.8%) |
| 20.0 cm | No (91.8%) | No (90%) | No (87.5%) | No (92.8%) |
| | | | | |
| 20.5 cm | Yes (93.4%) | Yes (90%) | Yes (87.5%) | Yes (86.8%) |
| 21.0 cm | Yes (98.4%) | Yes (100%) | Yes (100%) | Yes (98.8%) |
| 21.0 cm | Yes (100%) | Yes (100%) | Yes (100%) | Yes (98.8%) |
| 21.5 cm | Yes (96.7%) | Yes (100%) | Yes (100%) | Yes (96.4%) |
| 22.0 cm | Yes (96.7%) | Yes (95%) | Yes (91.7%) | Yes (91.6%) |
| 22.5 cm | Yes (95.1%) | Yes (95%) | Yes (95.8%) | Yes (92.8%) |
| 24.0 cm | Yes (98.4%) | Yes (100%) | Yes (95.8%) | Yes (98.8%) |
| 24.5 cm | Yes (85.3%) | Yes (85%) | Yes (75%) | Yes (81.9%) |
| 27.0 cm | Yes (100%) | Yes (100%) | Yes (100%) | Yes (96.4%) |

No represents clinician agreement for lack of forward head; Yes represents clinician agreement that forward head posture is present.

**Table 2. Frequency of Agreement on Identification of Forward Head Posture by Specialty Frequency of Agreement**

| Question Number | OCS | GCS | NCS | Other Specialty | Non Specialist |
|---|---|---|---|---|---|
| 1: 24.5 cm | Yes (83.3%) | Yes (63.6%) | Yes (100%) | Yes (80.4%) | Yes (84.2%) |
| 2: 19.5 cm | No (72.2%) | Yes (63.6%) | (50/50 split) | No (73.2%) | No (63.4%) |
| 3: 21.0 cm | Yes (100%) | Yes (100%) | Yes (100%) | Yes (97.6%) | Yes (99.1%) |
| 4: 21.5 cm | Yes (100%) | Yes (90.9%) | Yes (100%) | Yes (97.6%) | Yes (97.4%) |
| 5: 20.0 cm | No (94.4%) | No (81.8%) | No (75%) | No (90.2%) | No (93%) |
| 6: 24.0 cm | Yes (100%) | Yes (100%) | Yes (100%) | Yes (95.1%) | Yes (99.1%) |
| 7: 20.5 cm | Yes (88.9%) | Yes (90.9%) | Yes (100%) | Yes (87.8%) | Yes (89.5%) |
| 8: 17.0 cm | No (94.4%) | No (100%) | No (100%) | No (97.6%) | No (97.4%) |
| 9: 22.7 cm | Yes (100%) | Yes (100%) | Yes (100%) | Yes (92.7%) | Yes (93%) |
| 10: 18.5 cm | No (72.2%) | No (63.6%) | No (100%) | No (75.6%) | No (76.3%) |
| 11: 22.0 cm | Yes (88.9%) | Yes (90.9%) | Yes (100%) | Yes (95.1%) | Yes (93.9%) |
| 12: 18.5 cm | Yes (55.6%) | Yes (54.5%) | (50/50 split) | No (51.2%) | No (58.8%) |
| 13: 21.0 cm | Yes (100%) | Yes (100%) | Yes (100%) | Yes (97.6%) | Yes (100%) |
| 14: 27.0 cm | Yes (100%) | Yes (100%) | Yes (100%) | Yes (92.7%) | Yes (100%) |
| 15: 18.5 cm | No (77.8%) | No (63.6%) | No (75%) | No (73.2%) | No (80%) |

Lower Scores indicate agreement on absence of forward head posture. High Scores indicate agreement of forward head posture.

Abbreviations: OCS, orthopaedic certified specialist; GCS, geriatric certified specialist; NCS, neurologic certified specialist

measures to be used during the examination process. This study is a first step towards quantification of this postural abnormality using the CROM. While the visual plumb line assessment remains the most popular method in clinical practice, it has not been shown to be reliable.[6,7,16] If visual assessment is unreliable, the question must then be asked whether or not this routine clinical procedure should continue to be obeyed. The results of this study are not intended to be an endorsement for the CROM but to initiate the discussion about objective measures that are reproducible and reliable. The CROM is but one measurement tool.

While the CROM has been shown to be reliable, there are several inherent weaknesses as well. A visual assessment of posture is typically performed in the sagittal plane. This view allows the physical therapist to look at a number of mechanical relationships such as the glenohumeral position relative to the tragus of the ear. From the frontal view, the therapist can get an appreciation of any

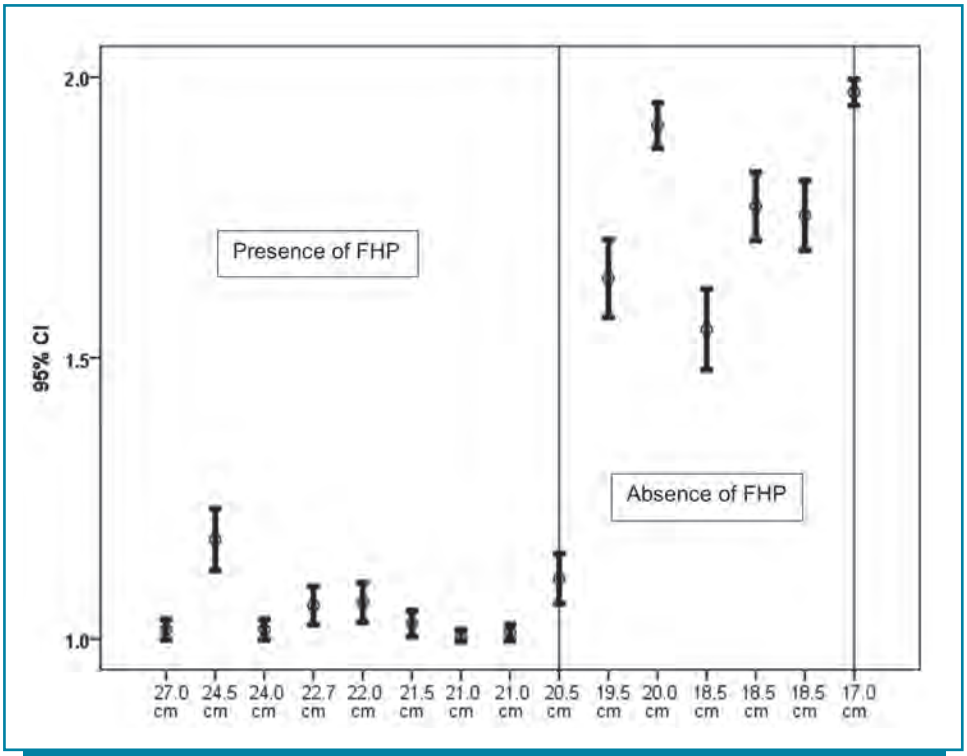



**Figure 3. Error bar graph representing mean 95% CI for agreement regarding forward head posture classification.**

**Line: Approximate agreement of distinction between forward head posture and absence of forward head posture.**

cervical lateral side bending tendencies or elevation of the scapulae as these observations can impact or influence the assessment of FHP. When using the CROM however neither of these relationships are taken into consideration.

Recent research has looked more closely at the craniovertebral angle as another way in which to measure FHP.[6,17-19] This method is more time intensive in that a photograph from the lateral aspect must be taken to measure the craniovertebral angle which is formed by intersecting horizontal lines through the spinous process of C7 and from C7 through the tragus of ear.[6,20-22] Measurement of the craniovertebral angle has been found to be reliable with excellent psychometric properties. The intraclass correlation coefficient (ICC) has been consistently high (ICC 0.91-0.93).[20,21] While reliable, it is not the method of choice possibly due to the time constraints involved in a clinical setting.[22,23]

The findings from this study lay the groundwork with a hope that further research would attempt to answer questions such as, "At what point does FHP cause pain?", "Is FHP a contributor to fall risk in older adults?", "Where is the threshold when FHP may be contributing to headaches and possibly conditions such as low back pain?" Research in this area is greatly needed to further the discussions relative to treatment.

### Limitations

A limitation of this study lies in the small sample of model participants. We purposely limited the number of photographs for review to 15 images. Our goal was to keep the time needed to complete the survey to a minimum thus increasing the likelihood of more responses from practicing physical therapists. Having a greater number of photographs with more variability in the measurements represented may have allowed for the ability to come closer to finding a significant point of agreement ($p < .05$). Another limitation was that we only surveyed physical therapists from North Carolina. In order to improve the generalizability, further research should include efforts to extend the survey to a national database of physical therapists.

## CLINICAL RELEVANCE

Physical therapists and other health care providers are educated and encouraged to assess postural alignment through observation as part of the routine clinical examination of patients. The assessment of FHP is a primary part of the postural examination. While physical therapists commonly assess, document, and describe the presence or absence of FHP, there is no quantifiable method to this measure. The results from this survey regarding the presence of FHP show the cutoff for agreement within North Carolina licensed physical therapists is 20.5 cm or greater when using the CROM. Having an objective method to quantify FHP will aid clinicians in the examination process and will serve to guide clinical decision making. By having a measurable and objective reference point from which to start will aid in documenting change in our patients, which is becoming increasingly tied to reimbursement.

## CONCLUSION

The study suggests that a CROM measurement at or above 20.5 cm is classified as FHP among physical therapists in North Carolina while a CROM measurement of less than 20.5 cm represents the absence of FHP. More research needs to be done in this area with a greater sample of therapists and a larger sample of CROM measurements.


## ACKNOWLEDGEMENT

A special thank you to Dr. A. Lynn Millar, PT, PhD, FACSM, for assistance with the statistical analysis.


## REFERENCES


1. Gupta B, Aggarwal S, Gupta B, Gupta M, Gupta N. Effect of deep cervical flexor training vs. conventional isometric training on forward head posture, pain, neck disability index in dentists suffering from chronic neck pain. *J Clin Diagn Res.* 2013;7(10):2261-2264.
2. Silva A, Punt T, Sharples P, Vilas-Boas J, Johnson M. Head posture assessment for patients with neck pain: is it useful? *Int J Ther Rehabil.* 2009;16(1):43-53.
3. Fernandez-de-las-Penas C, Cuadrado M, Pareja J. Myofascial trigger points, neck mobility and forward head posture in unilateral migraine. *Cephalalgia.* 2006;26:1061-1070.
4. Szeto G, Straker L, Raine S. A field comparison of neck and shoulder postures in symptomatic and asymptomatic office workers. *Appl Ergon.* 2002;33(1):75-84.
5. Garrett T, Youdas J, Madson T. Reliability of measuring forward head posture in a clinical setting. *J Orthop Sports Phys Ther.* 1993;17(3):155-160.
6. Yip CH, Chui TT, Poon AT. The relationship between head pos-

ture and severity and disability of patients with neck pain. *Man Ther.* 2008;13(2):148-154.
7. Silva AG, Punt TD, Johnson MI. Reliability and validity of head posture assessment by observation and a four-category scale. *Man Ther.* 2010;15(5):490-495. doi: 10.1016/j.math.2010.05.002. Epub 2010 Jun 4.
8. Bergqvist U, Wolgast E, Nilsson B, Voss M. Musculoskeletal disorders among visual display terminal workers: individual, ergonomic, and work organizational factors. *Ergonomics.* 1995;38(4):763-776.
9. McAviney J, Schulz D, Bock RB, Harrison DE, Holland B. Determining the relationship between cervical lordosis and neck complaints. *J Manipulative Physiol Ther.* 2005;28(3):187-193.
10. Weon J, Oh J, Cynn H, Kim Y, Kwon O, Yi C. Influence of forward head posture on scapular upward rotators during isometric shoulder flexion. *J Bodyw Mov Ther.* 2010;14(4):367-374. doi:10.1016/j.jbmt.2009.06.006.
11. Thigpen CA, Padua DA, Michener LA, et al. Head and shoulder posture affect scapular mechanics and muscle activity in overhead tasks. *J Electromyogr Kinesiol.* 2010;20(4):701-709. doi.org/10.1016/j.jelekin.2009.12.003.
12. Evick D, Aksoy O. Relationship between head posture and temporomandibular dysfunction syndrome. *J Musculoskelet Pain.* 2004;12(2):19-24. doi.org/10.1300/J094v12n02_03.
13. Cimbiz A, Beydemir F, Manisaligil U. Evaluation of trigger points in young subjects. *J Musculoskelet Pain.* 2006;14(4):27-35. doi.org/10.1300/J094v14n04_04.
14. Kendall FP, McCleary EK, Provance PG, Rodgers MM, Romani WA. *Muscles-Testing & Function with Posture and Pain.* 5th ed. Baltimore, MD: Lippincott Williams & Wilkins: 2005.
15. Brunton J, Brunton E, Mhuiri A. Reliability of measuring natural head posture using the craniovertebral angle. *Irish Ergonomics Review.* 2003:37-41.
16. Fedorak C, Ashworth N, Marshall J, Paull H. Reliability of the visual assessment of cervical and lumbar lordosis: how good are we? *Spine (Phila Pa 1976).* 2003;28(16):1857-1859.
17. Watson DH, Trott PH. Cervical headache: an investigation of natural head posture and upper cervical flexor muscle performance. *Cephalalgia.* 1993;13(4):272-284.
18. Gadotti I, Armijo-Olivo S, Silveira A, Magee D. Reliability of the craniocervical posture assessment: visual and angular measurements using photographs and radiographs. *J Manipulative Physiol Ther.* 2013;36(9):619-625.
19. Salahzadeh Z, Maroufi N, Ahmadi A, et al. Assessment of forward head posture in females: observational and photogrammetry methods. *J Back Musculoskelet Rehabil.* 2014;27(2):131-139.
20. Dimitriadis Z, Podogyros G, Polyviou D, Tasopoulos I, Passa K. The reliability of lateral photography for the assessment of the forward head posture through four different angle-based analysis methods in healthy individuals. *Musculoskeletal Care.* 2015;13(3):179-186.
21. Nam SH, Son SM, Kwon JW, Lee NK. The intra- and inter-rater reliabilities of the forward head posture assessment of normal healthy subjects. *J Phys Ther Sci.* 2013;25(6):737-739.
22. Diab AA. The role of forward head correction in management of adolescent idiopathic scoliotic patients: a randomized controlled trial. *Clin Rehabil.* 2012;26(12):1123-1132.
23. Falla D, Jull GA, Russell T, Vicenzion B, Hodges P. Effects of neck exercise on sitting posture in patients with chronic neck pain. *Phys Ther.* 2007;87(4):408-417.

# Patient Outcomes With and Without Implementation of a Neck Pain Classification System: A Preliminary Analysis

**Kevin P. Farrell, PT, PhD, OCS, FAAOMPT**
**Katherine E. Lampe, PT, DPT, CWS, FACCWS**

*St. Ambrose University, Davenport, IA*

## ABSTRACT

**Background and Purpose:** Research is lacking on application of classification and treatment systems. This study prospectively examined a neck classification system with interventions on pain and disability outcomes. **Methods:** Numeric Pain Rating Scale (NPRS) and Neck Disability Index (NDI) scores were collected for patients with neck pain. In phase 1, baseline patient outcomes were collected while therapists continued current assessment and interventions. During phase 2, therapists were trained in the use of a neck classification system with evidence-based 'matched' interventions. **Findings:** In both phases, clinically and statistically significant improvements in NPRS and NDI occurred, but there were no differences between phases. Phase 2 had significantly fewer visits versus phase 1 (7.46 vs. 9.95, respectively) and shorter care duration (28.65 versus 38.95 days). **Clinical Relevance:** Therapists correctly implemented and demonstrated more efficient patient outcome when using a neck classification system. The NDI and NPRS outcomes improved significantly during both phases. **Conclusion:** Implementing a neck classification system, with matched interventions, allowed more efficient attainment of patient outcomes.

**Key Words:** cervical, outcomes, matched interventions

## BACKGROUND AND PURPOSE

Neck pain is a common symptom encountered by approximately 20% or more of the general population.[1-3] These patients are frequently seen by physical therapists. There are many potential neck pain causes that may lead to a variety of treatment approaches. Regardless of the pain source, numerous interventions and treatment approaches are used.[1,2] Less than optimal outcomes may be related to the implementation of inappropriate or non-evidence-based interventions. Putting patients in specific categories or classifications may enhance uniformity of treatment and potentially improve outcomes.[2,4,5] Physical therapists have developed methods to enhance outcomes by using classification systems and clinical practice guidelines (CPGs).[2,4-7] Classification systems provide guidance by categorization based on examination and identifying ideal evidence-based interventions.[2,6,7]

In 2004, Childs et al created a neck pain classification system based on current evidence.[2] That system proposed 5 patient classification categories: mobility, centralization, conditioning/increase exercise tolerance, pain control, and reduce headache. Classification assignment depended on information gathered from the patient's history and physical examination. Those authors also identified appropriate interventions for each category based on existing literature. Fritz and Brennan investigated the Childs et al classification system in 247 patients with neck pain.[2,7] They retrospectively classified patients based upon the system proposed by Childs et al. They concluded the system could be implemented with their study patient population with 96% to 98% agreement between raters for selecting appropriate categories.[2,7] Furthermore, they compared patient outcomes for matched or unmatched interventions for the category. Matched interventions were defined by Fritz and Brennan as effective interventions identified by Childs et al for that classification as seen in Table 1.[2,7] Unmatched interventions did not follow the Childs et al system.[2] The outcomes compared were the Neck Disability Index (NDI) and Numeric Pain Rating Scale (NPRS) scores. Significantly better outcomes were found when the intervention(s) matched the appropriate classification versus non-matched intervention(s).

There is minimal literature addressing the benefits of implementing the Childs et al neck classification.[2] Several case reports have used the classification for patients fitting the cervical radiculopathy or exercise and conditioning categories.[8-10] In 2009 Cleland et al assessed an 8-hour continuing education session that used the Childs et al classification system.[2,11] However, they compared, in a randomized controlled trial, groups who received additional, individualized training versus those who did not. That study focused on the difference between groups who had additional, individualized follow-up sessions after training on the classification system versus those who did not (control). The study found a difference in NDI, number of visits, and percent of patients attaining minimal detectable change (MDC) after this additional posttraining. No change was found in NPRS. The study did acknowledge the inability to determine the impact of applying the classification system alone versus applying the classification system and additional training.

In 2011, Farrell and Lampe conducted a prospective pilot study that included 9 therapists and 47 patients, using the Childs et al classification system.[2,12] The investigation had two phases of data collection. In the first phase, baseline NDI and NPRS outcomes were collected as therapists continued to treat patients using their current, personal neck pain approach. In the second phase, the therapists were specifically trained to follow the Childs et al classification with treatment that matched each category. The training included a several hour educational session with no lab training.[2] In both phases, significant ($P < 0.002$) improvements were found in NDI and NPRS outcome scores. There was no significant difference, however, in outcomes between phases 1 or 2. The pilot study prospectively demonstrated that therapists could specifically implement the classification system and the appropriate treatment.[12]

The neck pain CPGs developed by the Orthopaedic Section of the American Physical Therapy Association (APTA) in 2008 had only 4 categories.[1] This guideline was based on current evidence and closely mirrored the Childs et al and Fritz and Brennan classifications.[2,7] The guidelines identified a method 'to match the clinical presentation with the most efficacious treatment approach.' Horn et al retrospectively assessed the benefit to follow the Orthopaedic Section, APTA neck pain CPG.[1,13] They set criteria for appropriate

CPG care, or adherent care, based on percent of current procedural terminology (CPT) codes considered 'manual' therapy or 'active' care billed during therapy. They assessed NDI and NPRS as well as health care use (medications, other health care visits, and diagnostic imaging) and charges between patients with adherent care or non-adherent care. They found that only 11% of 298 patients received adherent care. There was no difference in NDI change. A lower percent improvement in pain scores for those who received adherent care was found. Patients who received adherent care had significantly fewer visits (3.6 fewer) and lower charges. Other health care use was significantly lower in the adherent group. The study based adherence on CPT codes, but did not ensure treatment fit the specific interventions recommended by CPG category.[1] It was not clear if therapists used specific treatments based on appropriate classification. No other studies appear to have prospectively determined the impact of following guidelines/classifications and associated interventions.

Therefore, the purpose of this study was to examine the effect of implementing Childs et al[2] neck pain classification system on NPRS and NDI scores using a multi-hour training session, with no individualized follow-up training. Therapists would be responsible for classifying and documenting intervention categories for neck patients. The overall goal was to determine if the classification system with matched interventions could enhance patient outcomes.

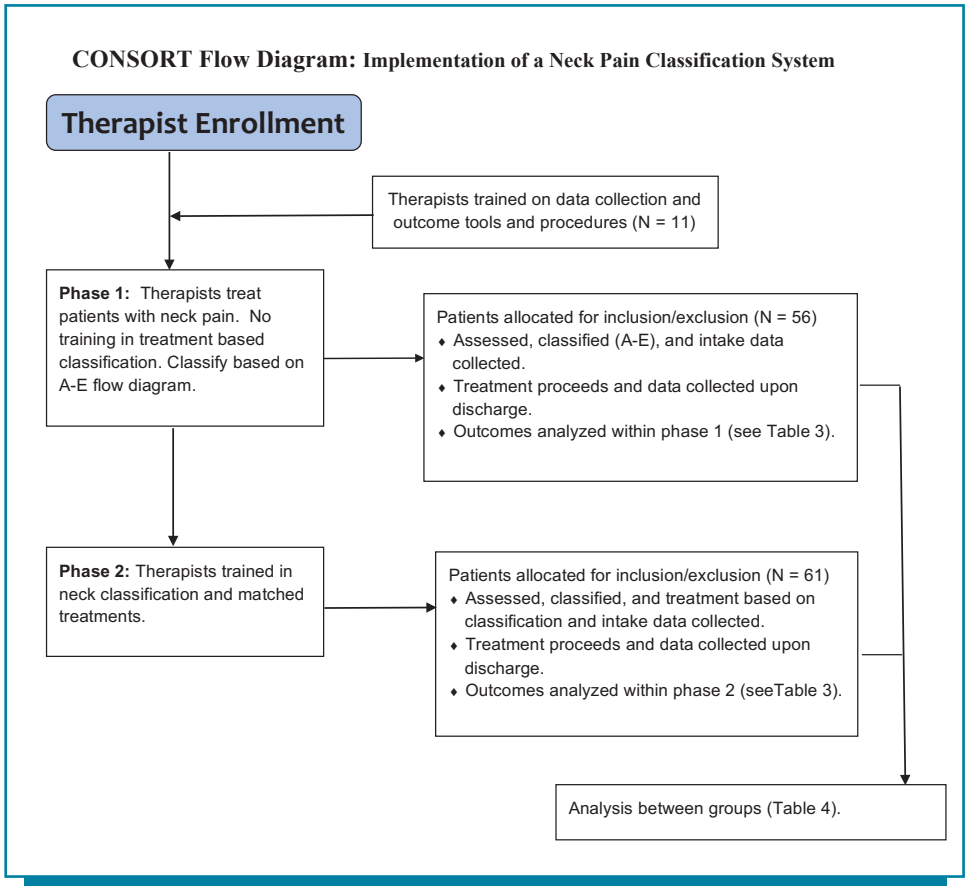



**Figure 1. Research format.**

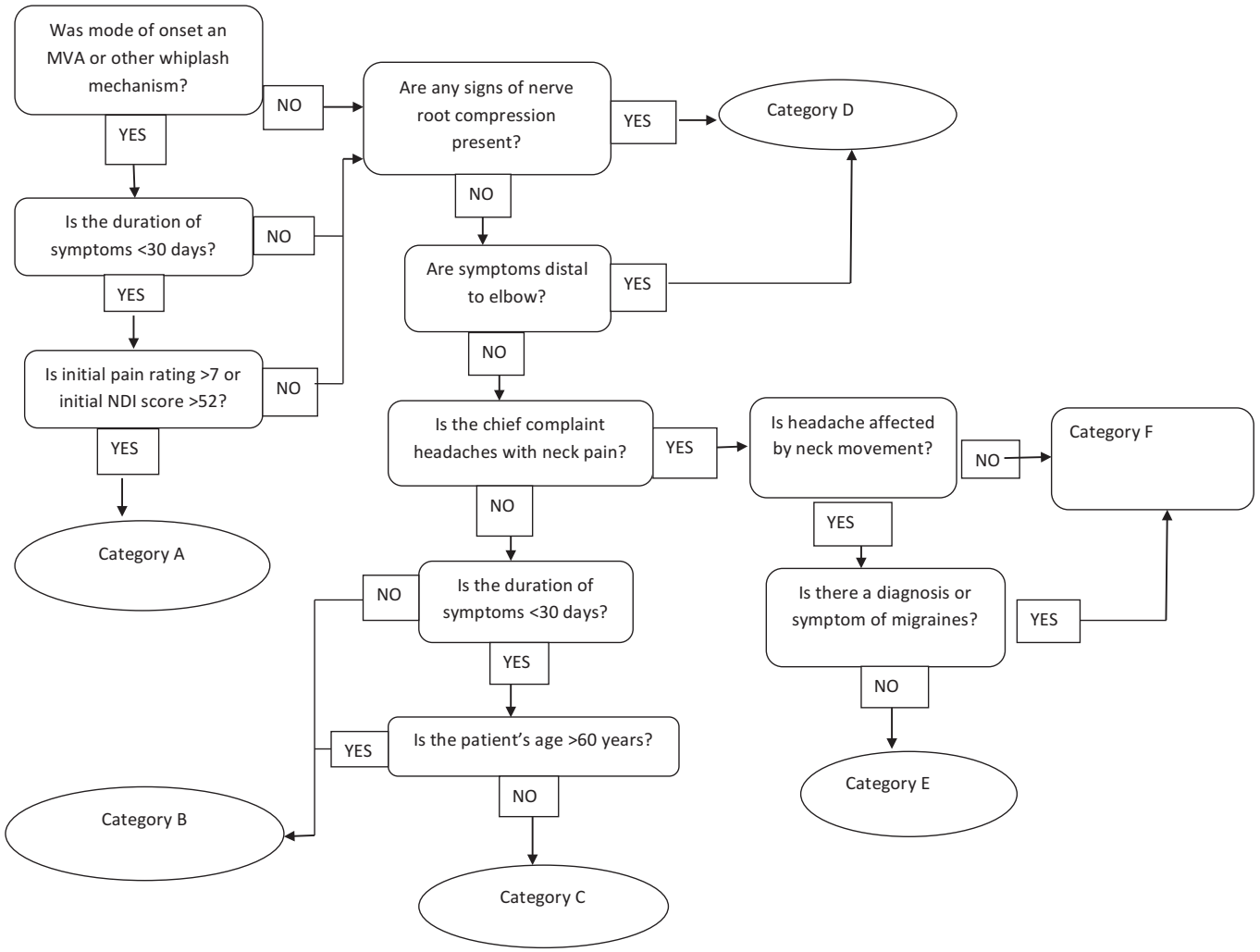
## METHODS

The study followed a quasi-experimental, pretest/posttest cohort design, comparing outcomes before and after therapists were educated to follow a neck pain classification with matched interventions (Figure 1). The study purposefully followed the Childs et al classification system, even though the cervical CPG had been published near the time of the initiation of this study.[1,2] This decision was made because there was only one change in classification categories and this allowed better comparison to the Fritz and Brennan study and the Farrell and Lampe pilot research.[7,12] Following this classification also allowed better clarity between treatment appropriateness and the neck pain CPG.[1]

Study approval was obtained from both the Genesis Health Care and St. Ambrose University Institutional Review Boards. Informed consent was obtained from therapists and patients ensuring all rights were protected. Therapists were recruited from 7 participating clinics within a regional health organization using flyers and information sessions. Therapists were surveyed to determine familiarity with neck pain interventions. For phase 1, an education session was held with all participating therapists to ensure standard study protocol. During this session, therapist data was gathered including demographics, educational training, and current basis for neck pain intervention. There were no specific inclusion/exclusion criteria for participating therapists, except that they must treat neck pain on a regular basis and participate in both phases of the study. Patient inclusion criteria included neck pain as well as symptoms that radiated into the arm, head, or neck. Exclusion criteria included anyone who the therapist considered inappropriate for therapy, demonstrated non-organic complaints, the potential for severe ligamentous instability, had prior neck surgery, had neck or a fracture in the upper quadrant, or was referred for two or less therapy sessions (ie, transcutaneous electrical nerve stimulation training, home exercise program only, etc). Patients were also excluded if they were pregnant, prisoners, minors, or non-English speaking. A power analysis using prior study data estimated that 150 patients were needed in each phase.[12]

### Phase 1

For phase 1, the therapists were instructed to assess and treat patients with neck pain as they normally do in order to establish NDI and NPRS baseline and other useful data. Researchers educated all participating therapists simultaneously, by providing standardized definitions of patient characteristics and interventions, as well as data collection instructions. After obtaining patient consent, the therapists recorded patient demographic and standard intake data. Therapists categorized patients using a flow sheet provided (Figure 2). The flow sheet was based on the Fritz and Brennan categories, but did not list a classification heading, only letters A through F.[7] Therapists were told this procedure helped organize data. Therapists also completed a data form after each physical therapy visit tracking care frequency, overall duration, and interventions provided during each session. Therapists chose from the Fritz and Brennan categories (Table 1) or other options such as modalities, education, massage, neuro-dynamic techniques, or 'other.'[7]




Abbreviations: MVA, motor vehicle accident; NDI, Neck Disability Index

**Figure 2. Phase 1 flow chart.**

Specific definitions were provided during the training session for each intervention category. On discharge, all relevant data was collected to represent the patient's posttreatment status.

## Phase 2

In phase 2, therapists were trained to use patient classification and matched interventions. Therapists were provided with the two articles on neck classification and educated how to implement them.[2,7] Therapists obtained patient pretreatment information as in phase 1. They followed a flow sheet with category names to determine the appropriate category (Figure 3). Therapists were instructed to follow the matched interventions discussed in the articles. They were explicitly told they could add other treatments as long as they included the matched interventions (Table 1). This protocol was similar to the protocol followed by Fritz and Brennan.[7] Therapists completed a data form after each visit indicating the category of intervention. The therapists could also indicate if the patient changed classification categories, as described by Childs et al or Fritz and Brennan.[2,7] Thus, the investigators could track changes in the interventions to match the new classification.

## Intake Data and Outcomes

The same data was collected on all patients during both phases. From the physical examination, therapists determined presence of headaches, signs of nerve root compression, or symptoms distal to the elbow. On discharge, therapists again noted if these signs or symptoms were still present. During intake and discharge, the primary outcomes measured were NPRS (0 to 10) and NDI score. The NDI is an outcome tool, expressed as a percentage, with 10 items related to neck pain and the patient's perceived disability. The NDI is a reliable and valid outcome commonly used to measure for neck pain.[14,15] The minimum clinically important difference (MCID) has been reported to be between 5 and 9.5 points with a 10 to 19% change.[7,15,16] The NPRS is a valid and reliable measure documenting changes in neck pain with an MCID ranging from 1.0 to 3.5.[16,17] For this study, a change of 2.0 on NPRS and 8% on NDI were used to indicate important changes. The authors chose to be slightly more conservative with values compared to others studies.[7,16]

## Analysis

Means and standard deviations (SD) were calculated for therapist demographic data, including experience and training in treating cervical pain. Outcomes of pre- and post-intervention NPRS and NDI scores were compared separately for phase 1 and 2 using a paired t-test to determine if a significant

**Table 1. Patient Classification and Matched Treatments[2]**

| Classification | Criterion | Proposed Matched Treatment Components |
|---|---|---|
| **Mobility** | Listed interventions must *both* be received within the first 3 sessions. | Cervical or thoracic mobilization or manipulation.<br><br>Strengthening exercises for the deep neck flexor muscles. |
| **Centralization** | *Either* of listed interventions must be received. | Mechanical or manual cervical traction (at least 50% of the sessions).<br><br>Cervical retraction exercises (at least 50% of the sessions). |
| **Exercise and Conditioning** | The listed interventions must *both* be received in at least 50% of the sessions. | Strengthening exercises for the upper-quadrant muscles.<br><br>Strengthening exercises for the neck or deep neck flexor muscles. |
| **Pain Control** | The listed interventions must *both* be received within the first 3 sessions; immobilization with a cervical collar or similar device cannot be used. | Cervical spine mobilization.<br><br>Cervical range of motion exercises. |
| **Headache** | The listed interventions must *all* be received. | Cervical spine manipulation or mobilization.<br><br>Strengthening exercises for the deep neck flexor muscles.<br><br>Strengthening exercises for the upper-quarter muscles. |

change occurred within the phase. Lastly, if the data set did not pass normality testing, an appropriate non-parametric test was performed.

Baseline comparisons were performed on the patient demographic data between phase 1 and phase 2. The pre- to post-changes in NDI and NPRS were compared between the phases, as well as other variables including treatment duration, number of visits, outcome change per visit, number of patients reaching MCID for each outcome measure, etc. Outcome variable comparisons were performed between phases using an appropriate parametric (t-test) or non-parametric test (Mann-Whitney U test or Rank Sum test). If the parametric data did not pass normality of distribution, appropriate non-parametric tests were used. Numbers needed to treat (NNT) were calculated for patients reaching the MCID level for outcomes of NDI and NPRS.

## FINDINGS

Basic demographic information was collected (Table 2) for the 11 therapists. Five additional therapists began the study, but their data was not included as they only had patients in the first phase or if the therapist moved out of the system during phase 1. All therapists were surveyed prior to the study and all reported being familiar with and used the interventions listed by Childs et al.[2]

### Phase 1 Outcome Data

For phase 1, some patient's data was excluded due to incomplete data provided or if the therapists did not have patients in both phases of the study as noted earlier. Two patients in the non-cervicogenic headache category were dropped due to no patients in this category during phase 2 for comparison. Thus, for the final analysis, 56 patients were included in phase 1. In this cohort, 45 of the 56 patients (82.1%) were correctly classified by the therapists using the A-F categories when investigators reviewed input data. In this group, 20 of the 56 patients (35.7%) received the appropriate, matched evidence-based intervention strategy. Results are presented as mean with SD in parenthesis in Table 3. Most patients (39/56 or 70%) reported symptoms > 30 days. The mean duration was skewed by 2 patients whose symptoms duration was greater than 10 years. The difference between pre- and post-values was statistically significant for NDI (P = <0.001) and NPRS (P = <0.001). Mean number of visits, NDI mean change per visit, NPRS change per visit, mean number of treatment and weeks are listed in Table 4. A graphical representation appears in Figure 4.

### Phase 2 Outcome Data

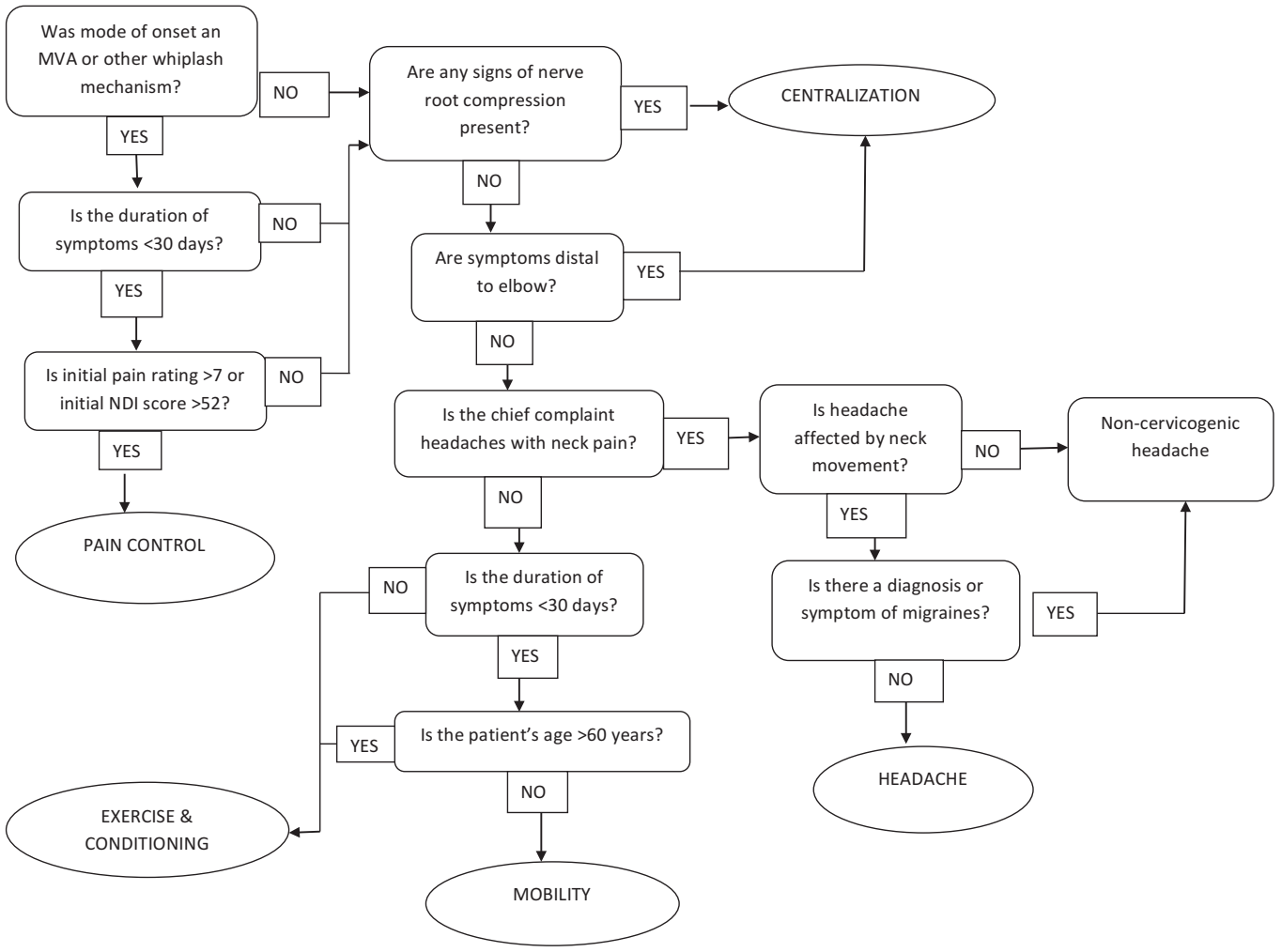
For the final analysis, 61 patients were included in phase 2. The majority of patients were correctly categorized (98.4% or 60/61). The appropriate matched interventions were used for 96.8% of patients (59/61). The therapists could not recall a basis for the miscategorization or use of non-appropriate intervention when asked. The mean patient symptom duration was longer than those in phase 1 with 36 of 61 patients (59%) reporting symptoms > 30 days. The mean symptom duration was again skewed by 2 patients whose symptoms were greater than 10 years.

The NDI and NPRS pre- and post-values are listed in Table 3. A graphical representation of phase two data is presented in Figure 4. The difference between pre- and post-values was statistically significant for NDI (P < 0.001). The difference between NPRS pre- and post-values was statistically significant, however, the data failed the test for normalcy. The Wilcoxon Signed Rank test was performed (P < 0.001). Mean number of visits, treatment days, treatment weeks, and percent change in NDI and NPRS are listed in Table 4.

### Phase 1 and 2 Pre- and Post- Differences

Patient characteristics and demographic information are listed in Table 4. The NDI and NPRS changes were compared between phases 1 and 2 as well as number of visits, duration of treatment, change in NDI and NPRS per visit, and number of subjects reaching MCID level (Table 4 and Figure 1). The two groups demonstrated similar demographics. There was no significant difference in baseline values between groups for NDI, NPRS, or mean age of patients between phases. The t-test comparing NDI percent change failed the equal variance test and a Mann-Whitney Rank Sum Test was performed. The difference was not statistically different between groups (p = 0.712). The t-test comparing NDI point change failed the equal variance test and a Mann-Whitney Rank Sum Test was performed. The difference was not statistically significant (P = 0.283).

There were statistically significant differences in several other outcome variables. The mean difference in number of visits between phases was statistically different (Mann-Whitney Rank Sum test: P < 0.001) with fewer visits in phase 2, 7.46 (+ 3.56) versus phase 1, 9.95 (+ 4.01). There was also a statis-




Abbreviations: MVA, motor vehicle accident; NDI, Neck Disability Index

**Figure 3. Phase 2 flow chart.**

**Table 2. Demographic Data for Participating Therapists**

- 11 therapists at 7 locations
- Gender: 5 male/6 female
- Training level: 1 Bachelors; 5 MPT; and 5 DPT
- Age: Mean 34.1 (7.4)* years; Range: 27–50 years
- Average years of experience: 8.5 (7.3); Range: 1–26 years
- Average years treating patients with neck pain: 7.8 (6.9): Range 1 – 26 years
- Other certifications and training: 2 Orthopaedic Clinical Specialists; 2 with other credentials (Certified Strength and Conditioning, Athletic Trainer Certified, etc.)
- 2 reported attending courses including cervical spine thrust joint manipulation
- Self-reporting for reading journals: 5 'rarely', 4 'occasionally', and 2 'frequently'
- Self-reporting for performing literature searches: 1 'never', 4 'rarely', and 6 'occasionally'

Abbreviations: MPT, Master of Physical Therapy; DPT, Doctor of Physical Therapy
*Means listed with standard deviation in parenthesis (SD)

tically significant difference in the mean percent change in NDI per visit between phases (Mann-Whitney Rank Sum test: P = 0.038) with a greater change per visit in phase 2, 3.29 (+ 3.29) versus phase 1, 2.29 (+ 2.36). There was not, however, a statistically significant difference in the mean change in NPRS per visit between phases (Mann-Whitney Rank Sum Test; P = 0.382). The number of treatment days was statistically lower (Mann-Whitney Rank Sum Test: p = 0.004) for phase 2, 28.65 (+ 17.05), versus phase 1, 38.95 (+ 21.22). Similarly, duration of care expressed in weeks was statistically significantly (Mann-Whitney Rank Sum Test: p = 0.004) lower in phase 2, 4.09 (+ 2.44) versus phase 1, 5.56 (+ 3.03).

Analysis compared the number of patients who met MCID for NDI and NPRS between phases. The number of patients who met MCID threshold for NDI in phase 1 was 46 of 56 (82.1%) and in phase 2 was 49 of 61 (80.3%). The NNT was 110.1. The number of patients who met the MCID threshold for NPRS in phase 1 was 46 (82.1%) and in phase 2 was 46 (75.4%). The numbers needed to harm was 14.9.

## CLINICAL RELEVANCE

This study prospectively implemented a neck classification with evidence supported matched interventions. This study assessed whether NPRS and NDI scores improved

**Table 3. Phase 1 and Phase 2 Data for Neck Disability Index and Numeric Pain Rating Scores**

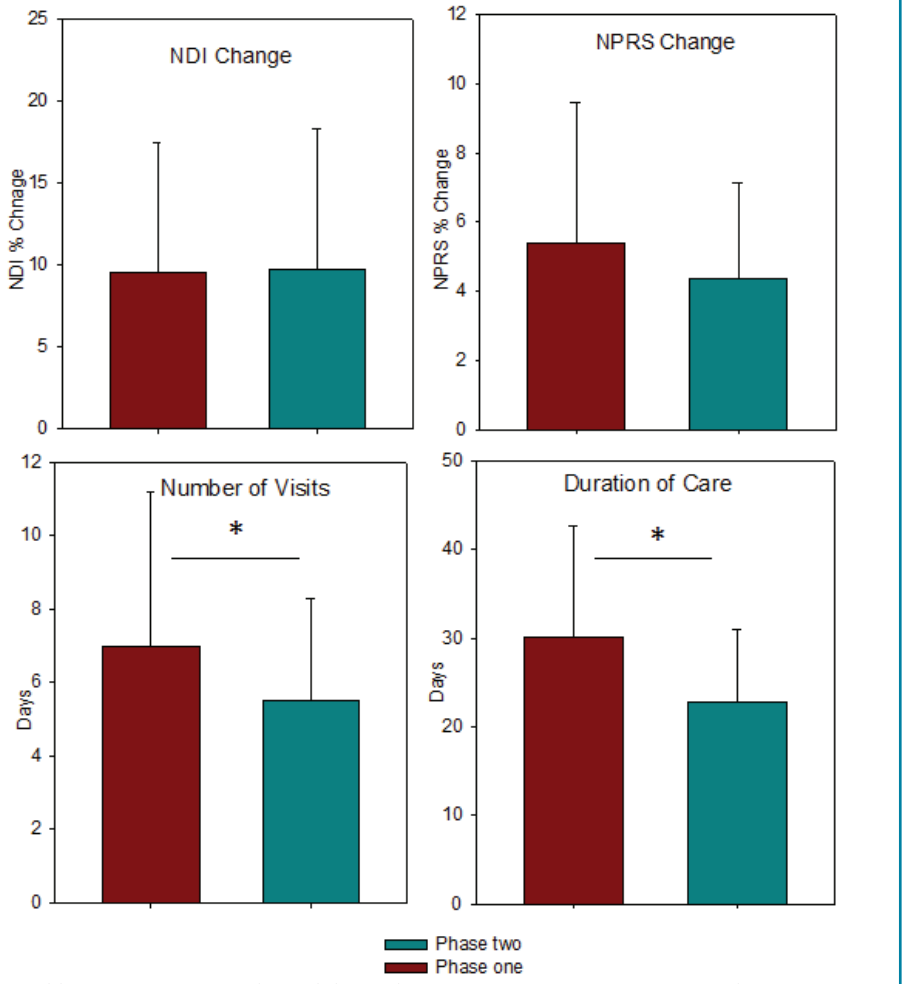
| Outcome | Baseline Mean (SD) | Post Mean (SD) | Change Mean (SD) | p value (95% CI) |
|---|---|---|---|---|
| **Phase 1 Data (N=56)** | | | | |
| **NDI Score (%)** | 33.88 (4.61) | 14.96 (13.34) | 18.91 (13.17) | 0.001* (15.39 – 22.44) |
| **NPR Score** | 5.13 (2.22) | 1.46 (1.58) | 3.67 (2.25) | < 0.001* (3.07 – 4.27) |
| **Phase 2 Data (N=61)** | | | | |
| **NDI Score (%)** | 31.96 (16.12) | 13.02 (12.54)† | 20.23 (13.27) | < 0.001* (15.63 - 23.14) |
| **NPR Score** | 4.39 (2.32) | 1.30 (1.69) | 3.24 (2.12) | < 0.001* |

Abbreviations: SD, standard deviation; CI, confidence interval;
*statistically significant
† Post missing data points: NDI = 2

**Table 4. Phase 1 and 2 Comparisons**

| Characteristic | **Phase 1** (N = 56) | **Phase 2** (N = 61) | Difference | p value |
|---|---|---|---|---|
| **Age (Years)*** | 55.0 (18.7) | 55.4 (18.5) | 0.40 | 0.903 |
| **Women** | 80.8% | 66.7% | | |
| **Symptom Duration (Days)*** | 356.2 (936.0) | 445.3 (1180.2) | | |
| **Prior Neck History*** | 39.3% (22/56) | 43.3% (26/60)# | | |
| **Classification Category** | **Pain Control** N = 6 (10.7%) | **Pain Control** N = 2 (3.3%) | | |
| | **Exercise/Condition** N = 23 (41.0%) | **Exercise/Condition** N = 5 (8.2%) | | |
| | **Mobility** N = 7 (12.5%) | **Mobility** N = 25 (40.1%) | | |
| | **Centralization** N = 17 (30.4%) | **Centralization** N = 24 (39.3%) | | |
| | **Headache** N = 3 (5.4%) | **Headache** N = 5 (8.2%) | | |
| **Outcomes** | | | | |
| **Correctly Categorized** | 82.1% (45/56) | 98.4% (60/61) | | |
| **Appropriate Matched Interventions** | 35.7% (20/56) | 96.8% (59/61) | | |
| **NDI% Change*** | 18.91 (13.17) | 20.23 (13.27) | 1.32 | 0.712 |
| **NPR Change*** | 3.67 (2.25) | 3.24 (2.12) | -0.43 | 0.283 |
| **Visits*** | 9.95 (4.01) | 7.46 (3.56) | -2.49 | <0.001† |
| **NDI% Change per Visit*** | 2.29 (2.36) | 3.29 (3.29) | 1.0 | 0.038† |
| **NPR Change per Visit*** | 0.449 (0.383) | 0.52 (0.46) | 0.071 | 0.382 |
| **Treatment Duration (Weeks)*** | 5.56 (3.03) | 4.09 (2.44) | -1.47 | 0.004† |
| **Treatment Duration (Days)*** | 38.95 (21.22) | 28.65 (17.05) | -10.30 | 0.004† |
| **NDI Number Attaining MCID (≥ 8%)** | 82.1% (46/56) | 83.1% (49/61) | | |
| **NPR Number Attaining MCID (≥ 2 points)** | 82.1% (46/56) | 75.4% (46/61) | | |

Abbreviations: N, number of subjects; NDI, Neck Disability Index; NPR, numerical pain rating; MCID, minimal clinically important difference
*Means listed with standard deviation in parenthesis (SD) following
†statistically significant
#One patient not reported




Abbreviation: NDI, Neck Disability Index; NPRS, Numeric Pain Rating Scale
*statistically significant ($p<0.05$)

**Figure 4. Mean ± standard deviation of primary outcomes variables for phase 1 and 2.**

when therapists were trained to implement a neck pain classification system and matched interventions. It specifically targeted implementing a neck classification system without any individualized follow-up training. The NPRS and NDI data were collected before and after therapists were trained in the Childs et al neck classification system.[2] While no significant improvements were found between the phases for these measures. A reduction in number of visits and duration of care were attained when therapists used a classification system.

Phase 1 revealed about 35.7% of the patients (20/56) received appropriate matched interventions. This may indicate poor therapist knowledge translation and implementation of evidence into clinical practice. It is much higher, however, than the 11% of adherent care noted in the Horn et al study of therapists following a CPG on neck pain.[13] On a positive note, patients still obtained improved outcomes during phase 1 period, even when the therapists did not follow evidence supported interventions.

Phase 2 demonstrated that therapists were trained relatively quickly to follow evidence supported approach. This is consistent with a Denniger report that a 2-day, 8-hour continuing education session was sufficient to change the clinician's confidence and belief in using this treatment-based classification system.[18] Classification training in this current study appeared adequate since all but one of the 61 patients (96.7%) were correctly classified in phase 2. Perhaps therapists in this current study paid closer attention to proper classification in phase 2 since they knew their interventions were dependent upon proper classification. This study shows that it is feasible to implement a neck treatment-based classification system. The Fritz and Brennan study did not train therapists, but simply assessed outcomes retrospectively.[7] In the current study, the number of patients per category were similar to those found by Fritz and Brennan with the majority of patients in similar categories: exercise and conditioning, mobility, and centralization groups.[7]

The current study implemented the neck classification system without the additional training time and detail seen in the 2009 Cleland et al study.[11] The current study provided participating therapists with the 2004 Childs, Fritz, Piva, and Whitman article as well as the Fritz and Brennan articles prior to a training session.[2,7] However, this study only spent one several hour session educating therapists on the classification system and the interventions. Outcomes were very similar to those of the 2009 Cleland et al study. The learning about the neck classification system may be similar to the time spent reading current literature before implementing it into practice. It also would support a more efficient means of incorporating evidence into practice versus the 2009 Cleland et al study which included two days of continuing education and individualized follow-up.[2]

Both phases in this current study demonstrated a statistically and clinically significant reduction in NPRS and NDI scores. Significant improvement in all patients, regardless of therapist training, matched, or adherent care, has been shown by other researchers.[7,12,13,19] The current results, however, did not demonstrate significantly greater NPRS and NDI outcomes during phase 2, although a trend was present. Almost 80% of the patients in each phase of this study met the MCID for both variables. This is slightly higher than those seen by Fritz and Brennan. They found 53.8% of unmatched treatments and 72.5% of matched treatments reached MCID levels.[7] There was no significant increase in percent attaining MCID in other studies, however, the Cleland study included additional, individualized training.[11]

There were significant differences in other variables measured. Using matched interventions appeared to be more efficient. For example, phase 2 produced the same patient outcomes as phase 1, but required approximately 2.5 fewer visits and in approximately 10 fewer days. This demonstrates that following an evidence supported neck classification is beneficial for patients and potentially for the overall health care system. Therapists may identify the patient type and appropriate interventions more efficiently by following classification and matched interventions. This is consistent with the Horn et al study where therapists adherent to CPGs demonstrated 3.6 fewer visits and lower levels of use of other health services, despite having significantly lower NPRS outcomes.[13] Positive

outcomes, in fewer visits and a shorter duration, have been found in another study comparing novice and expert clinicians.[20] Fewer visits and treatments were seen in clinicians who were orthopaedic clinical specialists versus those who were not, regardless of experience.[20] Levsen et al reported an increased level of training produced similar patient outcomes compared to no training, but training produced a greater outcome change per visit and in approximately two fewer visits for shoulder and back pain.[19] Training included a year-long series of courses to improve decision making and care consistency. Both studies may indicate that more efficient treatment could provide greater savings for patients and the health care system.

The lack of a significant difference between phases for NDI and NPRS could be related to potential study limitations. First, a smaller than anticipated number of patients were enrolled. A delay in securing the research agreement between institutions caused several therapists to not participate, thus their potential patients were not enrolled. Consequently, participating therapists enrolled more patients, increasing data collection time, during which some therapists moved out of the system during phase 1.

Other potential reasons for no significant phase difference in pain and disability outcomes could relate the following issues. Therapists may have been already providing 'matched' care in phase 1 (eg, approximately 1/3 of the time this was occurring). Thus, there were fewer patients who potentially could receive differing care between phases. As noted earlier, around 80% of patients in each phase of the study reached MCID value for NPRS and NDI, which was higher than those reported by Fritz and Brennan.[7] It is also possible that actual classification implementation does not produce greater outcomes, even though a trend was occurring. Perhaps this is the case since phase 1 outcomes were still clinically and statistically significant as seen in other studies.[7,12,13,19] The therapists may have had rationale to not follow the matched interventions, such as basing intervention on their experience and patient preferences. Unfortunately, the authors did not collect information on the rationale for any deviations in care. The improvements in each phase could also be due to passage of time. Further, there were no control groups for comparison. It is also possible that the therapist training was inadequate or the therapists did not implement the matched interventions to a level that would produce greater outcomes. However, in phase 2, the therapists did well following classifications and interventions. Lastly, the investigators did not specifically test the skills of the therapists. There may also be other trends in therapist characteristics that may be revealed in subsequent analysis.

Follow-up analysis is planned to assess outcomes based on a variety of factors. Linear regression analysis will be used to determine if specific therapist characteristics impacted outcomes (age, experience, level of training, etc). Second, stratified data could be analyzed since in phase 1, 30% of the patients were already receiving the matched interventions. Analysis will be done using therapists who were not using the matched interventions in phase 1, but did for phase 2, to further assess training impact. Subsequent analysis will also look at comparisons of patients getting matched versus unmatched intervention regardless of phase or therapist.

Another potential limitation of this study was the decision to use Childs et al classification system versus the neck pain CPG.[1,2] The authors believe that implementing this treatment-based classification system allowed comparisons of whether therapists were following 'matched' interventions, even as patients changed categories. The questionable value of applying the neck classification had been raised in 2009 by Cleland et al, but they could not separate out the effects of application versus additional training.[11] This idea appears relevant when comparing to other studies where it is not entirely clear if matched treatment was provided for the appropriate patient.[13] Future research could be done with a larger number of therapists and patients. Also assessing whether therapists continue to follow the training over time and ultimately the impact on patients, the profession, and health care. Overall, it appears that following a neck classification produced more efficient outcomes. As classification systems and CPGs become more prevalent, research is needed to determine their impact on patient outcomes and health care.

## CONCLUSION

This study demonstrated that therapists can be trained to implement a neck pain classification system and matched interventions. The NDI and NPRS were collected in two phases to determine outcomes when following a neck classification and matched interventions. Significant improvements in outcomes occurred in both phases of the study but there were no significant differences between phases for NDI and NPRS measures. Adhering to a classification system produced efficient outcomes with fewer visits and in a shorter time frame compared to not following the classification scheme. This supports the use of the classification systems for neck pain as well as the use of matched, evidence supported interventions.


## ACKNOWLEDGEMENTS

The authors would like to thank the participating therapists and staff at Genesis Physical Therapy clinics, Kathryn Ellsworth and Chris Hunter who were supervisors and coordinated the facilities participation. Also Becky Lawrence for her contribution in data reduction and analysis.

**Disclosure Statement:** The co-authors affirm that there was no financial affiliation (including research funding) nor involvement with any commercial organization that has a direct financial interest in any matter included in this manuscript.

**Clinical Trials Registry:** Protocol registered with Clinical Trials.gov PRS on 07/27/2016; ID number: NCT02850549

**Study Information:** The study protocol was approved by Genesis Health System (11-008).


## REFERENCES


1. Childs JD, Cleland JA, Elliott JM, et al. Neck pain: Clinical practice guidelines linked to international classification of functioning, disability, and health from the orthopaedic section of the American Physical Therapy Association. *J Orthop Sports Phys Ther.* 2008;38(9):A1-A34.
2. Childs JD, Fritz JM, Piva SR, Whitman JM. Proposal of a classification system for patients with neck pain. *J Orthop Sports Phys Ther*. 2004;34(11):686-696; discussion 697-700.
3. Schiller JS, Lucas JW, Ward BW, Peregoy JA. Summary health statistics for U.S. adults: National Health Interview Survey, 2010. https://www.cdc.gov/nchs/data/series/sr_10/sr10_252.pdf. Accessed November 21, 2017.
4. McKenzie RA. *Cervical and Thoracic Spine: Mechanical Diagnosis and Therapy.* Minneapolis, MN: Orthopedic Physical Therapy Products; 1990.
5. Wang WT, Olson SL, Campbell AH, Hanten WP, Gleeson PB. Effectiveness of physical therapy for patients with neck pain: an individualized approach using a

clinical decision-making algorithm. *Am J Phys Med Rehabil.* 2003;82(3):203-218.
6. Delitto A, Erhard RE, Bowling RW. A treatment-based classification approach to low back syndrome: identifying and staging patients for conservative treatment. *Phys Ther.* 1995;75(6):470-485; discussion 485-489.
7. Fritz JM, Brennan GP. Preliminary examination of a proposed treatment-based classification system for patients receiving physical therapy interventions for neck pain. *Phys Ther.* 2007;87(5):513-524.
8. Heintz MM, Hegedus EJ. Multimodal management of mechanical neck pain using a treatment based classification system. *J Man Manip Ther.* 2008;16(4):217-224.
9. Sabol N, Lehr ME. Clinical application of the classification system in the musculoskeletal management of a patient with chronic neck pain: A case report. *Orthop Phys Ther Pract.* 2012;24(3):131-136.
10. Tamayo A. The use of a clinical prediction rule for diagnosis and treatment based classification system for the treatment of a cervical radiculopathy patient: A case report. *Orthop Phys Ther Pract.* 2009;21(1):25-31.
11. Cleland JA, Fritz JM, Brennan GP, Magel J. Does continuing education improve physical therapists' effectiveness in treating neck pain? A randomized clinical trial. *Phys Ther.* 2009;89(1):38-47. doi: 10.2522/ptj.20080033. Epub 2008 Nov 6.
12. Farrell KP, Lampe KE. Implementation of a treatment based classification system for neck pain: A pilot study. *Orthop Phys Ther Pract.* 2011;23(2):91-96.
13. Horn ME, Brennan GP, George SZ, Harman JS, Bishop MD. Description of common clinical presentations and associated short-term physical therapy clinical outcomes in patients with neck pain. *Arch Phys Med Rehabil.* 2015;96(10):1756-1762. doi: 10.1016/j.apmr.2015.06.012. Epub 2015 Jul 9.
14. Riddle DL, Stratford PW. Use of generic versus region-specific functional status measures on patients with cervical spine disorders. *Phys Ther.* 1998;78(9):951-963.
15. Stratford P, Riddle D, Binkley J, Spandoni G, Westaway M, Padfield B. Using the neck disability index to make decisions concerning individual patients. *Physiother Can.* 1999;51:107-112.
16. Cleland JA, Childs JD, Whitman JM. Psychometric properties of the neck disability index and numeric pain rating scale in patients with mechanical neck pain. *Arch Phys Med Rehabil.* 2008;89(1):69-74. doi: 10.1016/j.apmr.2007.08.126.
17. Kovacs FM, Abraira V, Royuela A, et al. Minimum detectable and minimal clinically important changes for pain in patients with nonspecific neck pain. *BMC Musculoskelet Disord.* 2008;9:43. doi: 10.1186/1471-2474-9-43.
18. Denninger TR, Whitman JM. Examination of clinician perceptions following continuing education on treatment-based classification for cervical pain [AAOMPT conference abstract]. *J Man Manip Ther.* 2010;18:214.
19. Levsen MJ, Hansen ML, Kent AD, Sieren JJ, Thoreson JP, Farrell KP. Effects of a physical therapist training on outcomes of patients with chronic low back pain or chronic shoulder pain. *J Man Manip Ther.* 2001;9(2):84-91.
20. Hart DL, Dobrzykowski EA. Influence of orthopaedic clinical specialist certification on clinical outcomes. *J Orthop Sports Phys Ther.* 2000;30(4):183-193.

# Call for Candidates

## 2019 Election

Three positions are available for service within the Orthopaedic Section beginning February 2019. If you wish to nominate yourself or someone you know, please visit www.orthopt.org, then fill out the nomination form, and submit it to the Orthopaedic Section office: tfred@orthopt.org. Deadline for nominations is September 1, 2018. Elections will be conducted during the month of November.

**OPEN SECTION OFFICES**

**President:** Nominations are now being accepted for election to a 3-year term beginning at the close of the Orthopaedic Section Membership Meeting at CSM 2019.

**Director:** Nominations are now being accepted for election to a 3-year term beginning at the close of the Orthopaedic Section Membership Meeting at CSM 2019.

**Nominating Committee Member:** Nominations are now being accepted for election to a 3-year term beginning at the close of the Orthopaedic Section Membership Meeting at CSM 2019.

# Differential Diagnosis for Management of Lateral Hip Pain: A Case Report

**Kristen Simeone, PT, DPT**
**Jason A. Craig, PT, DPhil**

*Department of Physical Therapy, Marymount University, Arlington, VA*

## ABSTRACT

**Background and Purpose:** Lateral hip pain is of high prevalence in the orthopedic physical therapy setting. The purpose of this case study was to determine correct and valid clinical tests to aid physical therapists in differentially diagnosing between trochanteric bursitis and gluteal tendinosis. **Methods:** A detailed literature search was conducted to determine valid clinical tests that will aid physical therapists in better differentially diagnosing lateral hip pain pathologies. **Findings:** The 5 valid clinical tests found included single limb stance, hip lag sign, Ober's test, resisted abduction, and isometric abduction. **Clinical Relevance:** By performing these 5 valid clinical tests, physical therapists can better narrow down the hip structure of concern; therefore, decreasing pain, increasing functional ability, and improving quality of life. **Conclusion:** There is a need for additional studies addressing the implementation of these 5 clinical tests and their effects on proper diagnosis among patients with lateral hip pain.

**Key Words:** clinical testing, muscle strain, validity

## BACKGROUND AND PURPOSE

Lateral hip pain, more commonly referred to as greater trochanteric pain syndrome (GTPS), is frequently seen in the orthopedic physical therapy setting; however, there have been a plethora of causes identified for lateral hip pain.[1,2] Trochanteric bursitis, iliotibial band (ITB) friction, gluteal tendinosis, and gluteal tears are the more common diagnoses that encompass GTPS, with approximately 2 patients per 1000 each year being affected.[3-5] Greater trochanteric pain syndrome is more prevalent in women than men with a 4:1 ratio, especially between the fourth and sixth decades of life.[1,3,6] Due to the complexity of the hip joint and surrounding anatomy, differential diagnosis of lateral hip pain can often be difficult, specifically between trochanteric bursitis and tendinosis.[1,2,6,7]

The hip is a ball and socket joint with 3 degrees of freedom.[8] The 4 muscle groups providing motion at the hip include gluteal, anterior, posterior, and medial. Greater trochanteric pain syndrome typically focuses on disorders of the gluteal region of the hip and the structures commonly affected are gluteus medius and minimus and the ITB.[8,9] Due to its shape and location, the gluteus medius muscle is often the most susceptible to injury.[6] It is a fan shaped muscle, with proximal attachment on the external surface of the ilium and a distal attachment on the lateral surface of the greater trochanter[8,9] but more specifically to the superior-posterior and the lateral facets of the greater trochanter.[5] The gluteus medius contributes to internal rotation and is the prime abductor of the hip, responsible for keeping the pelvis level during gait, running, and single leg activities.[4]

Other anatomical structures may also contribute to the lateral hip pain such as bursae, which are membranous, fluid filled sacs, located in areas between bony prominences and soft tissues to act as a gliding interface and provide cushioning during friction.[3-5,9] According to Woodley et al,[1] when referring to the trochanteric bursitis, there are thought to be 8 bursae that could be the origin of pain in the lateral hip. Of those 8, the most common bursae involved in trochanteric bursitis are the subgluteus medius, the subgluteus maximus (trochanteric), and the subgluteus minimus bursae.[10] The subgluteus maximus bursa is the largest and located superficially to the posterior facet of the greater trochanter and the lateral insertion of the gluteus medius tendon,[5,10] whereas the subgluteus medius bursa is located deep to the gluteus medius tendon, and the subgluteus minimus bursa is located over the anterior facet of the greater trochanter, deep to the gluteus minimus tendon.[10] Due to the close proximity of numerous anatomical structures, irritation of the bursae is common.

Trochanteric bursitis has been defined as inflammation of the bursa, which can be caused by repetitive action causing friction over the bursa or acute trauma to the surrounding muscles and tendons.[9] Trochanteric bursitis is the most common diagnosis for patients with complaints of lateral hip pain.[1,3,4,6] The common presentation of trochanteric bursitis is a dull, aching pain, with tenderness around the greater trochanter and radiation of pain along the lateral thigh.[1,5] Conservative treatment and corticosteroid injections have been shown to be effective in 90% of people diagnosed with trochanteric bursitis.[3] Unfortunately, the pain pattern and presentation of trochanteric bursitis is not unique, making it hard to differentiate between this and other disorders, especially tendinosis.

Tendons are comprised of 95% Type I collagen fibers and are responsible for distributing forces across joints, stabilizing joints, and aiding in body movement.[11] Tendinosis refers to a degeneration of the tendon's collagen over time.[11,12] Within the lateral hip, tendinosis and tears most commonly affect the gluteus medius. Over the last decade, research has shown an increasing number of cases of gluteal tendinosis and tears.[11] Due to common misdiagnoses and the umbrella term GTPS, it is unclear from the literature exactly what the incidence of gluteus medius tendinopathies may be. According to Woodley et al,[1] the prevalence of gluteal tendon pathology is variable, ranging from 25.7% to 83.3%, making it one of the most common causes of lateral hip pain and the most common of tendinopathies in the lower extremity.[5]

Tendinosis onset is often insidious, worsening over time; however, it can also occur following a fall or a forceful contraction.[6] Tendinosis and bursitis share the same common symptoms of pain and tenderness along the greater trochanter.[3,5,6,9] Tendinosis does not typically present with inflammation; therefore, cortisone injections are often unsuccessful.[5,6,11] The most common activity limitations associated with gluteal tendinosis are rising to stand or walking after sitting, sleeping on the involved side, single leg stance activities, and climbing stairs.[5] Patients often show increased weakness in abduction and may develop a Trendelenburg gait pattern.[5,6] Tendinosis could ultimately result in partial or even full-thickness tears if untreated or not detected soon enough, making conservative therapy an insufficient measure.[6,11,12]

Long and colleagues[10] performed a study with a sample size of 877 patients with GTPS. Of the sample size, 79.8% showed no evidence of bursitis on ultrasound and 49.9% had gluteal tendinosis. Of those with tendinosis, 26.9% had isolated gluteus medius tendinosis and 0.2% had partial thickness tears of the gluteus medius.[10] Literature has shown the increase of misdiagnoses between trochanteric bursitis and gluteal tendinosis results in an increased recovery time and prolonged duration of disability and pain.[1,2,4-7,10]

## METHODS

To mitigate misdiagnoses of lateral hip pain, much research is being conducted to determine reliable clinical tests to best evaluate patients. Several tests have been used to differentially diagnose between bursitis and tendinosis that have shown to be both reliable and valid.[1,5,6]

Literature research has demonstrated that there are 5 valid and reliable clinical tests for differentiating causes of lateral hip pain. Those tests are single limb stance, hip lag sign, Ober's test, resisted abduction, and isometric hip abduction.[1,5,6] Each test aids in indicating slightly different diagnoses so it is important that each test be implemented during the initial evaluation of a patient with lateral hip pain. These tests can easily be completed in a relatively short time.

The tests should be in the order of easiest to most difficult for the patient to do:

1. Isometric hip abduction test (sensitivity: 80%, specificity: 71%).[6] This test is performed by having the patient start in the sidelying position. The patient is then asked to do isometric hip abduction without any external resistance applied by the examiner. If the patient has reduced abductor contraction and/or increased pain with the contraction, it is indicated as a positive test for gluteus medius tendinosis.[6]
2. Resisted abduction (sensitivity: 73%, specificity: 46%).[5] In this test the patient is asked to lay on the uninvolved side and the examiner brings the involved leg into abduction and slight extension. The examiner then applies moderate resistance against the involved leg. The test is considered positive if weakness is elicited and is indicative of GTPS, specifically tendon involvement.[5]
3. Ober's Test (sensitivity: 41%, specificity: 95%)[5] should be performed next. The patient should be in sidelying on the uninvolved side with the involved leg in 90° of knee flexion. The examiner then brings the leg into adduction and allows it to fall to end range. If there is restricted range and/or pain reproduction, it is considered a positive test, which is indicative of ITB tightness or trochanteric bursitis.[5,6]
4. The hip lag sign (sensitivity: 89%, specificity: 97%)[5] test is performed with the patient in sidelying on the uninvolved side and the examiner passively brings the involved leg into abduction, slight extension, and internal rotation. The patient is then asked to hold that position. If the patient's foot drops more than 10 cm or the patient is unable to hold the internally rotated position, it is considered a positive test. The hip lag sign is indicative of a gluteus medius tear.[5]
5. The single leg stance test (sensitivity: 23%, specificity 94%)[1] is where a patient is asked to stand on the involved leg for 30 seconds with minimal hand support of the examiner. If the patient is unable to lift the uninvolved leg off the ground or if the patient is unable to stand on the involved leg for at least 30 seconds, it is considered a positive test. A positive single leg stance test is indicative of tendinosis of the gluteus medius.[1,5,6]

Following the detailed patient history and completion of above clinical tests, it is the physical therapist's responsibility to determine if the patient should be referred for further diagnostic imaging or if additional testing is warranted. The two most reliable diagnostic imaging tests identified in the literature are ultrasonography and magnetic resonance imaging (MRI). The MRI is considered a gold standard for determining tendinosis and gluteal tears with an accuracy of 91%.[2,13] Ultrasonography is also considered a reliable test for determining gluteal tendon pathology with a sensitivity of 79% to 100%.[2,10]

The purpose of this case study was to determine the most appropriate and reliable clinical tests to perform during an evaluation of the hip region. This aids the physical therapists in more accurately discerning between trochanteric bursitis and gluteal tendinosis in a patient with lateral hip pain.

### Patient Description

The patient was a 61-year-old Caucasian female with a two-year history of left lateral hip pain that began approximately two weeks after she slipped on the ice sustaining a fall on the outstretched hand. For her hand injury, she was referred to a hand therapist by her primary care physician. She recovered from the hand injury after several months of therapy. For her left hip pain two weeks following her fall, she consulted with an orthopedic surgeon who diagnosed her with left hip trochanteric bursitis and prescribed physical therapy for 4 weeks. The patient was compliant with 4 weeks of therapy but only displayed minimal pain reduction, which ultimately led to her discharge from physical therapy. At this point, her physician administered a cortisone injection that only slightly decreased her pain for approximately one week. She discontinued treatment following the cortisone injection and took ibuprofen on an as needed basis.

Eight months following the initial injury in August 2016, the patient reported an increase in pain in her left hip and returned to her physician for additional evaluation. The physician at that point ordered an MRI, which revealed left gluteus medius tendinosis with small partial thickness tearing at the greater trochanter and no evidence of trochanteric bursitis (Figure 1 and 2). Two months later the patient underwent an open repair of the left gluteus medius in November 2016 to reattach the gluteus medius tendon to the greater trochanter. Following the procedure, the patient was on strict nonweight bearing (NWB) precautions for 6 weeks. She came to physical therapy in December 2016 once she was no longer in the NWB status. The orthopedic surgeon provided a detailed protocol for the plan of care (Appendix).

A review of systems revealed that prior to her injury she was active and worked as a school nurse. Her family history was positive for cardiac disease. She was on medications to control her hypertension. Due to the postoperative restrictions of NWB status and no driving she was not engaged in any activities following her hip surgery. Her postoperative pain was being managed well with ibuprofen on an as needed basis.

Upon initial evaluation of the hip, the patient demonstrated 90° of active hip flexion and 20° of active hip abduction, before experiencing pain. Passive physiological movements were not performed due to protocol restrictions and internal and external rotation was not measured due to the patient reporting 7/10 pain level on the numeric pain rating scale.

A general strength screen was performed of the patient's bilateral upper extremities and right lower extremity (LE); all were within normal limits (WNL). The manual muscle testing of the left LE revealed: hip abduction 4-/5, hip flexion 4/5, knee flex-


**Figure 1. Coronal view of superficial fibers of left gluteus medius showing tendinosis.**


**Figure 2. Coronal view of deep fibers of left gluteus medius detached from greater trochanter.**

ion and extension 5/5, and 5/5 ankle dorsiflexion. The abnormalities included left Trendelenburg, decreased step length on the right, and decreased gait speed. A gross neurological screen was performed and reflexes and sensation were WNL. The integumentary examination revealed a well healed incision with no apparent redness, swelling, or warmth. With palpation by the examiner, the patient reported mild tenderness along the greater trochanter, along the incision and into the gluteus medius muscle. No palpable muscle tightness was noted at evaluation. The patient's functional limitations included ascending and descending stairs without assistance, walking greater than a quarter mile, squatting, and sit to stand transitions.

The outcome measures performed on January 12, 2017, included Timed Up and Go (TUG) (sensitivity: 31%, specificity: 74%[14]) and Five Times Sit to Stand (FTSTS) (sensitivity: 66%, specificity: 67%).[15] The patient scored 15.21 seconds (cut-off score: 14 seconds)[14] for the TUG and 14.9 seconds for the FTSTS (cut-off score: 15 seconds).[16] The Oswestry Disability Index (ODI), with the intraclass correlation coefficient of 0.94 on the interrater reliability,[17] was given to the patient at the time of the initial evaluation. She scored a 16/50 that translated to a 32% disability rating.

A plan of care was made for 4 to 6 weeks with 2 sessions per week. The goal of treatment was to increase abductor strength, increase range of motion, and decrease overall disability rating to get the patient back to full time work and activities of daily living.

### Intervention

Due to the partial tearing of the patient's gluteus medius tendon, conservative therapy was not sufficient alone to correct the problem. The patient underwent an open repair of left gluteus medius to reattach the deep gluteus medius tendon fibers to the greater trochanter. Following surgery, the patient was required to wear an abduction hip brace for 6 weeks and remain toe touch weight bearing (Figure 3).

Following her surgery, the patient was seen two times a week for one hour sessions focusing on strengthening, starting with isometrics, and progressing to weight bearing. The protocol was broken into 4 phases: immediate rehabilitation (weeks 1-2), intermediate rehabilitation (weeks 3-8), advanced rehabilitation (weeks 9-12), and sport specific training (weeks 12+). The patient was also given a home exercise plan (HEP) to adhere to in accordance with the in-clinic program. The intermediate phase focused primarily on nonweight-bearing strengthening such as isometric gluteus sets, clam shells, adduction ball squeezes, and ankle pumps. During this phase, range of motion was a main focus as well and soft tissue massage to decrease remaining tightness of the surrounding musculature. As the patient met criteria for progression, the therapist added the weight-bearing closed chain exercises to include monster walks, side steps, lunges, squats, stair training, standing hip 4-way, step ups, and step downs. Research has shown that progressing from nonweight-bearing to weight-bearing strengthening exercises produces greater increases in strength and overall better outcomes.[5] After 6 weeks of treatment, the patient's visits were decreased to one time per week as the patient was demonstrating compliance with her HEP.

## FINDINGS

The patient was re-evaluated after 4 weeks of treatment and the outcome measures were reassessed. The patient showed significant improvements in all outcome measures. At this time, the gait reassessment showed no Trendelenburg, an increased step length, and increased gait speed. Along with the ODI, the patient self-reported a decrease in pain and increased confidence with ambulation, ascending and descending stairs, and strength overall.

The patient was able to stand on the involved leg for greater than 30 seconds with no hip drop and had a negative hip lag sign. The patient scored a 4/5 for resisted abduction. The patient had no pain with isometric hip abduction testing during re-evaluation.

## CLINICAL RELEVANCE

The purpose of this case study was to

**Figure 3. The patient wearing an abduction hip brace that prohibits abduction following surgical repair of the gluteus medius.**

determine the use of special clinical tests during an evaluation to aid physical therapists in differentially diagnosing between trochanteric bursitis and gluteal tendinosis. The 5 clinical tests that have shown the most validity include the single leg stance, the hip lag sign, Ober's test, resisted abduction, and isometric hip abduction.[1,5,6]

The patient in this case showed significant improvements in strength during her time in physical therapy postsurgery as opposed to her presurgical treatment sessions even though the content of both periods of therapy mirrored one another closely. The patient was highly motivated and had a strong support system that aided in keeping her compliant with her HEP. She showed an increased confidence, increased gait speed, increased single limb stance time on the involved leg, and significant improvements in the TUG and FTSTS times. With an overall increase in strength, TUG, and FTSTS, the patient showed an increase in her ODI scores as well as reports of an overall improved quality of life.

The 5 tests discussed in this study were not performed during the patient's preoperative physical therapy management. Thus, it is the assessment of the authors that as a result the patient was misdiagnosed and participated in physical therapy that most likely had limited effect. Although those tests were known, at the time of her original presentation in the physical therapy clinics, these tests had not yet been made a common practice in physical therapy. Grouping the 5 tests together in a more comprehensive sequence to rule in or rule out specific structures in the lateral hip region is more effective than just selecting single tests in isolation. Each test indicates a slightly different diagnosis; however, they can help to determine and narrow down the hip structure of concern.[1,5,6] With each of these tests being easy to administer,[5,6] it would be appropriate to add them to each hip initial evaluation as well as to the reassessment during each week of care. By working in a systematic way, these tests can further rule in or rule out pathologies in an effort to determine an accurate diagnosis and appropriate intervention.

As discussed in the outcomes and seen in Table 1, while the same intervention was used both pre- and postsurgery, the strengthening protocol was more effective following the correct initial intervention. With an accurate diagnoses a decrease in recovery and disability times for patients suffering with lateral hip pain can be expected. Thus, had these 5 tests been used at the initial evaluation of this patient, she likely would have been referred out in a timely manner to undergo a corrective surgical intervention.

Although much literature exists on various possible causes, further studies are recommended to ascertain the validity and reliability of the 5 clinical tests used in this case for the differential diagnosis of lateral hip pain. Hence, timely and accurate interventions to facilitate recovery and improved function.

## CONCLUSION

The beneficial outcomes from the second (postoperative) period of physical therapy when applied under the correct diagnosis as compared to the lack of improvement seen while the patient was under an alternate diagnosis suggest that accurate testing, and not limiting testing to just one or two special tests, would have been a more effective way to determine an accurate diagnosis and would have ensured that the patient received the appropriate treatment.

## REFERENCES


1. Woodley SJ, Nicholson HD, Livingstone V, et al. Lateral hip pain: findings from magnetic resonance imaging and clinical examination. *J Orthop Sports Phys Ther.* 2008;38(6):313-328. doi:10.2519/jospt.2008.2685.
2. Redmond JM, Chen AW, Domb BG. Greater trochanteric pain syndrome. *J Am Acad Orthop Surg.* 2016;24(4):231-240. doi: 10.5435/JAAOS-D-14-00406.
3. Board TN, Hughes SJ, Freemont AJ. Trochanteric bursitis: the last great misnomer. *Hip Int.* 2014;24(6):610-615. doi:10.5301/hipint.5000154.
4. Ho GW, Howard TM. Greater trochanteric pain syndrome: more than bursitis and iliotibial tract friction. *Curr Sports Med Rep.* 2012;11(5):232-238. doi:10.1249/JSR.0b013e3182698f47.
5. Mulligan EP, Middleton EF, Brunette M. Evaluation and management of greater trochanter pain syndrome. *Phys Ther Sport.* 2015;16(3):205-214. doi:10.1016/j.ptsp.2014.11.002.
6. Grimaldi A, Mellor R, Hodges P, Bennell K, Wajswelner H, Vicenzino B. Gluteal tendinopathy: a review of mechanisms, assessment and management. *Sports Med.* 2015;45(8):1107-1119. doi: 10.1007/s40279-015-0336-5.
7. Klauser AS, Martinoli C, Tagliafico A, et al. Greater trochanteric pain syndrome. *Semin Musculoskelet Radiol.* 2013;17(1):43-48. doi:10.1055/s-0033-1333913.
8. Flack NA, Nicholson HD, Woodley SJ. The anatomy of the hip abductor muscles. *Clin Anat.* 2014;27(2):241-253. doi:10.1002/ca.22248.
9. Moore KL, Dalley AF, Agur AMR. *Clinically Oriented Anatomy.* 7th ed. Baltimore, MD: Lippincott Williams & Wilkins; 2014.


**Table 1. Outcome Measures at Initial Evaluation and Re-evaluation**

| Outcome Measures | Falls Risk Cut Off Score | Initial Evaluation Scores | Re-evaluation Scores (after 4 weeks) | Change | Minimal Detectable Change |
|---|---|---|---|---|---|
| **ODI**[18] | Not reported | 16/50 = 32% disability | 9/50 = 18% disability | 5 points = 14% | 10% |
| **TUG**[14,19] | 13.5-14 seconds | 15.2 seconds | 9.9 seconds | 5.3 seconds | Not reported for this patient population |
| **FTSTS**[20] | 12 seconds | 14.9 seconds | 8.5 seconds | 6.4 seconds | 2.5 seconds |

Abbreviations: ODI, Oswestry Disability Index; TUG, Timed Up and Go; FTSTS, Five Times Sit to Stand

10. Long SS, Surrey DE, Nazarian LN. Sonography of greater trochanteric pain syndrome and the rarity of primary bursitis. *AJR Am J Roentgenol.* 2013;201(5):1083-1086. doi:10.2214/AJR.12.10038.
11. Kaeding C, Best TM. Tendinosis: pathophysiology and nonoperative treatment. *Sports Health*. 2009;1(4):284-292. doi:10.1177/1941738109337778
12. Domb BG, Carreira DS. Endoscopic repair of full-thickness gluteus medius tears. *Arthrosc Tech.* 2013;2(2):e77-81. doi:10.1016/j.eats.2012.11.005.
13. Cvitanic O, Henzie G, Skezas N, Lyons J, Minter J. MRI diagnosis of tears of the hip abductor tendons (gluteus medius and gluteus minimus). *AJR Am J Roentgenol.* 2004;182(1):137-143. doi:10.2214/ajr.182.1.1820137.
14. Barry E, Galvin R, Keogh C, Horgan F, Fahey T. Is the Timed Up and Go test a useful predictor of risk of falls in community dwelling older adults: a systematic review and meta-analysis. *BMC Geriatr.* 2014;14:14. doi:10.1186/1471-2318-14-14.
15. Whitney SL, Wrisley DM, Marchetti GF, Gee MA, Redfern MS, Furman JM. Clinical measurement of sit-to-stand performance in people with balance disorders: validity of data for five-times-sit-to-stand test. *Phys Ther.* 2005;85(10):1034-1045.
16. University of Delaware Physical Therapy. 5X Sit-to-Stand Test (5XSST). www.udel.edu/PT/clinic/measures/5XSST_handout.pdf. Accessed January 28, 2017.
17. The Rehabilitation Measures Database. Rehab Measures - Oswestry Disability Index. www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=1114. Accessed January 28, 2017.
18. Michigan State University. Oswestry Low Back Pain Disability Questionnaire. www.rehab.msu.edu/_files/_docs/Oswestry_Low_Back_Disability.pdf. Accessed February 3, 2017.
19. The Rehabilitation Measures Database. Rehab Measures - Timed Up and Go. http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=903. Accessed February 5, 2017.
20. Goldberg A, Chavis M, Watkins J, Wilson T. The five-times-sit-to-stand test: validity, reliability, and detectable change in older females. *Aging Clin Exp Res.* 2012;24(4):339-3 44. doi:10.1007/BF03325265.

## Appendix. Arthroscopic Hip Surgery

**Physical Therapy Protocol**

The intent of this protocol is to provide guidelines for your patient's therapy progression. It is not intended to serve as a recipe for treatment. We request that the PT/PTA/ATC should use appropriate clinical decision making skills when progressing a patient forward.

**Please contact office to obtain the operative reports from our office prior to the first post-op visit.** Also please contact if there are any questions about the protocol or your patient's condition.

Please keep in mind common problems that may arise following hip arthroscopy: hip flexor tendonitis, adductor tendonitis, sciatica/piriformis syndrome, ilialupslips and rotations, low back pain from quadratus lumborum (QL) hypertonicity and segmental vertebral rotational lesions. If you encounter any of these problems please evaluate, assess, and treat as you feel appropriate, maintaining precautions and guidelines at all times. Gradual progression is essential to avoid flare-ups. If a flare-up occurs, back off with therapeutic exercises until it subsides.

Please reference the exercise progression sheet for timelines and use the following precautions during your treatments. Thank you for progressing all patients appropriately and please send all progress notes to office or hand deliver with the patient themselves. **Successful treatment requires a team approach, and the PT/PTA/ATC is a critical part of the team! Please contact at any time with your input on how to improve the therapy protocol.**

***Please Use Appropriate Clinical Judgement During All Treatment Progressions***

**INITIAL PREOPERATIVE ASSESSMENT**

Assess bilateral hips
ROM – flexion, extension, internal rotation, external rotation, abduction, adduction
Gait – look for Trendelenburg gait
Impingement test – flexion/adduction/internal rotation often reproduces pain
Ober's Test
Strength – abduction, flexion, extension

**** PLEASE SEE LAST PAGE FOR MODIFICATIONS – PATIENT SPECIFIC PROCEDURES****
**Begin therapy Post-Operative Day (POD)#1**
**(unless otherwise instructed)**

**Phase 1 – Immediate Rehabilitation (1 to 2 weeks):**
**Goals:**
Protection of the repaired tissue
Prevent muscular inhibition and gait abnormalities
Diminish pain and inflammation

**Precautions:**
20 lb. flat-foot-weight-bearing post-op, duration per medical doctor's orders depending on procedure
Do not push through pain or pinching, gentle stretching will gain more ROM
Gentle passive ROM only, **no passive stretching**
**Avoid capsular mobilizations**
**Avoid any isolated contractions of iliopsoas**

**Initial Exercises**

**Active Assisted ROM: within range limitations, painfree**
**ROM guidelines (painfree)**
**Flexion:** 90° x 3 weeks
**Extension:** 0° x 3 weeks
**Abduction:** 25°-30° x 3 weeks
**Internal rotation:** 90° hip flexion: 0° x 3 weeks; neutral (prone): within comfort zone
**External rotation:** 90° hip flexion: 30° x 3 weeks; neutral (prone): 20º x 3 weeks
**After 3 weeks, gradually progress ROM as tolerated,* ***within painfree zone***

- Soft tissue massage (scar, anterior, lateral, medial and posterior aspects of hip, lumbar paraspinals, quad/hamstring)
- Stationary bike with no resistance
- Isometric (quad setting, gluteal setting, transverse abdominis isometrics with diaphragmatic breathing)
- Prone lying (modify if having low back pain) – AVOID in instability patients

**Phase 2 – Intermediate Rehabilitation (3 to 8 weeks)**

**Criteria for progression to Phase 2:**

**Full Weight Bearing Must Be Achieved Prior To Progressing To Phase 2**
Non weight bearing exercise progression may be allowed if patient is not progressed by medical doctor to full weight bearing (Please see last page for microfracture modifications)

**Goals:**

Protection of the repaired tissue
Restore full hip ROM – (ROM must come before strengthening)
Restore normal gait pattern
Progressive strengthening of hip, pelvis, and lower extremities
Emphasize gluteus medius strengthening (nonweight bearing)

**Precautions:**

No forced (aggressive) stretching of any muscles
No joint/capsular mobilizations – to avoid stress on repaired tissue
Avoid inflammation of hip flexor, adductor, abductor, or piriformis

**Intermediate Exercises**

**Gentle strengthening; ROM must come before strengthening**
- Stationary bike no resistance, add resistance at 5 to 6 weeks
- Hooklying progression: pelvic clock, transverse abdominis with bent knee small range external rotation, marching, add isometric with Kegel ball, isometric abduction with ring
- Prone progression: internal rotation/external rotation active ROM, prone on elbows with glut setting-press ups, hip extension, alternating arm/leg raise
- Sidelying progression: clams 30º hip flexion to 60° hip flexion, hip abduction straight leg raise, side plank on elbow
- 1/2 kneel: gentle pelvic tilt for gentle stretch of iliopsoas
- Bridge progression
- Balance progression: double leg to single leg balance
- Pelvic floor strengthening
- Elliptical/stair stepper: 6 to 8 weeks
- Step and squat progression
- Slide board: hip abduction/adduction, extension, internal rotation/external rotation. No forced abduction. Stop short of any painful barriers.
- **Continue to avoid any isolated contraction of iliopsoas**

**Phase 3 – Advanced Rehabilitation (9 to 12 weeks)**

**Criteria for progression to Phase 3:**

Full ROM
Painfree normal gait pattern
Hip flexor strength of 4/5
Hip abduction, adduction, extension, and internal rotation/external rotation strength of 4+/5

**Goals:**

Full restoration of muscular strength and endurance
Full restoration of patient's cardiovascular endurance
Emphasize gluteus medius strengthening in weight bearing

**Precautions:**

No contact activities
No forced (aggressive) stretching
No joint mobilizations – to avoid stress on repaired tissue

**Exercises:**

- No treadmill walking until 12 weeks
- 4-pt lumbar/core stabilization progression
- Anterior/side plank progression
- Crab/monster walk
- Lunges all directions
- Single leg squat
- **Continue progressions of exercises in phase 2.**

**Phase 4 – Sport Specific Training > 12 weeks**

**Criteria for progression to sport specific training:**

Hip Flexor strength 4+/5
Hip adduction, abduction, extension, internal rotation/external rotation 5-/5
Cardiovascular endurance equal to preinjury level
Demonstrate proper squat form and pelvic stability with initial agility drills, stable single-leg squat.
Return to sport activities as tolerated without pain, consistent with medical doctor orders.

**Exercises:**

- Customize strengthening and flexibility program based on patient's sport and/or work activities
- Z cuts, W cuts, Cariocas
- Agility drills
- Jogging
- Gradual return to sport

# How to Use Scientific Evidence at the Point of Care: Guidelines-based Physical Therapy for a Patient with Acute Lateral Ankle Sprain

**Justin Fischer, PT, DPT, FAAOMPT[1]**
**Todd E. Davenport, PT, DPT, MPH, OCS[2]**

*[1]Kaiser Permanente, Park Shadelands, Walnut Creek, CA*
*[2]University of the Pacific, Stockton, CA*

## ABSTRACT

**Purpose:** Clinical practice guidelines (CPGs) have been introduced to support evidence-based practice in physical therapy clinical evaluation and management of individuals following ankle sprains. Translational work implementing CPGs into clinical practice has yet to be undertaken extensively. The purpose of this case study is to provide an example of implementing current best evidence-based practice and effective clinical reasoning in patients with an acute ankle ligamentous injury. **Case Description:** A licensed physical therapist (Doctor of Physical Therapy and Fellow-In-Training at a credentialed Fellowship program) evaluated and treated a patient with acute ankle ligamentous injury using a synthesis of 3 published CPGs, the patient's perspectives, and the attending physical therapist's clinical reasoning to determine the appropriate examination, evaluation, intervention, and prognosis for the patient. **Outcomes:** The patient demonstrated clinically and statistically significant improvements in Foot and Ankle Ability Measure scores, numeric pain rating, and functional activity tolerance. The basis of which were in response to individualized examination, evaluation, and management strategies that were predicated on clinical evidence syntheses, patient preferences, and the physical therapist's judgment. The physical therapist's reasoning was especially important to adapt CPG-based care given the severity and irritability of injury, tissue healing time, patient beliefs, and clinical logistics. **Discussion:** CPG-based care involves an iterative clinical reasoning process, synthesis of merging data revealed during examinations and interventions process, and the need to evolve the rehabilitation plan based on that emerging data.

**Key Words:** evidence-based practice, treatment, foot and ankle, clinical reasoning

## INTRODUCTION

The Orthopaedic Section of the American Physical Therapy Association (APTA) developed clinical practice guidelines (CPGs) to provide a scientific rationale for the consequences of health conditions, provide a common means of communication across health care providers, permit comparison of data across countries, health disciplines, and time; and for health information systems. To date, the Orthopaedic Section has 10 published CPGs. One area of focus has been foot and ankle pathology, including ankle sprains.[1,2] In addition to the Orthopaedic Section, the National Athletic Trainer's Association (NATA)[3] and the Royal Dutch Society for Physical Therapy (KNGF)[4] in the Netherlands also have published CPGs for ankle sprains. Although there is considerable overlap in the content and recommendations of each CPG, it remains unclear whether there are clinically meaningful differences that might impact patient care, because no conceptual work has been published to date to critically apply each CPG to specific patient cases. The purpose of this case study is to demonstrate the application of published CPGs, clinical judgment, and patient preference in the clinical management of an individual with acute ankle sprain.

## CASE DESCRIPTION AND EXAMINATION

A 27-year-old male was referred from the emergency department with a complaint of intermittent sharp pain around the lateral malleolus and plantar longitudinal arch of the left foot. The pain began immediately after landing on an opponent's foot and rolling his ankle during a basketball game 4 days prior. The patient quit playing and was nonweight bearing immediately after the incident. He was driven to the emergency department, evaluated, and discharged home with bilateral axillary crutches and weight bearing as tolerated in a controlled ankle movement (CAM) boot after the radiographs for fracture were negative. During his physical therapy examination, he described pain as 8/10 at worst on the numeric pain rating scale. Pain limited his ambulation to approximately 50 yards but returned to baseline within 30 seconds of rest. He worked full time in a seated position and avoided any sudden movements or stair climbing. He reported waking 2 times per night due to pain before returning to sleep within 5 minutes. His ankle was very stiff upon awakening causing him to ambulate with an antalgic gait even in the CAM boot. His reported pain improved during the day with rest, elevation, and ice but worsened in the evening. His past medical history was unremarkable except for a left ankle sprain 5 years prior that occurred while playing basketball. The patient's goals were to return to recreational basketball and normal walking.

### Foot and Ankle Ability Measure

The Foot and Ankle Ability Measure (FAAM) is a region-specific 29-item instrument developed to assess physical function for individuals with foot and ankle related impairments. It contains 2 subscales, a 21-item activities of daily living (ADL) subscale, and an 8-item sports subscale. The FAAM has been shown to be valid and reliable and is recommended in both the NATA and Orthopaedic Section CPGs. The minimal clinically important difference was reported to be 8 and 9 points over a 4-week timeframe for the ADL and sports subscales, respectively.[5] At the examination, the patient's FAAM was 66% on the ADL subscale and 6% on the Sports subscale (Table 1).

### Observation and Gait

To develop a working hypotheses regarding tissue involvement, impairments, and underlying clinical pathomechanics, a gait observation was performed and assessed, as recommended by the NATA and Orthopaedic Section CPGs. The patient demonstrated a supramalleolar ecchymosis extending caudally around the lateral malleolus and distally along the 5th ray to the styloid process.

He ambulated weight bearing as tolerated on the left with bilateral axillary crutches with mid foot initial contact and an absence of a terminal stance phase on the left lower extremity.

### Range of Motion and Circumferential Measurement

Both the NATA and Orthopaedic Section CPGs recommend that range of motion testing and figure-of-eight swelling measurements should be performed (Figure 1). The patient had 57.5 cm and 58.5 cm figure-of-eight girth measures on his right and left sides, respectively (Table 1). Passive physiological movement testing revealed capsular and soft tissue restrictions. Dorsiflexion and eversion movements were accompanied by tight capsular end feels. Plantar flexion and inversion motions resulted in an empty end feel.

### Muscle Performance

The Orthopaedic Section CPG recommends the use of functional movements (heel raises, jump, etc.) to assess for muscle performance. The KNGF and the NATA CPGs discussed strength deficits but failed to provide a recommended evaluation technique. Heel raises were attempted to 10 repetitions maximum. The patient was able to achieve 10 repetitions on his right. He attempted 2 on his left at approximately 25% range of motion before discontinuing due to pain (see Table 1). Single limb stance demonstrated immediate medial-lateral deviation on his left and no deviation during 15-second testing on his right. Manual muscle testing for ankle invertors and evertors was graded as 3+/5 and 4/5, respectively on left, and 5/5 for both on right.

### Integrity and Mobility

None of the CPGs recommended passive mobilization for examination and diagnosis. All CPGs recommend the use of joint stability testing. Passive accessory joint movement testing was used to guide selection of manual therapy techniques. Grade IV+ subtalar and midfoot joint movement testing were assessed with normal mobility. Grade IV anterior to posterior left talocrural joint movements were moderately hypomobile and left distal tibiofibular joint mobility was extremely hypomobile. Both passive accessory movements created a "swollen feeling in his ankle." Talar tilt and anterior drawer ankle ligamentous stability testing demonstrated a normal painfree end feel on the right. An examination of the left ankle revealed hypermobility during both tests with 3/10 pain around the lateral malleolus. Lastly palpation was performed with pain evident medial to the talar dome and near the location of the patient's left anterior talofibular ligament.

**Table 1. Outcome Measures**

| | Evaluation | 2nd Session | Discharge |
|---|---|---|---|
| FAAM ADL | 66% | 70% | **100%** |
| FAAM Sports | 6% | 50% | **100%** |
| NPRS | 8/10 | 4/10 | **1/10** |
| Ankle Active ROM DF (deg) | 5° | 9° | **18°** |
| Ankle Active ROM INV (deg) | 22° | 32° | **48°** |
| Girth (cm) | 58.5 | 57.5 | 57 |
| Heel raises (reps) | 2, pain | 7, LOB | **10**, no LOB |
| Stationary squat (deg) | 80° | 105° | 115° |
| Single leg hop (reps) | 0 | 10, P | **10**, no pain |

Discharge measurements representing change beyond the minimum clinically importance difference are bolded.

Abbreviations: FAAM, Foot and Ankle Ability Measure; ADL, activities of daily living; NPRS, numeric pain rating score; ROM, range of motion; DF, dorsiflexion; INV, inversion; LOB, loss of balance

## INTERVENTIONS

The referenced CPGs describe no benefit with the use of modalities including ultrasound, diathermy, electrotherapies, or low-level laser, but did support benefit with therapeutic exercises including range of motion, strengthening, and proprioception. Both the NATA and Orthopaedic Section CPGs recommend the use of cryotherapy, whereas the KNGF CPG cites no evidence to support its use. The KNGF CPG also states no value to using passive accessory manual joint mobilization following injuries. The NATA and Orthopaedic Section CPGs however found adequate evidence to support the use of manual joint mobilization but varied in their approach. The NATA CPG recommended using passive joint mobilization and mobilization with movement to regain range of motion and function. Although more general, the Orthopaedic Section CPG recommended not only graded passive accessory joint movements, but also manipulation, lymphatic drainage, and soft tissue mobilization. High velocity, low amplitude thrust techniques were not recommended in the acute injuries. The NATA and the KNGF CPGs both supported proper warm-up prior to participating in activities. All CPGs stressed the importance of long-term therapeutic exercises including proprioception and neuromuscular control to reduce the risk of future injury.

The physical therapist in this case used the 3 pillars of evidence-based practice when planning interventions for the patient.[6] These pillars included eliciting the patient's perspective regarding his or her beliefs and goals, incorporating the physical therapists clinical experience, and using evidence at the point of care. A Maitland style subjective examination was completed.[7] Clinical reasoning was guided by the World Health Organization International Classification of Functioning, Disability, and Health to identify the patient's body structure, function impairments, activity limitations, participation restrictions, environmental factors, and personal factors.[8] Application of best current evidence at the point of care allowed the physical therapist to adapt questioning and testing to validate the hypotheses and establish a treatment plan during and between clinic visits. The patient was educated on the physical therapist examination, evaluation findings, prognosis, and plan of care. He was seen for 4 visits over an 8-week period.

### Manual therapy

Manual therapy addressed range of motion restrictions and gait abnormality (Table 2). These interventions were initially targeted at improving range of motion and decreasing inflammation. Techniques were selected based on the arthrokinematic principle of roll and glide.[9,10] Immediate post-testing resulted in increased range of motion and an ability to perform heel raises (Table 3). Range of motion and circumferential swelling measurement gains were maintained at the second session (see Table 1), but the patient was still unable to land and push off when jumping due to pain. To address this issue, the physical therapist progressed to

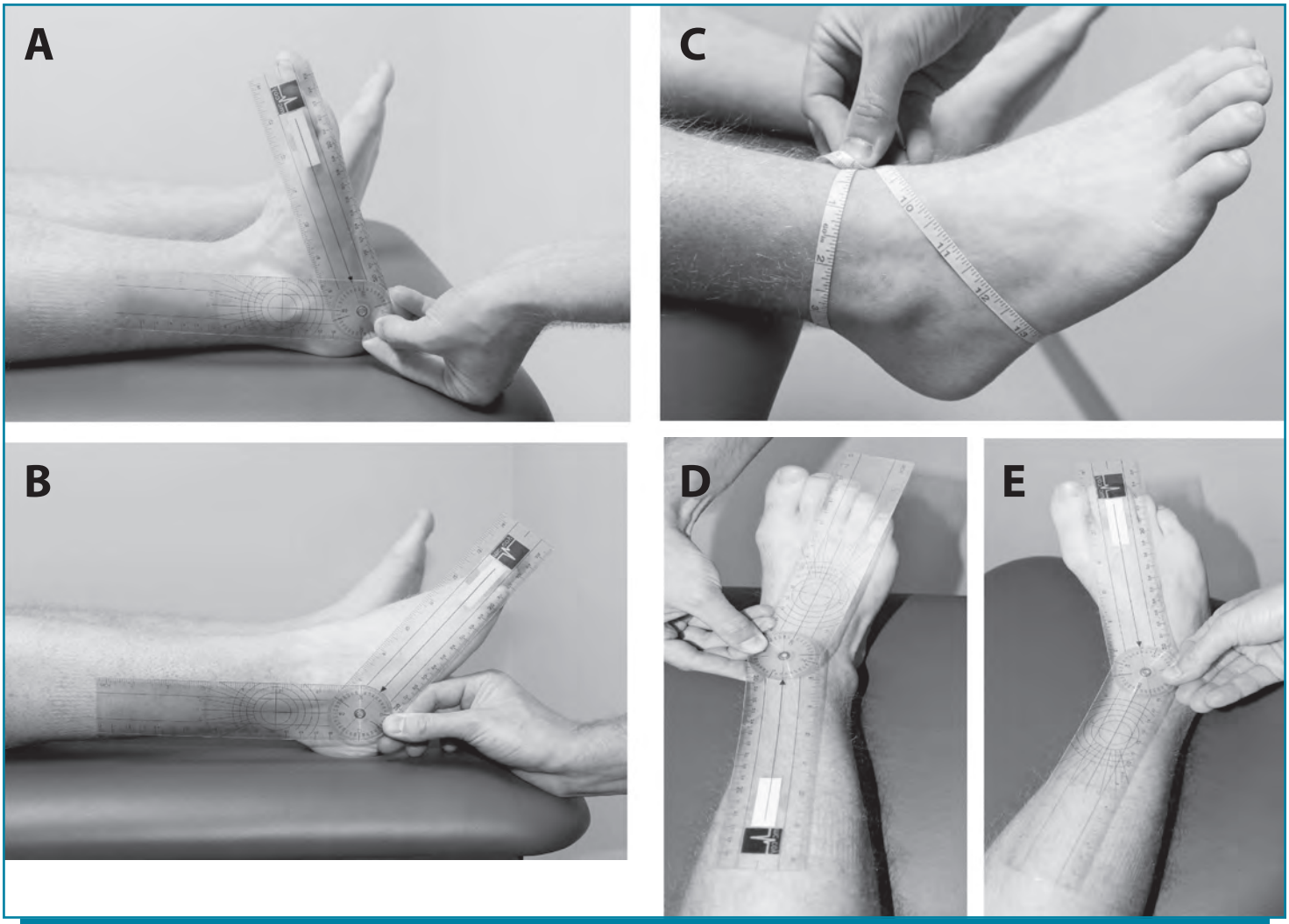



**Figure 1. Evaluation measurements: A, ankle dorsiflexion. B, ankle plantar flexion. C, figure-of-eight edema measurement. D, transverse tarsal eversion. E, transverse tarsal inversion.**

a grade IV+ mobilization with movement in weight bearing (Figure 2). Postintervention testing demonstrated that the patient achieved 100% improvement in pain during the single leg hop immediately after intervention. To address the limited inversion range of motion, pain, and the joint hypomobility a nonweight-bearing anterior to posterior mobilization with passive inversion of the distal tibiofibular joint was performed (Figure 2).[11-13] Following the intervention, an equal, painfree active and passive physiological range of motion in the ankle was achieved. The patient was able to retain his range of motion and weight-bearing ability on assessment at each successive treatment session, so no other manual therapy was performed (Tables 4-6).

### Therapeutic exercise

Therapeutic exercise techniques were aimed to strengthen and progress proprioception in the newly acquired range of motion. The patient was instructed in heel to toe gait pattern with guidelines in gradually discontinuing the use of the CAM boot starting with an hour and progressing by an additional hour each day as tolerated. Stretching (Table 3) reinforced the active and passive physiologic range of motion gains from manual therapy techniques. Proprioceptive training and strengthening (Table 4) were initiated in the second treatment session for return to daily activities and sport. Specific exercises were chosen to mimic movements for daily activities, including stairs and return to sport. All exercises were progressed in future sessions for weight bearing and to an unstable surface for proprioception involved with playing basketball (see Tables 5 and 6). The final session included a dynamic warm-up routine for playing basketball (see Table 6).

### Modalities

No modalities were used aside from self-administered cryotherapy at home. The therapist elected to not use modalities based on the CPG findings, and professional preference.

## OUTCOMES

The numeric pain rating scale and both subscales of the FAAM (see Table 1) demonstrated clinically meaningful improvements from evaluation to discharge, with the patient returning to running 3 to 5.5 miles outdoors 2 to 3 times per week and playing basketball 2 to 2.5 hours 3 days per week. He continued his dynamic warm-up exercises, maintained his home exercises once daily, met all of his therapy goals, and was using no external braces or assistive devices.

## DISCUSSION

The effectiveness of physical therapy management including manual therapy, ther-

**Table 2. ICF Model Function-based Classification at Initial Evaluation**

| | Body Function and Structure Impairments | Activity Limitations | Participation Restrictions |
|---|---|---|---|
| **Patient's Perspective** | Pain around left lateral malleolus and arch of left foot | 1. Walking<br>2. Running<br>3. Basketball | 1. Exercise<br>2. Work duties |
| **Physical Therapist's Perspective** | Sensation of pain (b280)<br>Reduced mobility of joint functions (b710)<br>Reduced muscle power functions (b730) | Moving around (b455)<br>Maintaining body positions (d410) | Recreation and leisure (d920)<br>Remunerative employment (d850) |
| **Contextual Factors** | | | |
| **Personal**<br>Temperament and personality functions:<br>• Intention to actively participate in physical therapy<br>• Active and healthy individual | | **Environmental**<br>• Products and technology for employment (e135)<br>• Natural events (e230)<br>• Lives alone<br>• Seated sales job | |

**Table 3. Patient Treatment, Pre- and Postintervention Measures, Rationale, and Clinical Practice Guidelines Use for Session 1 of 4 (Initial Evaluation)**

| Preintervention Clinical Measure | Treatment | Rationale | Postintervention Clinical Measure | Inclusion in Published Clinical Practice Guidelines APTA | NATA | KNGF |
|---|---|---|---|---|---|---|
| **Active range of motion**<br>• Dorsiflexion 5°<br>• Plantar flexion 22°<br>• Inversion 22°<br>• Eversion 8°<br>• Heel raises 2 repetitions | **Manual Therapy**<br>Grade 2+ and 3- talocrural anterior to posterior passive accessory movement neutral and 5° dorsiflexion. | Improving range of motion and decreasing inflammation. Anterior to posterior to address the role and glide arthrokinematics principle with open chain ankle active range of motion.[11] | **Active range of motion**<br>• Dorsiflexion 13°<br>• Plantar flexion 42°<br>• Inversion 35°<br>• Eversion 20°<br>• Heel raises 4 repetitions | X | X | X |
| **Observational Gait Analysis**<br>Patient demonstrates approximately 50% of normal stride length with mid foot initial contact, mild limp in midstance, and toe off terminal stance. | **Education**<br>Instruction in heel to toe gait pattern. | Reinforce proper gait pattern for patient's goal of return to walking and sports without controlled ankle movement boot. | **Observational Gait Analysis**<br>Patient demonstrates approximately 90% of normal stride length, heel strike initial contact, mild limp in midstance, and toe off terminal stance. | X | X | X |
| Range of motion limited, as above.<br><br>Manual muscle tests for left ankle invertors and evertor muscles 3+/5. | **Therapeutic exercise**<br>• Gastrocnemius stretch<br>• Seated heel raises<br>• Single leg stance<br>• Standing partial squat | Reinforce active range of motion. Initiate muscle performance for return to daily activities/sports and prevention of reinjury. | **Therapeutic exercise**<br>Independently performing. | X | X | X |

Abbreviations: APTA, American Physical Therapy Association; NATA, National Athletic Trainers Association; KNGF, Royal Dutch Society for Physical Therapy

apeutic exercises, and modalities is generally supported in the literature.[2-4] However, there are conflicting recommendations between the KNGF CPG, NATA CPG, and Orthopaedic Section CPG regarding management for ankle ligamentous injuries. These conflicting recommendations require the physical therapist to critically appraise each document and best adapt the evidence to the patient. Some interventions were used due to commonality in the CPGs. Individual techniques were based on duration of symptoms, subjective assessment of severity and irritability, and objective active and passive physiological movement test findings, strength and proprioception, and passive accessory movement findings. The treating physical therapist's initial goals were to improve ranges of motion, then weight-bearing ability, and finally specific movements for activities. Hence the interventions were initiated in open chain, progressed to closed chain on stable surface, and finally on unstable surface or at quicker speed, with overlapping phases of open and closed chain, therapeutic, and proprioceptive interventions occurring throughout.

Differing clinical presentations and preferences influence patient management. Each patient who presents to the clinic has different activity limitations, participation restrictions, and goals he or she wishes to accomplish. Many of these variables are not reflected in CPGs and must be carefully

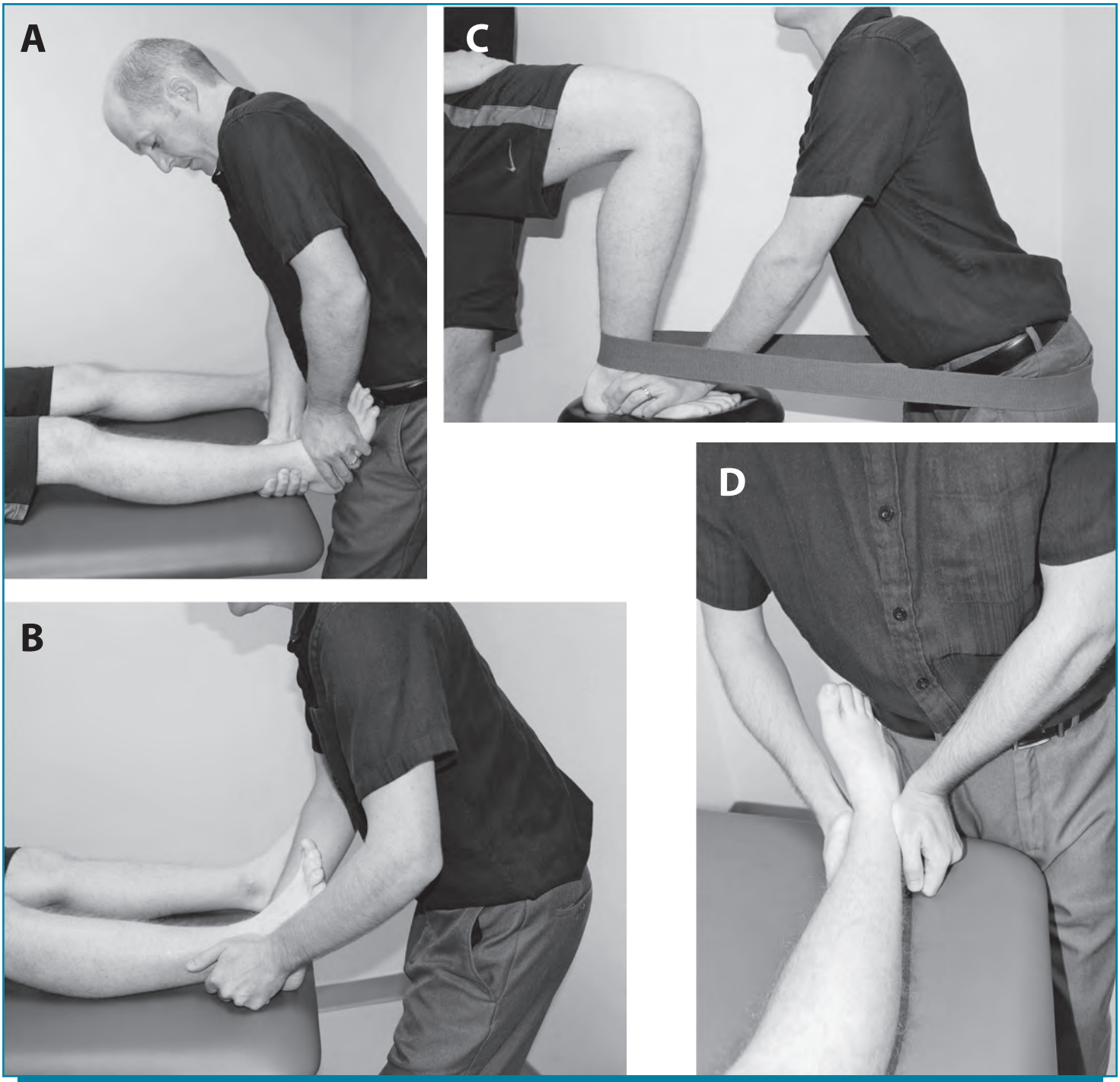



**Figure 2. Manual therapy evaluation and treatment techniques, including A, talocrural joint anterior-to-posterior passive accessory joint movement testing. B, anterior-posterior passive accessory joint movement testing of the distal tibiofibular joint. C, Mulligan mobilization with movement for dorsiflexion loss to the talocrural joint. D, a Mulligan nonweight-bearing distal tibiofibular anterior-to-posterior mobilization with passive inversion movement.**

identified by the physical therapist using the ICF model, which in combination will guide an optimal treatment plan. In this case, the therapist initiated treatment with less vigor, but progressed the patient to explosive exercises for a return to basketball while maintaining proper alignment and control. This significantly improved the patient's self-ratings on the FAAM. All of the interventions were completed in a 40-minute in clinic session and can be performed at almost any physical therapy clinic. The frequency or duration of treatments may differ between practice settings. This case highlights the importance of the patient-therapist relationship for identifying impairments, functional limitations, external factors, and patient and therapist perspectives for successfully returning patients to their daily activities.

## CONCLUSION

Treatment of ankle stability and movement coordination dysfunctions requires the use of clinical reasoning, using best available evidence at the point of care, and consideration of the patient's goals and beliefs. Ankle

**Table 4. Patient Treatment, Pre- and Postintervention Measures, Rationale, and Clinical Practice Guidelines Use for Session 2 of 4**

| Preintervention Clinical Measure | Treatment | Rationale | Postintervention Clinical Measure | Inclusion in Published Clinical Practice Guidelines APTA | NATA | KNGF |
|---|---|---|---|---|---|---|
| Dorsiflexion passive range of motion with knee flexed with "pinching" at the talar dome, single leg hop 50% speed of unaffected, pinch talar dome, and inversion passive physiological movement 3/10 pain. | **Manual Therapy** Grade 4+ mobilization with movement for dorsiflexion loss. | Address passive capsular restriction pain in dorsiflexion. Address pain inhibition with weight bearing for return to painfree jumping/ landing.[12,13] | Dorsiflexion passive range of motion with knee flexed without talar dome "pinching," single leg hop without pain/pinching and 100% speed, inversion passive physiological movement status quo. | X | X | X |
| Dorsiflexion passive range of motion with knee flexed-without talar dome "pinching," single leg hop– no pain/pinch and 100% speed, and inversion passive physiological movement 3/10 pain. | **Manual Therapy** Grade 4++ distal fibular anterior to posterior glide with passive inversion. | Address joint hypomobility, improve inversion range of motion and pain inhibition due to positional fault[11-13] for return to painfree daily activities and sports. | Dorsiflexion passive range of motion with knee flexed no talar dome pinch and 100% speed, single leg hop – no pain/"pinching," inversion passive physiological movement 1/10 pain. | X | X | X |
| Satisfactory completion of prior home exercise program without increased lateral ankle pain and swelling. | **Therapeutic Exercise**<br>• Balance single leg in star pattern at 0° and 5° knee flexion<br>• Forward full lunge<br>• Standing heel raises<br>• Stationary squats on unstable surface<br>• Single leg stance on unstable surface | Progress strength and proprioception on single leg and unstable surface for running and basketball. | **Therapeutic Exercise** Independently performing. | X | X | X |
| Independently performing gastrocnemius stretching. | Gastrocnemius stretching as per Session 1. | Maintain ankle dorsiflexion range of motion. | **Gastrocnemius Stretching** Independently performing. | X | X | X |

Abbreviations: APTA, American Physical Therapy Association; NATA, National Athletic Trainers Association; KNGF, Royal Dutch Society for Physical Therapy

**Table 5. Patient Treatment, Pre- and Postintervention Measures, Rationale, and Clinical Practice Guidelines Use for Session 3 of 4**

| Preintervention Clinical Measure | Treatment | Rationale | Postintervention Clinical Measure | Inclusion in Published Clinical Practice Guidelines APTA | NATA | KNGF |
|---|---|---|---|---|---|---|
| Dorsiflexion passive range of motion with knee flexed no talar dome pinch and 100% of normal speed, single leg hop – no pain/"pinching," Inversion passive physiological movement no pain. | **Manual Therapy** Not performed. | Range of motion and ability to weight bear were maintained from prior session. | **Manual Therapy** None. | X | X | X |
| Independently performing prior home exercise program. | **Therapeutic Exercise** Same as Session 2 but 1 set on flat ground and 2 sets on unstable surface (excluding gastrocnemius stretch). | Progress sport-specific strength and proprioception for return to full basketball game. | **Therapeutic Exercise** Independently performing. | X | X | X |

Abbreviations: APTA, American Physical Therapy Association; NATA, National Athletic Trainers Association; KNGF, Royal Dutch Society for Physical Therapy

**Table 6. Patient Treatment, Pre- and Postintervention Measures, Rationale, and Clinical Practice Guidelines Use for Session 4 of 4**

| Preintervention Clinical Measure | Treatment | Rationale | Postintervention Clinical Measure | Inclusion in Published Clinical Practice Guidelines | | |
|---|---|---|---|---|---|---|
| | | | | APTA | NATA | KNGF |
| Dorsiflexion passive range of motion with knee flexed no talar dome "pinching" and 100% speed, single leg hop without pain/"pinching," inversion passive physiological movement no pain. | **Manual Therapy** Not performed. | Range of motion and ability to weight bear were maintained from prior sessions for daily activities including walking, running, and basketball. | **Manual Therapy** Not applicable. | X | X | X |
| **Therapeutic Exercise** Independently performing. | **Therapeutic exercise** Same as Session 2. | Basketball specific strengthening and proprioception. | **Therapeutic Exercise** Independently performing. | X | X | X |
| **Dynamic Neuromuscular Training** Not performing. | Dynamic warm-up<br>• High knees<br>• Lateral shuffle<br>• Carioca | Proprioception, basketball and running specific active warm-up and injury prevention. | **Dynamic Neuromuscular Training** Independently performing. | | X | X |

Abbreviations: APTA, American Physical Therapy Association; NATA, National Athletic Trainers Association; KNGF, Royal Dutch Society for Physical Therapy

ligamentous injuries require the use of various therapeutic interventions with constant meticulous assessment and reassessment by the therapist to optimally progress patients toward their goals. When scientific evidence, patient perception, and clinician judgement are integrated to create a physical therapy plan for evaluation and clinical management, the patient is provided effective and efficient care that is evidence-based. As this case demonstrated, CPGs are only recommendations for managing ankle instability and movement coordination dysfunction. They are not step-by-step management tools. Future studies should begin to incorporate CPGs, as well as integrate patient preferences and clinical decision making models to substantiate the utility of an evidence-based practice approach.

## REFERENCES


1. Cazika CM, Tran E, Cai An, DiPreta JA. Ankle sprains and instability. *Med Clin North Am*. 2014;98(2):313-329. doi: 10.1016/j.mcna.2013.11.003. Epub 2014 Jan 10.
2. Martin RL, Davenport TE, Paulseth S, et al. Ankle stability and movement coordination impairments: ankle ligament sprains. *J Orthop Sports Phys Ther.* 2013;43(9):A1-40. doi: 10.2519/jospt.2013.0305.
3. Kerkoffs GM, van den Bekerom M, Elders L, et al. Diagnosis, treatment, and prevention of ankle sprains: an evidence-based clinical guideline. *Br J Sports Med.* 2012;46(12):854-860. doi: 10.1136/bjsports-2011-090490. Epub 2012 Apr 20.
4. Kaminski W, Hertel J, Amendola N, et al. National Athletic Trainers' Association position statement: conservative management and prevention of ankle sprains in athletes. *J Athl Train*. 2013;48(4):528-545. doi: 10.4085/1062-6050-48.4.02.
5. Martin RL, Irrgang J, Burdett RG, Conti SF, Van Swearingen JM. Evidence of validity for the foot and ankle ability measure (FAAM). *Foot Ankle Int.* 2005;26(11):968-983.
6. Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence based medicine: what it is and what it isn't. *BMJ*. 1996;312(7023):71-72.
7. Hengeveld E, Banks K. *Maitland's Peripheral Manipulation.* 4th ed. Philadelphia, PA: Butterworth Heinemann; 2005.
8. World Health Organization. Towards a Common Language For Functioning, Disability and Health ICF. www.who.int/classifications/icf/training/icfbeginnersguide.pdf. Accessed December 1, 2016.
9. Neumann D. *Kinesiology of the Musculoskeletal System.* 1st ed. St. Louis, MO: Mosby; 2002.
10. Kaltenborn F. *Mobilization of the Extremity Joints.* 5th ed. Oslo, Norway: Norli; 1999.
11. Mulligan BR. *Manual Therapy: "NAGS", "SNAGS", MWMS, etc.* 6th ed. Minneapolis, MN: Orthopedic Physical Therapy Products; 2010.
12. Kavanagh J. Is there a positional fault at the inferior tibiofibular joint in patients with acute or chronic ankle sprains compared to normals? *Man Ther.* 1999;4(1):19-24.
13. O'Brien T, Vicenzino B. A study of the effects of Mulligan's mobilization with movement treatment of lateral ankle pain using a case study design. *Man Ther.* 1998;3(2):78-84.

# Introduction to Efforts of the Newly Established Council, Frontiers in Rehabilitation Science and Technology (FiRST)

Dan White, PT, ScD, MSc, NCS

## OVERVIEW

The incorporation of innovative medical technologies and approaches into clinical care promises to expand the scope of physical therapist practice towards new frontiers. **Sensing technologies and robotics** offer individuals with disabilities exciting new possibilities for communicating, moving, and interacting with their surroundings. **Regenerative medicine** aims to treat and cure a host of injuries, diseases, and age-related tissue declines through the development of cellular therapeutics and tissue engineering technologies. Accordingly, in the not-so-distant-future, **precision medicine** will allow physical therapists to prescribe rehabilitation programs that are targeted and specific, according to the patient's genotype. Finally, **telehealth** will allow individuals in even the most remote areas of the country to receive access to state-of-the-art treatments. This is just the beginning. Building on the *Physical Therapy and Society Summit (PASS)*, APTA's Board of Directors established the Frontiers in Rehabilitation Science and Technology Council to help prepare its members for the future.

## FiRST COUNCIL

The FiRST Council is composed of any APTA member in good standing. One does not have to be a member of any specific section or component. The council also welcomes "Council Partners" to join. Council Partners are individuals ineligible for APTA membership, but with an interest in helping to achieve FiRST's overall goals. This may include physicians, bioengineers, geneticist, researchers, developers, etc.

The leadership team of the FiRST Council includes the following:

- Co-Chairs: Steve Wolf and Colleen Kigin
- Content Leaders: Alan Lee, Allon Goldberg, Randy Trumbower, Fabrisia Ambrosio
- **Newly Added Leader: Douglas M. White**
- Component Leaders: Deborah Larsen, Neurology; Bob Latz, HPA; Dan Malone, CVP; and Gary Chelburn ACAPT
- BOD Representative: Sue Whitney

## FOUR AREAS OF FOCUS

The first 4 major areas of focus were developed in response to the primary suggested action areas identified during *PASS*, but were also recognized as not the only areas of innovation and advancement for the profession. Other areas will be considered as this effort progresses.

Sensors and Robotics. Led by Randy D Trumbower, PT, PhD, and members from this focus area are working to build research and teaching resource for clinicians, students, clients, caregivers, and researchers to stay current on the emerging trends and concepts of sensing technologies and robotic interfaces. The team believes our profession will be vital in the design, development, and implementation of sensing technologies and robot interfaces. The goal of this group is to highlight the ever-expanding possibilities of interfacing sensing technologies and robotics with physical therapy to evaluate, treat, and monitor complex interactions within the human movement system following disease or injury.

Regenerative Rehabilitation. Led by Fabrisia Ambrosio, PT, PhD, members from this focus area have organized numerous national and international meetings/sessions on the topic of Regenerative Rehabilitation. Members have also developed a number of Regenerative Rehabilitation educational modules and resources, including two Independent Study Courses offered through the Orthopaedic Section as well as a special series in the *Physical Therapy* journal. Ongoing efforts will further promote interactions with the regenerative medicine community with the goal of optimizing the synergistic effects of rehabilitation with regenerative medicine technologies for enhanced patient outcomes.

Genomics (Precision Medicine). Led by Allon Goldberg, PT, PhD, and Catherine Curtis PT, EdD, has focused on assisting educational programs on incorporation of genomics background and value to the profession. The group has been working on generating research and resources focusing on direct application to clinical practice, namely the importance of family history and genetic factors not only to risk and progression of rare diseases but also common chronic conditions and response to exercise interventions. The era of personalized medicine is here bringing with it greater emphasis on prevention, an area where physical therapists have an important role.

Rehabilitation Telehealth. Led by Alan Lee, PT, PhD, DPT, and members from this focus area have been very active in assisting telehealth rehabilitation advocacy, education, research, and practice. Efforts include educational modules and resources, including American Telemedicine Association's principles for delivering telerehabilitation services, an Independent Study Course offered through the Orthopaedic Section, two learning center webinars, several *Physical Therapy* journal papers, and assisted with the Federation of State Boards of Physical Therapy's telehealth regulatory resource guide.

## NEWLY ADDED AREA OF FOCUS

Imaging. This new content area is led by Douglas M. White. Recent advances in imaging technology such as functional magnetic resonance imaging and ultrasound imaging have opened new opportunities to further incorporate imaging to physical therapist practice, research, and education. Ultrasound has moved from the radiology suite to the point-of-care and into the hands of physical therapists. Physical therapists are finding new and innovative ways to use imaging. The goal of this content area is to exploit the expanding possibilities of imaging with physical therapy to evaluate and manage injury and disease and study human movement. Expanding the knowledge and availability of imaging in physical therapist practice will further enhance patient management. Our activities to date include collaboration with the American Institute of Ultrasound in Medicine (AIUM.org) to add physical therapists to their training guidelines for musculo-

skeletal (MSK) ultrasound, and co-sponsorship with APTA on webinars highlighting physical therapists use of ultrasound imaging in MSK and peripheral nerve conditions. Additional webinars are planned for 2018. Early discussions are underway with colleagues in Europe of a potential CSM presentation in 2019 highlighting ultrasound use by physical therapists in Europe. We are building our team and welcome those interested to join our content area.

More details regarding each focus area will be highlighted in future issues. We encourage those interested in one or multiple areas to become part of the FiRST community.

## GET INVOLVED

APTA members in good standing can get involved by visiting APTA Communities (http://communities.apta.org/p/us/in/navID=10737423332) and selecting "Frontiers in Rehabilitation, Science and Technology (FiRST)" (http://communities.apta.org/p/co/ly/gid=195). If you would like to become more involved with the Council, select "Sign Up." This will insure that you receive notification of activities related to FiRST. If you are aware of individuals that would like to be a FiRST Council Partner, please have them contact practicedept@apta.org

# Congratulations to our CSM Award Winners!

**The Awards Ceremony was held on February 23, 2018 at the Hilton Riverside in New Orleans, LA.**

## PARIS DISTINGUISHED SERVICE AWARD

The Paris Distinguished Service Award is the highest honor awarded by the Orthopaedic Section and is given to acknowledge and honor an Orthopaedic Section member whose contributions to the Section are of exceptional and enduring value. The recipient of this award is provided an opportunity to share his or her achievements and ideas with the membership through a lecture presented at APTA Combined Sections Meeting.

**Philip McClure, PT, PhD, FAPTA**, is Professor and Chair of Physical Therapy at Arcadia University. He received a Bachelor of Science degree in Physical Therapy from Temple University, a Master of Science in Orthopaedic Physical Therapy from the Medical College of Virginia, and a PhD in Biomedical Science from Drexel University. Dr. McClure's research has included laboratory and clinical studies related to scapular dysfunction and rotator cuff disorders. He has received grant support from both federal and private agencies. He has served as the Chair for the Research Committee, Orthopaedic Section, APTA, and as an invited expert reviewer for systematic reviews related to the rotator cuff by the American Academy of Orthopaedic Surgeons and Agency for Healthcare Research and Quality. He also led the initial group within the Orthopaedic Section in developing Guidelines for Shoulder Disorders. Phil has received the National Award for Excellence in Teaching from the Orthopaedic Section, APTA, the Baethke-Carlin National Award for Excellence in Academic Teaching from the APTA, and was named a Catherine Worthingham Fellow of the American Physical Therapy Association.

## ROSE EXCELLENCE IN RESEARCH AWARD

The purpose of this award is to recognize and reward a physical therapist who has made a significant contribution to the literature dealing with the science, theory, or practice of orthopaedic physical therapy. The submitted article must be a report of research but may deal with basic science, applied science, or clinical research.

**Julie Fritz, PT, PhD, FAPTA,** is a Distinguished Professor in the Department of Physical Therapy and Athletic Training, and the Associate Dean for Research in the College of Health at the University of Utah. She received her Master of Science in Physical Therapy from the University of Indianapolis and her PhD in Rehabilitation Science at the University of Pittsburgh. Her research has focused on examining treatments for low back pain, and conducting clinical trials and health services research examining the outcomes of translation of decision-making strategies into physical therapy practice. Her research has been funded by the National Institutes of Health, the Agency for Healthcare Research and Quality, Department of Defense, PCORI, and the Physical Therapy Foundation. In 2015, Dr. Fritz was designated as a Catherine Worthingham Fellow of the American Physical Therapy Association. Dr. Fritz has been an author or co-author of papers recognized by the Orthopaedic Section with the Rose Excellence in Research Award on 6 previous occasions.

## JAMES A. GOULD EXCELLENCE IN TEACHING ORTHOPAEDIC PHYSICAL THERAPY AWARD

This award is given to recognize and support excellence in instructing orthopaedic physical therapy principles and techniques through the acknowledgement of an individual with exemplary teaching skills. The instructor nominated for this award must devote the majority of his or her professional career to student education, serving as a mentor and role model with evidence of strong student rapport. The instructor's techniques must be intellectually challenging and promote necessary knowledge and skills.

**Amee L. Seitz, PT, PhD, DPT, OCS,** is an Assistant Professor and Musculoskeletal Team Leader in the Department of Physical Therapy and Human Movement Science, Feinberg School of Medicine, at Northwestern University in Chicago, IL. Her primary teaching focus is leading the orthopaedic course series. She is the principal investigator of the Musculoskeletal Biomotion Research Laboratory with a research focus that seeks to better define neuromuscular and biomechanical mechanisms of upper extremity musculoskeletal disorders specific to the shoulder. Dr. Seitz has a BS in Physical Therapy from Ohio University, an Advanced Masters in Orthopaedic Physical Therapy, and transitional DPT from MGH IHP, and a PhD in Rehabilitation Science from Virginia Commonwealth University. She is a board-certified Orthopaedic Clinical Specialist and has over 20 years of clinical experience in orthopaedics, specializing in rehabilitation of shoulder disorders. She is a contributing author of the APTA Clinical Practice Guidelines for Adhesive Capsulitis, and serves on the writing panel of the AAOS Clinical Practice Guidelines for Rotator Cuff Tears. She is current Vice Chair of the Orthopaedic Section Research Committee, and Past President the American Society of Shoulder & Elbow Therapists. She publishes and presents nationally and internationally on shoulder injury, mechanisms, and rehabilitation.

## OUTSTANDING PT STUDENT AWARD

The purpose of this award is to identify a student physical therapist with exceptional scholastic ability and potential for contribution to orthopaedic physical therapy. The eligible student shall excel in academic performance in both the professional and pre-requisite phases of his or her educational program, as well as be involved in professional organizations and activities that provide for potential growth and contributions to the profession and orthopaedic physical therapy.

**Christopher Chism, SPT,** is a 3rd year physical therapy student from the University of Wisconsin. He plans to continue his education after graduation by pursuing an orthopaedic residency program. He completed his undergraduate studies in the athletic training program at Concordia University Wisconsin. During his time in the physical therapy program, he has held multiple jobs. He worked as an assistant to the UW-Health Sports Physical Therapy Department and he also continued to practice as an athletic trainer, where he independently contracted with local schools and organizations. In addition to these work commitments, he held leadership positions at the program, state, national, and international levels. At the state level, he helped form the first Student Special Interest Group for Wisconsin and served on the inaugural board. Nationally, he represented Wisconsin as the Core Ambassador to the APTA Student Assembly Board of Directors. Internationally, he is currently serving as the North America and Caribbean Regional Facilitator for the World Confederation of Physical Therapy's Future Network. In his free time, Chris loves outdoor activities including hunting, fishing, hiking, and camping with his fiancé and their dog. Chris would ultimately like to open a private practice with a focus on providing high quality orthopaedic care.

## OUTSTANDING PTA STUDENT AWARD

The purpose of this award is to identify a student physical therapist assistant with exceptional scholastic ability and potential for contribution to orthopaedic physical therapy. The eligible student shall excel in academic performance in both the pre-requisite and didactic phases of his or her educational program, and be involved in professional organizations and activities that provide the potential growth and contributions to the profession and orthopaedic physical therapy.

**Megan Trimble, SPTA,** of Somerset Community College has been named the recipient of the APTA Orthopaedic Section's Outstanding PTA Student Award for 2018. Trimble holds a Bachelor of Science Degree in Exercise Science from Western Kentucky University. She serves as Treasurer of her class and the Physical Therapy Student Organization and is a peer mentor and tutor. She is an active member of the Kentucky Physical Therapy Association (KPTA) and attended the KPTA Conclave and APTA's National Student Conclave in 2016 and 2017.

Trimble has been active in a number of charitable and community service activities including raising awareness of homeless issues through conducting food and clothing drives for a local homeless shelter, volunteering for causes including the Special Olympics, and faith-related projects. She has also coordinated and participated in activities to support research through the Foundation for Physical Therapy, with Somerset named "Outstanding PTA Program."

The nomination was supported by program faculty members Steve Hammons and Ron Meade and by program students Ashley Evans and Sarah Stamper.

Trimble is the daughter of Steve and Melony Atwell of Bowling Green and is married to Jordyn Trimble. She is expected to graduate from the Physical Therapist Assistant Program in May 2018.

## Outstanding Research Poster Award

The Outstanding Research Poster was awarded to Daniel Watson, PT, DPT, DSc, OCS, SCS for his research project, Wearable Technology May Assist in Retraining Foot Strike Patterns in Previously Injured Runners.

## The *Journal of Orthopaedic and Sports Physical Therapy* Awards

**2017 George J. Davies – James A. Gould Excellence in Clinical Inquiry Award**

This was awarded to Noa Ben-Ami, PT, PhD; Gabriel Chodick, MHA, PhD; Yigal Mirovsky, MD; Tamar Pincus, MPhil, MSc, PhD; Yair Shapiro, MD, PhD for Ben-Ami N, Chodick G, Mirovsky Y, Pincus T, Shapiro Y. Increasing Recreational Physical Activity in Patients With Chronic Low Back Pain: A Pragmatic Controlled Clinical Trial. *Journal of Orthopaedic & Sports Physical Therapy.* Volume 47, Number 2, Pages 57-66. doi:10.2519/jospt.2017.7057. February 2017.

**2017 JOSPT Excellence in Research Award**
(no photo available, authors were not able to attend CSM)

This was awarded to Sanneke Don, PT, MPT; Margot De Kooning, PT, PhD; Lennard Voogt, PT, MT, PhD; Kelly Ickmans, PT, DPT; Liesbeth Daenen, PT, PhD; Jo Nijs, PT, MT, PhD for Don S, De Kooning M, Voogt L, Ickmans K, Daenen L, Nijs J. The Effect of Visual Feedback of the Neck During Movement in People With Chronic Whiplash-Associated Disorders: An Experimental Study. *Journal of Orthopaedic & Sports Physical Therapy.* Volume 47, Number 3, Pages 190-199. doi:10.2519/jospt.2017.6891. March 2017.

## Outgoing Committee Chairs

We would like to thank our Outgoing Committee Chairs for their years of service to the Orthopaedic Section:

Membership Chair, Renata Salavatori, PT, DPT, OCS, FAAOMPT

Public Relations Chair, Mark Shepherd, PT, DPT, OCS, FAAOMPT

Nominating Committee Chair, Judith Woehrle, PT, PhD, OCS

## Congratulations to Our Newly Certified & Re-certified Orthopaedic Certified Specialists

At CSM in New Orleans, 1,163 physical therapists were awarded their OCS and 398 were re-certified. For a complete listing of the 2017 Certified Clinical Specialists by Specialty Area please visit:

http://www.abpts.org/uploadedFiles/ABPTSorg/About_ABPTS/Statistics/CertifiedSpecialistsbyArea.pdf

# Financial Report

Kimberly Wellborn, PT, MBA
Treasurer, Orthopaedic Section

For members who were unable to attend the Orthopedic Section Membership Meeting at CSM 2018, below is a summary of the financial state of the Section.

The audited results for 2016 shows a profit of $314,766 (Figure 1). The unaudited profit for year-end 2017 is $183,024. The Section continues to be able to cover annual expenses with the income brought in by membership dues, the educational offerings at CSM and Annual Meeting, and the sale of our independent study courses (ISCs).

Below are the Section's investment funds as of December 31, 2017 (Figure 2). Per policy, the Section must keep between 40% and 60% of our annual expenses in reserve. For 2018, 60% of expenses was $1.24 million. As of December 31, 2017 the Section had $1.45 million. The Research, Practice, and Education fund met the goal of reaching $3 million (this was a goal set when the Section initially created this fund). The Section has initiatives related to providing education in formats that our members want, and these funds allow us to continue to do so.

The Section continues to be at a strong financial status and can financially support the initiatives for 2018 and beyond (Figure 3).

INCOME/EXPENSE
(Audited)

| FINANCIAL YEAR | INCOME | EXPENSE | PROFIT |
|---|---|---|---|
| 2014 | $2,157,798 | $1,743,794 | $ 414,004 |
| 2015 | $ 1,591,351 | $ 1,721,881 | $ (130,530) |
| 2016 | $2,144,025 | $1,829,259 | $ 314,766 |

**Figure 1. 2016 audited results.**

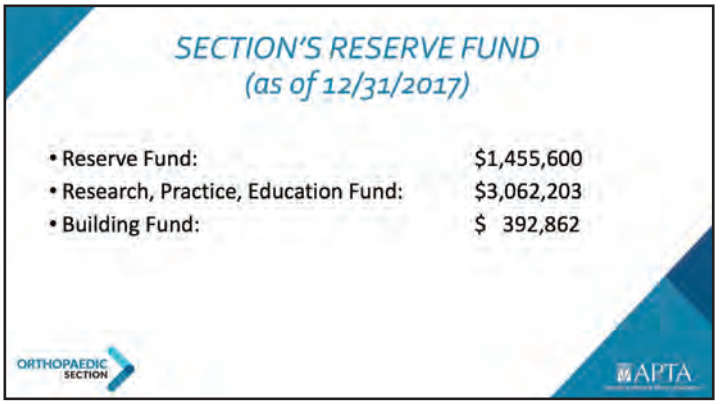



**Figure 2. Investment funds.**

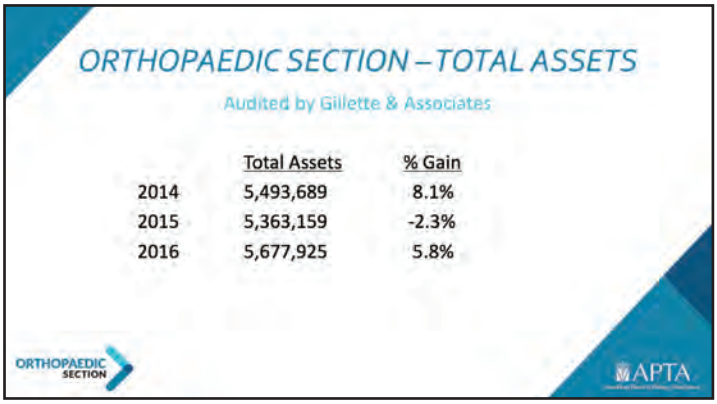



**Figure 3. Total assets.**

## Proposed Name Change–
## Don't Forget to Vote!

The Orthopaedic Section, APTA, Inc. is seeking a name change to the Academy of Orthopaedic Physical Therapy. A full report was provided in the last issue of *Orthopaedic Physical Therapy Practice* (pp 47, 64), a discussion was held at the CSM Orthopaedic Section Business Meeting, and by now you should have received an e-blast announcement asking you to vote. If you have not yet done so, please take the time to vote. The Section must receive valid ballots from at least 5% of the eligible voters and at least two-thirds of the valid ballots must contain a vote in favor of the proposed amendment.

**Deadline is May 1, 2018.**

# Wooden Book Reviews

**Rita Shapiro, PT, MA, DPT**
**Book Review Editor**

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

**Guide to Evidence-Based Physical Therapy Practice, 4th Edition,** Jones & Bartlett Learning, 2018, $99.95
ISBN: 9781284104325, 470 pages, Soft Cover

Author: Jewell, Dianne V., PT, DPT, PhD, FAACVPR

**Description:** This book explains research applicable to rehabilitation and provides guidance in finding, appraising, and applying research to clinical practice. This update includes new cases for each chapter that demonstrate the concepts, a new chapter on qualitative research studies, and expanded coverage of clinical practice guidelines. The section on most commonly used electronic search engines is also updated. **Purpose:** The purpose, according to the author, is to provide "foundational groundwork in research methods" and teach physical therapy students and practicing clinicians how to integrate evidence in their practice. With physical therapy research growing and changing, the need for clinicians and future clinicians to understand how to digest and apply research is great. The book successfully covers each step of evidence-based physical therapist practice and the website complements the book. **Audience:** The audience includes current and future clinicians. The cases at the beginning of each chapter are practical examples of evidence-based practice. For current clinicians, the book is a sound reference and easier to read than some other books on the subject. **Features:** The book has four parts that cover the principles of evidence-based practice, elements of evidence, appraising the evidence, and applying it in practice. It includes updated information about online tools including PubMed's "My NCBI" and APTA's "PT Now." It also has helpful checklists for appraising evidence based on the type of evidence, such as interventional studies. **Assessment:** As evidence and the way it is organized and consumed continue to evolve, regular updates are needed. This fourth edition includes current information about how to find evidence as well as thoughts on placing value on different types of research for clinical practice. It is a reference for practicing clinicians as well as a comprehensive introduction to evidence-based practice for future clinicians. A useful addition to the book would have been information on citation managers and tips on how to organize clinical evidence. Overall, however, this is a useful book that fulfills its intended purpose.

*Monique Serpas, PT, DPT, OCS*
*Southeast Louisiana Veterans Health Care System*

**Sport Therapy for the Shoulder: Evaluation, Rehabilitation, and Return to Sport,** Human Kinetics, 2017, $64
ISBN: 9781450431644, 225 pages, Hard Cover

Author: Ellenbecker, Todd S., DPT, MS, SCS, OCS, CSCS; Wilk, Kevin E., PT, DPT, FAPTA

**Description:** The objective of this new Sports Therapy series is to provide evidence-based books of regional musculoskeletal conditions by providing focused evaluation techniques and prescriptively recommend therapeutic activities with return to sport progression. The first book in this series focuses on shoulder joint injuries. Although it is specific to the athletic population and sports-related shoulder injuries, it can be applied to general population rehabilitation as well. The book also includes access to a website with videos. **Purpose:** The purpose is to provide a systematic evaluation and outline a rehabilitation program with sport-specific activity progression to eventually return to sport participation. **Audience:** This is an excellent reference for seasoned clinicians engaged in rehabilitation of sports-related shoulder injuries, and it is also a good resource for sports physical therapy educators. It is extremely useful for physical therapists enrolled in orthopedic or sports physical therapy residency programs. In general, athletic trainers and other sports medicine providers can also benefit from the work. **Features:** The first of the book's four parts is an excellent review of musculoskeletal functional anatomy of the shoulder complex and the biomechanical principles of motion of the shoulder girdle. Also noteworthy are discussions of the sport-specific functional mechanics and phasic motion analyses of the shoulder for baseball, tennis, volleyball, golf, and swimming. Part II details the evidence-based clinical examination and functional evaluation of the shoulder joint with all tests described in detail as well as demonstrated in the online videos. Part III is an excellent overview of nonoperative and postsurgical rehabilitation guidelines for the shoulder. The content includes joint mobilization, concepts for regaining range of motion with various techniques, and methodical progression of strengthening exercises. One chapter is dedicated to surgical management and postsurgical rehabilitation protocols that are based on the repair and healing phases. Part IV offers clinically proven objective criteria that can assist in the decision process to return the athlete to sport. It describes four rehabilitation phases following shoulder injury/surgery and objective outcome criteria to assist in activity progression determination for each of five sports highlighted in this book. **Assessment:** This book is well written and comprehensive. Its greatest strengths are the interval return-to-sports programs and the appendixes, which include thrower's and advanced thrower's ten exercise programs. These materials can be used in the clinic and as handouts for patients to use at home to enhance patient compliance. It would have been preferable to have the exercises in these appendixes also available as online videos.

*Rita Shapiro, PT, MA, DPT*
*Naval Health Clinic Annapolis*

## CURRENT CONCEPTS IN OCCUPATIONAL HEALTH

The OHSIG is pleased to include the revised and updated document related to prevention and ergonomics in this issue of *Orthopaedic Physical Therapy Practice*. This is the first of a series of articles meant to define fundamental interventions for practice within the context of work. The following document may also be accessed on the OHSIG web page: https://www.orthopt.org/content/special-interest-groups/occupational-health/current-concepts-in-occ-health.

When first completed, this article was titled Occupational Health Physical Therapy Guidelines: Work Related Injury/Illness Prevention and Ergonomics BOD 03-01-17-57 (Program 32) [Retitled: Occupational Health Physical Therapy Guidelines: Prevention of Work-Related Injury/Illness; Initial BOD 11-99-25-71]

The revision team for this article includes Brian Murphy, Lori Deal, Caroline Furtak, Chris Studebaker, and Marty Koehler.

# Current Concepts in Occupational Health: Work-Related Injury and Illness Prevention

## INTRODUCTION

Programs for injury and illness prevention including ergonomics initiatives in the workplace maintain the health and productivity of workers. Well designed and appropriately implemented programs decrease injuries and related costs. In addition, they can successfully balance the needs of individual employees and the needs of a company for competitive performance.[1]

Physical therapist participation in injury and illness prevention and ergonomics programs continues to evolve, at least partially in response to the fluctuating incidence and cost of work limiting or restricting conditions. A physical therapist's ability to remediate occupational health issues related to neuro-musculoskeletal conditions and to enhance human performance contributes significantly to the effectiveness of these programs.[2-4]

The physical therapist is a vital member of the team performing workplace analysis and problem solving related to injury and illness prevention. With expertise in identification of work-related risks to the neuro-musculoskeletal system, the physical therapist can design, implement, and monitor health, wellness, fitness, and productivity solutions for an individual, employer, or industry population.

## PURPOSE

The purpose of this document is to provide guidelines for the interventions and parameters related to occupational injury and illness prevention and ergonomic services as provided by physical therapists, and to promote consistency of language among physical therapists. Implementation and use of this information is intended for:

1. physical therapists, physical therapist assistants, and physical therapy students interested in injury/illness prevention and ergonomics services; and
2. occupational health providers, safety professionals, and team members to facilitate successfully integrated delivery of injury/illness prevention and ergonomics services.

### Key Stakeholders

Those impacted by the provision of such illness/injury prevention and ergonomic services include:

1. employers who manage injury/illness prevention and ergonomics programs through use of physical therapists in the provision or management of such programs;
2. employees and labor organizations seeking to improve health and safety through the use of physical therapists providing and managing injury/illness prevention and ergonomics programs;
3. federal and state regulatory agencies who define and provide guideline resources for patients/clients involved in, or considering injury/illness prevention and ergonomics programs in which physical therapists participate or provide management of such programs;
4. insurers, insurance brokers, and third-party administrators using physical therapists to implement injury/illness prevention and ergonomics programs to facilitate reduction of costs for their employer clients;
5. business groups and trade associations using physical therapists to implement injury/illness prevention and ergonomics programs to facilitate reduction of costs for their employer clients; and
6. educators, students, researchers, and others involved in the development and presentation of instructional injury/illness prevention and ergonomics programs that may be provided or managed by physical therapists.

## DEFINITIONS

Several definitions are used in this document and are commonly used terms in the provision of workplace services.

Administrative controls refer to work processes or procedures implemented to reduce the magnitude, frequency, or duration of exposure to ergonomic risk factors and/or improve efficiency of work.[5]

Behavioral controls include strategies under an individual employee's control, such as personal protective equipment, habits, and other procedures implemented to reduce ergonomic hazards.[5]

Engineering controls include physical changes implemented in a workplace, such as equipment, implemented to reduce or eliminate ergonomic hazards.[5]

Ergonomics is the study of work. It refers to the relationships among the worker, the work that is done, the tasks and activities inherent in that work, within the environment in which the work is performed. Ergonomics uses scientific and engineering principles to improve the safety, efficiency, and quality of movement involved in work.[6]

Evaluation (Ergonomic) refers to a dynamic process in which the workplace is evaluated including its furnishings, tools, and tasks in relation to the physical abilities and attributes of the worker. It is synonymous with Ergonomic Assessment.[7]

Evaluation of worker capacity refers to a detailed examination that objectively measures an applicant's/worker's current level of

ability to perform the physical demands of a specifically identified job. A physical therapist makes clinical judgments based on the analysis of this data when providing a report.

Examination refers to a comprehensive screening and specific testing process leading to diagnostic classification or, as appropriate, to a referral to another practitioner. The examination has 3 components: the patient/client history, the systems reviews, and tests and measures.[8]

Injury/Illness refers to the occurrence of work-related pathology/pathophysiology, pain, impairment, activity limitation, or participation restriction. The categorization of an incident to injury or illness may be different depending upon the regulations or regulatory agency involved.[9]

Occupational health providers are health care professionals who participate in the delivery of services that may include work-related injury/illness prevention, treatment, and ergonomics services.[10]

Occupational health team members are all participants in a specialized team effort for injury/illness prevention, treatment, and ergonomics in a work environment. This group may include claims personnel, nurses, vocational rehabilitation providers, and others.[11]

Prevention refers to activities that are directed toward the avoidance, minimization or delay of the onset of impairment, activity limitations, and/or participation restrictions and includes 3 phases, as follows.[10]

Primary prevention refers to prevention of disease in a susceptible or potentially susceptible (work-place) population before it ever occurs through specific measures such as general health promotion efforts.[10]

Secondary prevention refers to efforts to decrease the duration of illness, severity of diseases, or sequelae that have already occurred through early diagnosis and prompt intervention.[10]

Tertiary prevention refers to limiting the degree of disability and promoting rehabilitation and restoration of function in patients with chronic and irreversible diseases.[10]

Prognosis refers to the determination of the predicted optimal improvement in functioning that might reasonably be expected, taking into account any stated fiscal or organizational constraints, for a given work station or work site, and the amount of time needed to reach that level.[10]

Screening refers to determining the need for further intervention, such as examination or consultation by a physical therapist, referral to another health professional, or referral to other resources. Screening, such as musculoskeletal screening, may be for the purposes of injury prevention without a referral from another party.

Surveillance (Ergonomic Surveillance) refers to active and passive methods to assess risk and prioritize ergonomic issues for the purpose of illness/injury prevention. Active methods may include on-going observation and review of worker, work environment, and work activities. Passive surveillance may include analysis of surveys, injury data, and risk analysis.[12] Surveillance carries other meanings in the broader context of safety, including medical surveillance as OSHA defines it, and surveillance of risks and hazards as pertains to prevention of exposures such as chemicals and blood borne pathogens.[13]

Work culture refers to the organizational and interpersonal environment that influences attitudes and behaviors of individuals toward safety and injury/illness prevention, injury/illness management, productivity demands, communication, and work relationships.

## CONCEPTUAL MODEL

There is an interaction of the elements of work demands, worker capacity, worker behaviors, and administrative controls in the conceptual model of injury/illness prevention (Figure 1). Work demands vary with changing processes and tools, variable production levels, and changing work schedules. Worker capacity changes with aging workers, employment turnover, and changes in worker health. Worker behaviors are affected by experience, individual characteristics, morale, policy, training, and incentives. The work environment may be affected by such variables as regulations, productivity demands, weather, and administrative controls established by management.

Injury prevention in the arena of occupational health occurs in a complex and dynamic environment that is in constant flux. A challenge associated with injury prevention and ergonomics programs is in maintaining a dynamic balance of the aforementioned elements in the midst of changing and competing forces. Changing one or any combination of these elements may alter this balance and impede success of the programs. Therefore, injury prevention initiatives must attempt to consider and manage these elements as they are implemented.

Multiple strategies exist that can be used to restore a desired balance in the workplace (see Figure 1). The model presents the reality that worker behaviors attempt to balance the demands of work with the worker's capacity.

Each workplace possesses unique physical demands, environmental exposures, work pacing, etc. In order to understand the physical requirements of each job, the physical therapist may perform a job analyses. The physical therapist may recommend ergonomic changes to match worker demands to the worker's capacity, or vice versa. Worker capacity may be addressed by job-specific exercise programs developed by physical therapists. Worker behavior may be modified by management and employee education developed and presented by a physical therapist.

In-depth understanding of a workplace by physical therapists, including work demands, worker capabilities, safety rules, governmental rules and regulations, production constraints, and economic

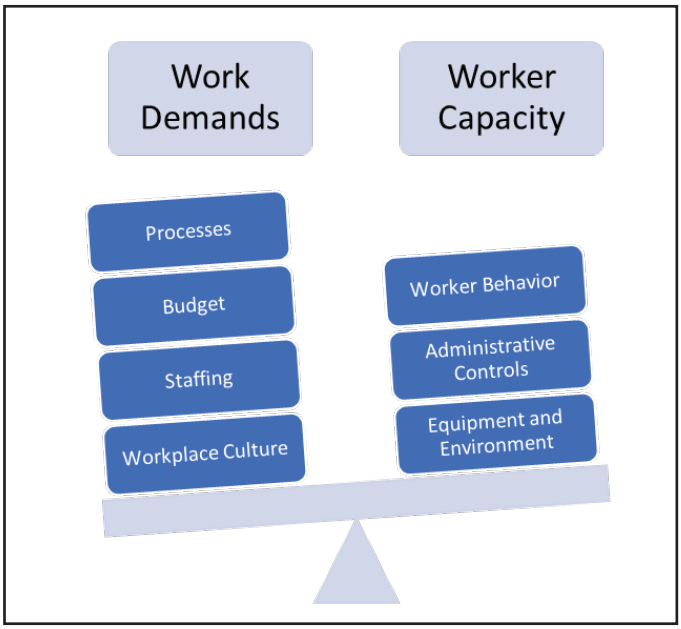



**Figure 1. A balance model for injury/illness prevention management.**

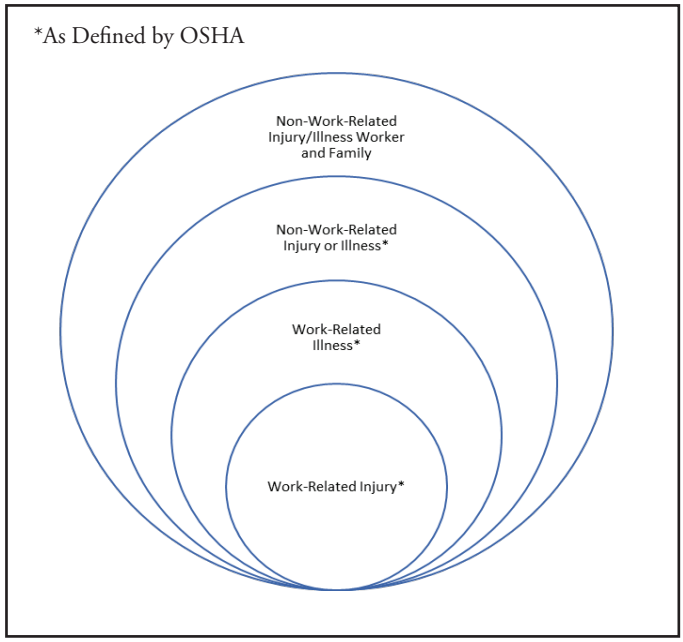



**Figure 2. Populations included in injury/illness prevention programs.**

factors of business necessity are of utmost importance when developing injury/illness prevention strategies. Thorough dialogue with workplace stakeholders including human resources, labor unions, managers, and employees is essential. A full appreciation of the unique set of administrative controls and constraints and the availability of resources is necessary before specific injury/illness prevention and ergonomics plans are constructed by a physical therapist.

Injury/illness prevention and ergonomics programs may focus on different populations (Figure 2). The first populations include workers only. These populations may be workers who have an injury or illness that is directly caused by work, workers whose injury or illness develops over time as a result of work, or workers whose injury or illness, either work-related or non-work-related, is exacerbated by work. The second population may extend beyond workers, to include families of workers.

Business and industry are keenly aware that broader health promotion programs have a positive impact on total health care costs. To reduce total health care costs, businesses are addressing issues including health risk behavior modifications, health promotion, ergonomics, and injury/illness prevention for workers and their families. Depending upon the employer-sponsored health plan, workplace and non-workplace-related injury/illness prevention and ergonomics services can be provided by physical therapists. Such services can encompass the cardiovascular/pulmonary, integumentary, musculoskeletal, and neuromuscular systems. The physical therapists' scope of practice encompasses all the aforementioned injury/illness prevention and ergonomic services.

## KNOWLEDGE BASE

Physical therapists participate in injury/illness prevention and ergonomics programs by assuming a variety of roles. Ergonomic processes require data review, work analysis, worker and workforce analysis, surveillance, ergonomic risk identification, and risk analysis.

- Data review requires knowledge of the types of records relating to injury reporting, the requirements and limitations involved in reporting and recording occupational injuries, and statistical methods of evaluating injury data.
- Work analysis requires knowledge of industrial processes, availability and functionality of industrial equipment and tools, how workers may be assisted/constrained in performing occupational tasks, and how industrial processes, equipment, tools, and tasks may be modified within appropriate economic constraints.
- Analysis of workers and the workforce requires knowledge of how individual workers perform occupational tasks, and the composition of the general workforce participating in similar industrial processes.
- Surveillance is a workplace safety strategy defined and described by the Occupational Safety and Health Administration (OSHA) in conjunction with the Centers for Disease Control (CDC) and National Institute of Occupational Safety and Health (NIOSH) in preventing injuries. It is a process by which physical therapists may follow the flow of work and resultant injury/illness to detect and eliminate underlying causes that introduce hazards or exposures, and provide information concerning work practices and injury/illness.[14]
- Evaluation and analysis of identified ergonomic risks provide opportunities for intervention to modify risks and prevent potential injuries.

Examination and evaluation of the interaction of each of these components of the ergonomic process permits identification of stressors imposed upon workers and the workforce. Opportunities for intervention by physical therapists to alleviate stressors may include education and training, health promotion, recommendation of ergonomic controls, and work re-entry management. Education and training provides an opportunity for physical therapists to demonstrate the best use of available equipment, tools, and methods of task performance. Education and training is necessary for both management and workers, so both share the responsibility of appropriate supervision and action. Health promotion encourages employees to engage in wellness and fitness behaviors that may contribute to primary injury/illness prevention. Recommending and implementing ergonomic controls can reduce the risk of injury to a worker or group of workers performing a job task, and work re-entry management provides for a smooth, safe, and cost-effective means of returning injured workers to the job.

There are several regulatory bodies, agencies, and laws that govern, have an impact on, or provide guidance relevant to workplace practices. Some of these are involved in oversight of industry standards and injury prevention programs and may affect the provision of such services. Many of these also provide resources for program design and implementation.

Among these are:

1. United States Department of Labor (DOL)
2. United States Bureau of Labor Statistics (BLS)
3. Occupational Safety and Health Administration (OSHA)
4. National Safety Council
5. National Institutes of Health (NIH)
6. National Institute for Occupational Safety and Health (NIOSH)
7. Americans with Disabilities Act (ADA)
8. Equal Employment Opportunity Commission (EEOC)
9. Uniform Hiring Guidelines
10. State Department(s) of Labor
11. State workers' compensation statutes

12. State ergonomics guidelines and standards
13. Insurance industry statistics and modification rates for each insurance carrier
14. Insurance carriers and third-party administrators for group health and workers' compensation

Each of these entities and laws may affect various aspects of employment practice in different ways. Physical therapists combine these areas of knowledge to provide services to client companies and integrate the perspectives and needs of all those involved in workplace practices. As such, physical therapists are uniquely qualified to develop, implement, manage, and evaluate effective injury/illness prevention programs. Physical therapists practicing in occupational health, especially those providing or managing injury/illness prevention and ergonomics programs, recognize the value of expanding their knowledge base in areas applicable to the dynamics of the workplace, and workplace organization. Physical therapists recognize that general knowledge of organizational structure is necessary when consulting for a specific client company. This includes knowledge of the: (1) policies and procedures specific to a client company; (2) latitude permitted in developing, implementing, and enforcing policies and procedures under state and federal law; and (3) ability to work within different labor environments, such as union versus non-union. Physical therapists also recognize that the ability to develop and implement such programs may be limited or enhanced by client company organization; policies and procedures; state and federal law; and management and employee participation, support, and work rules.

The ability to provide successful intervention is most often defined by economic benefit. Economic benefit may be limited within a given workplace by internal factors such as product characteristics and production processes. External factors that may affect economic benefit are insurance carrier programs, the availability of occupational health provider resources, and history of occupational health cost.

In developing injury/illness prevention and ergonomics, physical therapists take into consideration issues relating to product design, production, and quality standards. As a company continuously improves its design and processes, the worker risk exposure must continuously be monitored as well to ensure a new process or design does not increase the worker risk.

Finally, in order for an injury prevention program to be successful, a physical therapist must understand the client company's current human resource challenges. Some factors that can challenge human performance directly or indirectly are return to work management, hiring efforts, and current and planned staffing levels. The physical therapist can recommend job matching, job accommodations, and job rotation schedules to minimize risk to workers in these and other similar situations. All aspects of worker-management relationships have an impact on corporate values and work culture. It is advisable that physical therapists have an understanding of or collaboration with organizational psychologists to effectively address a program's success at many levels within an organization.

## MANAGEMENT MODEL

Physical therapists, in their management of individual patients/clients, integrate 5 elements in case management: examination, evaluation, diagnosis, prognosis, and intervention(s). These elements are incorporated in a manner designed to provide the best functional outcome in the shortest possible case duration. This approach is also successfully employed by physical therapists in the development, implementation, and management of workplace injury/illness prevention programs.

## EXAMINATION

When investigating the potential for injury/illness prevention and ergonomics programs, the first step is to take a complete history of the client company's injury/illness experience. Investigation starts with a review of epidemiological and worker demographic information. This information can be extracted from OSHA reportable injuries/illnesses (OSHA 300 logs), an analysis of loss time records, productivity records, medical records, near-miss and at-risk behavior logs, industry-wide incidence rates (noted by OSHA Standard Industrial Classification *https://www.bls.gov/iif/oshsum.htm*), and insurance reports. Access to these records, and others listed previously, should be granted by a client company if the client company wishes to design and implement an effective injury/illness prevention and ergonomics program.

Some companies may not have an analysis of loss time records, near-miss/at-risk behavior logs, or incidence rates. These data may have to be constructed after the incident. Insurance carriers often share data generously for consultants who are working to decrease costs associated with occupational injury and illness. Information available from insurance carriers will include loss run, experience modification rate, and insurance reserves data. Loss run data demonstrate the effects of injury/illness on time lost from work. Experience modification rate data demonstrate how insurance costs are modified based on a client company's injury/illness experience. Insurance reserves data indicate the financial implications of funds allocated for injury/illness and how injury/illness prevention programs can decrease the amount of funds encumbered for insurance coverage.

The first tests and measures to be performed relate to individual work sites and work stations. Ergonomic tests and measures examine the environment, site, tools, equipment, materials, machinery, workflow, production processes and requirements, physical demands, physical stressors, and task rotation. Environmental factors of noise, ambient temperature, humidity, light, and air quality all may contribute to potential injury/illness during performance of occupational tasks. Physical characteristics of the work site and workstation, including surfaces, work station area size and configuration, and seating also may contribute to potential injury/illness during performance of occupational tasks. Individual aspects of occupational tasks that may contribute to potential injury/illness include tools, equipment, materials, machinery, individual work sequencing and pacing, general production processes rate, and quality and production demands. Specific physical demands placed on individuals during occupational tasks may include force, repetition, postures and motions, vibration, and surface temperature of materials. Examining work sites and workstations requires an appropriate surveillance system for identification of at-risk employment situations/work processes within which accurate tests and measures can be performed and recorded.

The second tests and measures to be performed relate to individuals who will perform occupational tasks. Examination of each worker and the work force includes anthropometrics, including age and gender, examination of the individual worker, evaluation of the physical capacities of the worker, and assessment of work and health habits, risk behaviors, and worker/workforce characteristics. Health habits should include nutrition, exercise, and smoking history. These

aspects of individuals should be examined for workers who are new hires; transferring jobs within the same client company; or returning to work following injury/illness, leave, or lay-off.

### Evaluation, Diagnosis, and Prognosis

Reports relating to the evaluation and diagnosis of work sites or work stations, with respect to preventing injury or illness, should include data analysis; work analysis; evaluation of worker/workforce, safety, behavior, and compliance; identification of at-risk employees; identification of at-risk work processes/work stations; and identification of solutions. Reports relating to prognosis of work sites or work stations, with respect to preventing injury/illness, should include an estimate of goals and outcomes for all interventions.

## INTERVENTIONS

Successful injury/illness prevention and ergonomics programs address the needs of both individual workers and employers. The dynamic nature of these programs mandates careful analysis and balancing of relevant components of intervention. There are two major areas of intervention. The first area of intervention includes those aspects of prevention programs where physical therapists may take primary leadership roles. Procedural intervention components include monitoring at-risk employees and work processes, ergonomics, education and training, health promotion, return-to-work case management, and occupational health committee/team development.

The second area of intervention includes those aspects of injury/illness prevention and ergonomics programs in which physical therapists most often participate as team members. Participatory intervention components include involvement as a team member in work assignment, human resources management, compensation and benefits, labor relations, corporate values and work culture, and design and production standards.

## OUTCOMES

Physical therapists may participate in, and direct, the development of evidence that injury/illness prevention and ergonomics programs are efficacious and effective. In doing so, physical therapists generate, analyze, and interpret data related to incidence rates, severity rates, restricted duty rates, modification rates, direct and indirect health care costs, direct and indirect worker compensation costs, cost per case, aggregate annual costs, insurance reserve pool, quality control, productivity, employee morale/turnover, and return on investment for injury/illness prevention and ergonomics programs. Generating, analyzing, and interpreting data related to injury/illness prevention and ergonomics is performed by physical therapists use of the full range of statistical and epidemiological methods, and appropriate application of such methods.

## CONCLUSION

Physical therapists are uniquely positioned to provide comprehensive workplace services to prevent as well as manage neuro-musculoskeletal injury. Many resources exist to support the development of such services and include resources available through the entities listed in the previous section entitled "Knowledge Base." To name only a few examples, OSHA produces information on assessing and providing solutions related to musculoskeletal hazards,[15] the CDC and NIOSH produce numerous resources related to guidelines for manual materials handling, upper extremity injury prevention, program design such as the Total Worker Health program, and others.[16] Additionally, Clinical Practice Guidelines are published that provide current evidence-based direction for such programs, including guidance for prevention, intervention, and management of injuries in work populations such as those published by American College of Occupational and Environmental Medicine (ACOEM).

An occupational health injury/illness prevention and ergonomics system should provide explicit definition of what services a physical therapist will perform and the anticipated outcomes. A comprehensive occupational health injury/illness prevention and ergonomics program developed, implemented, and managed by a physical therapist will explicitly define the: (1) scope of the program, program plan, relevant policies and procedures; (2) authorities, responsibilities, accountabilities of those participating in the program; (3) surveillance strategy, benchmark, baseline, and triggering indicators, and intervention protocols; (4) content and process of report generation, report distribution; (5) maintenance of the program; and (6) methods of program evaluation and improvement through measures that determine actual outcomes.

Comprehensive injury and illness approaches in occupational health, as described, can have a substantial positive impact on employees and organizations. When physical therapists contribute to the development, implementation, and management of injury/illness prevention and ergonomics programs, significant and lasting workforce health improvement and workplace health-related cost reductions can be expected.

## REFERENCES


1. Occupational Safety and Health Administration. Injury and Illness Prevention Programs White Paper. https://www.osha.gov/dsg/InjuryIllnessPreventionProgramsWhitePaper.html#. Accessed September 9, 2017.
2. DeWeese C. How multiple interventions reduced injuries and costs in one plant. *Work*. 2006;26(3):251-253.
3. Landers M, Maguire L. Effects of a work injury prevention program for housekeeping in the hotel industry. *Work*. 2004;22(3):239-246.
4. Ryden LA, Molgaard CA, Bobbitt SL. Benefits of a back care and light duty health promotion program in a hospital setting. *J Community Health*. 1988;13(4):222-230.
5. Occupational Safety and Health Administration. Safety and Health. Ergonomics. Solutions to Control Hazards. https://www.osha.gov/SLTC/ergonomics/controlhazards.html. Accessed September 20, 2017.
6. Occupational Safety and Health Administration. Ergonomics: The Study of Work. https://www.osha.gov/Publications/osha3125.pdf. Accessed September 20, 2017.
7. Gale Encyclopedia of Nursing and Allied Health. Ergonomic Assessment. http://www.encyclopedia.com/medicine/encyclopedias-almanacs-transcripts-and-maps/ergonomic-assessment. Accessed September 20, 2017.
8. American Physical Therapy Association. Guide to Physical Therapist Practice 3.0. http://guidetoptpractice.apta.org/. Accessed September 22, 2017.
9. Occupational Safety and Health Administration. OSHA Injury and Illness Recordkeeping and Reporting Requirements. https://www.osha.gov/recordkeeping/index.html. Accessed September 22, 2017.
10. Dictionary of American History. Medicine, Occupational. http://www.encyclopedia.com/history/dictionaries-thesauruses-


*(Continued on page 122)*

# President's Letter

*Annette Karim, PT, DPT, PhD*
*Board-Certified Orthopaedic Clinical Specialist*
*Fellow of the American Academy of Orthopaedic Manual Physical Therapists*

## WELCOME TO OUR NEW PASIG MEMBERS!

CSM was a busy and fruitful time for the PASIG. At CSM we held a membership meeting, programming, and off-schedule pre-professional dancer screening and fellowship Task Force meetings. For PASIG membership meeting minutes, contact Megan Poll, at: meganpoll@gmail.com. For the pre-professional dancer screening Q&A and Fellowship Task Force Q&A meeting minutes, contact Andrea Lasner (alasner1@jhmi.edu).

Every year the PASIG leadership has at least one conference call, hundreds of emails, and then we meet onsite at CSM. We have already moved forward with the submission of a grant proposal to the Orthopaedic Section for a PASIG strategic planning session. Stay tuned for updates! The Orthopaedic Section Strategic Plan is the document the PASIG has used to create objectives, available here:

https://www.orthopt.org/uploads/content_files/Downloads/Other_Section_Attachments/2016Strategic_plan_10_16_2015_TKF.pdf

What are the accomplishments, you ask? I have outlined our work under the headings of the Orthopaedic Section's Strategic Plan.

1. **Education and Professional Development, Standards of Practice**
   a. **We have the validation of the Description of Fellowship Practice (DFP) from the American Board of Physical Therapy Fellowship and Residency Education (ABPTRFE)!!** The DFP will serve as a single document for all developing fellowships to use as a guideline for creating new performing arts fellowships and achieving accreditation. This is a significant new pathway for our practice field. Thank you to Mariah Nierman, our Fellowship Task Force Chair, Laurel Abbruzzese, who served as Assistant and is now our new Fellowship Task Force Chair, and committee members Yuriko Nabeta, Janice Ying, Elizabeth Corwin, Rosalinda Canizares, and Annette Karim (me!) for the many hours of volunteer work. Contact Laurel for additional information. The first Performing Arts Fellow-in-Training is Tessa Kasmar from Ohio State University. She spoke at our Fellowship Task Force Q&A. The next developing performing arts fellowship program is at Johns Hopkins University.
   b. **We maintain a list of Performing Arts Clinical Sites.** We are currently updating the list of clinical rotation sites on our website. Please email Rosie Canizares (Rcc4@duke.edu) if you take students and would like your information included on this list.
   c. **We have appointed a Practice Chair, Andrea Lasner.** We would like to investigate telehealth, connect practice settings, and clarify distinguishing features of entry-level vs. residency vs. fellowship-level performing arts practice.
2. **Research**
   a. **We have completed our 2-year, $15,000 grant in support** of the research in tendinopathies done by University of Southern California PhD candidates K. Michael Rowley and Hai-Jung (Steffi) Shih, under the mentorship of Kornelia Kulig. The researchers presented their updates at our membership meeting and provided content for our main session. We are pleased at their progress and hope to continue to support new research in the performing arts once we replenish our funds.
   b. **We continue to send out and publish monthly research citation blasts.** Thank you to Laura Reising for her work in creating the monthly blasts and welcome to Sara Edery-Atlas, who will focus the next set of blasts on pain science in the performing artist. If you can contribute pain science content, or if you have other citation blast ideas, contact Sarah at: Sarah.Edery-Altas@nyumc.org
   c. **We continue to invite authors to the OPTP PASIG pages.** Thank you to Brooke Winder on her case report "Pelvic Floor Dysfunction in a Dancer with Lumbar, Sacroiliac, and Coccyx Pain: A Case Report" and to Kahra Woolverton and Mary Lou Galantino for "Outcome Measures for Dance Injury: A Pilot Study Exploring Functional Movement Screen and a Novel Screening Tool." If you have a brief, clinically-focused case report on a performing arts physical therapist patient, or a clinical commentary, please contact Annette Karim to submit your writing: akarim@apu.edu
   d. **We awarded two PASIG student scholarships.** Congratulations to student scholarship recipient Kathleen Sun, under the faculty mentorship of Laurel Abbruzzese at Columbia University for her CSM poster presentation, "A Rubric for Evaluating Adolescent Dancer Screens." Congratulations to student scholarship recipient Hannah Colopy, under the faculty mentorship of Rosie Canizares at Duke University for her IADMS poster presentation, "Associations Among Ages, Experience, and Injuries of Dancers." Both scholarships were given blinded peer-review. Thank you, Anna Saunders, Scholarship Chair, for organizing this.
   e. **New awards.** The PASIG intends to provide not only student, but also clinician/academician awards for both poster and platform presentations at CSM 2019. We have found we end up with a surplus of our non-rolling annual funds from the Orthopaedic Section every year, so we have decided to provide additional research awards with the surplus monies.
3. **Public Awareness and Advocacy**
   a. **We have a social media presence!** We have 166 members on our members-only Facebook page and 586 Twitter followers. To belong to our Facebook page,

contact Dawn (Muci) Doran (dawnd76@hotmail.com), and please tweet about performing arts with us @PT4PERFORMERS

b. **We are developing a pre-professional dance screen.** A core group of clinicians, researchers, and students are investigating the development of a single pre-professional dance screen. There are several screens in our field for pre-professionals. The PASIG is gathering these screens and screen developers, promoting the support of reliability and validity studies. Contact Mandy Blackmon (mandydancept@gmail.com) if you are interested in joining this group. For professional dancer screening, please look at the Dance USA website.

c. **We have an Orthopaedic Section Board liaison.** Lori Michener is our liaison. Lori, Rosie Canizares, and Annette Karim are the voting members of the PASIG. We welcome new ideas and will promote them into action with the advisement of the PASIG leadership and majority vote.

d. **We have participated in and serve as leaders in the performing arts field.** Our leaders and members are involved in organizations such as the International Association of Dance Medicine and Science, Performing Arts Medicine Association, Dance USA, and the American Academy of Orthopaedic Manual Physical Therapists.

4. **Member Engagement**

a. **We have >690 members and a membership directory** so you can find members for affiliations, patient care, collaboration, research, and practice. Please email Liz Chesarek at echesarek@gmail.com, if you are a new member or want to become more involved as a current member. Membership is free to all Orthopaedic Section members. Students, clinicians, and academicians we need you!

b. **We provide mentorship to students.** We have provided and intend to continue to provide mentors to 3rd year student Orthopaedic Section members who are interested in clinical practice and research in the performing arts and orthopaedics. If you are interested in being a mentor, please contact Megan Poll (meganpoll@gmail.com), who not only serves as PASIG Secretary, but as the coordinator for the 6-month Orthopaedic Section mentorship program. For students interested in becoming a mentee, contact Megan for the upcoming round of applications.

c. **We invite members to join our standing committees.** Please contact the chair of the committee you are interested in.

d. **We welcome our new leadership and committee members, including our students.**

## WHAT IS NEXT?

**Find out what matters most to you, our members.** Janice Ying created a short survey for you. Please take the time to help us know how best to serve you. It is time to set new initiatives, so we want to hear from you!

**https://www.surveymonkey.com/r/ZJ5YWWN**

**The 2018 Annual Orthopaedic Section Meeting** will be held in Baltimore, MD from April 26-28, 2018. More information will be posted when available at: https://www.orthopt.org/content/education/2018-annual-orthopaedic-section-mtg

The Orthopaedic Section has **increased the annual non-rolling SIG budget** from $2,500 to $3,750. This will allow us to provide more scholarships and continue to bring the PASIG booth to events such as IADMS.

**Increasing our encumbered funds.** 2017 Finance Report: Total amount spent from the 2017 annual, non-rolling budget was $1,533.40. The current balance of our encumbered funds is $575.12. We have used our money to support Performing Arts research and scholarship and look forward to future endeavors that move our profession forward. We welcome any ideas you may have toward increasing our encumbered funds, and we welcome endowments and gift donations!

**Writing Online Independent Study Courses.** We plan on updating retired monographs and providing courses online via the Orthopaedic Section.

**Giving a Lifetime Achievement Award** to a clinician or academician who has contributed significantly to the performing arts.

**Applying for the $3,000 Strategic Planning Grant.** This is a new grant, offered by the Orthopaedic Section to the SIGS specifically for SIG strategic planning. This is the perfect time for us to take another look at strategic planning and create new goals.

**Encourage members to create new Performing Arts Fellowships. Information from Laurel Abbruzzese, Fellowship Task Force Chair:** The DFP (Description of Fellowship Practice) recently approved by the American Board of Physical Therapy Residency and Fellowship Education (ABPTRFE), serves as the foundation of any Performing Arts Fellowship program. Once final edits are completed, a curricula development resource link will be added to the ABPTRFE site. All important resources for Fellowship Program Development are on the ABPTRFE site.

http://www.abptrfe.org/Home.aspx

### Some Helpful Starting Points

A fellowship program must be completed within a minimum of 1,000 hours including 150 educational hours and 850 patient-care clinic hours inclusive of 150 hours of 1:1 mentoring throughout the program. At least 75 of the 150 mentoring hours must be in-person (1:1). Fellowship programs are completed in no fewer than ten (10) months and in no more than sixty (60) months.

All accredited fellowship programs must be compliant with the new ABPTRFE Quality Standards by January 1, 2019. The new standards require participants of a fellowship program to meet one of the following admission criteria:

American Board of Physical Therapy Specialties (ABPTS) specialist certification in the related area of specialty as defined within the DFP, or

Completion of an ABPTRFE - accredited residency in a related specialty area as defined within the DFP.

- **Application Process**
- **Costs**
- **Malpractice Insurance**
- **Directory of Programs**

Link to the new ABPTRFE Quality Standards: http://www.abptrfe.org/uploadedFiles/ABPTRFEorg/For_Programs/Apply/Forms/ABPTRFEClinicalQualityStandards.pdf

**Fellowship Program Mentors Qualifications:** Mentors for fellowship programs are required to be physical therapists who are either: (1) ABPTS board-certified specialists in the program's related area of practice and with experience in the area of subspecialty (ABPTS Sports or Orthopaedic Certified Specialist) or

(2) graduate of an ABPTRFE-accredited residency/fellowship program in that related area of practice and with experience in that area of subspecialty (successful completion of credentialed Sports or Orthopaedic Residency Program)

### Mentoring Resource Manual

http://www.abptrfe.org/ForPrograms/MentoringResourceManual/

http://www.abptrfe.org/uploadedFiles/ABPTRFEorg/For_Programs/ABPTRFEMentoringResourceManual.pdf

### Successful Mentorship for Residency and Fellowship Education

http://learningcenter.apta.org/student/MyCourse.aspx?id=e659bff6-1199-4287-a9c8-6a5a1ce9ceb0&programid=dcca7f06-4cd9-4530-b9d3-4ef7d2717b5d

*According to reps from the ABPTRFE, if a site is going to fail a site visit it would typically be related to mentoring. Mentoring is different than clinical instruction. The above mentoring resource are highly recommended by the ABPTRFE.*

### Current Performing Arts Fellowship Programs

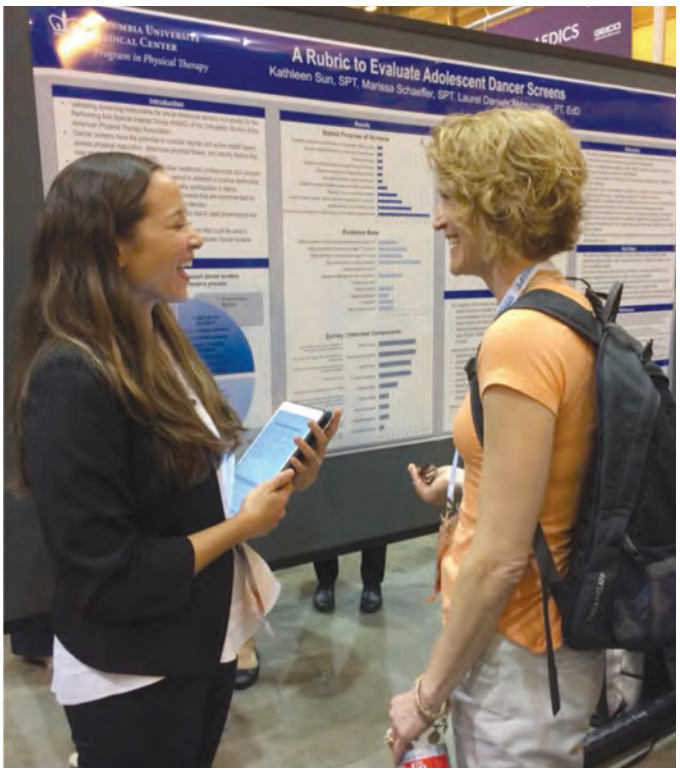
**Performing Arts - Candidate Program**

The Ohio State University Sports Medicine Performing Arts Fellowship
RF-PTCAS Participant: Program Profile
2835 Fred Taylor Dr.
Columbus, OH 43202
Contact: Tiffany Marulli PT, DPT
Phone: 614/293-2385
Fax: 614/366-3601
Email: tiffany.marulli@osumc.edu

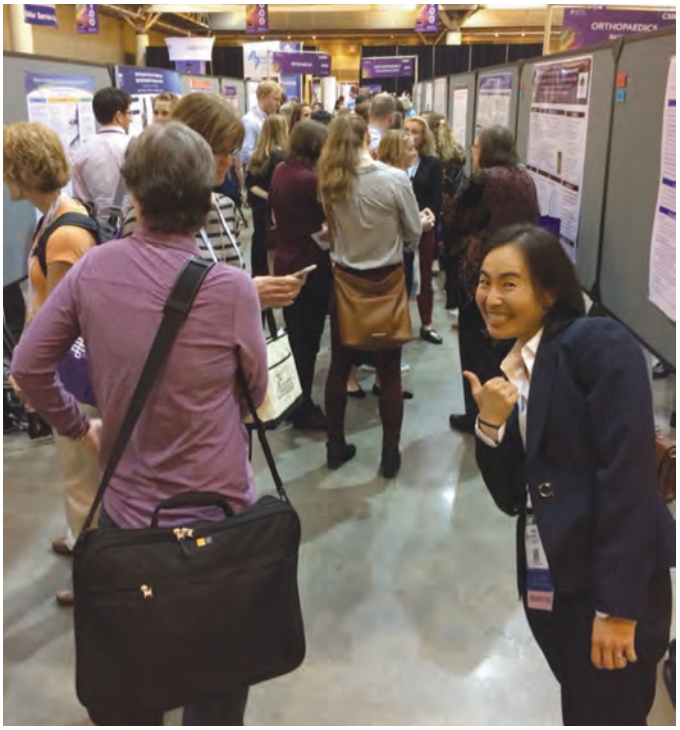
**Performing Arts - Developing Program**

The Johns Hopkins Hospital Performing Arts Fellowship
10753 Falls Rd.
Pavilion 2, Suite 235
Lutherville, MD 21093
Contact: Andrea Lasner PT, MSPT
Phone: 410/583-2666
Fax: 410/847-3838
Email: alasner1@jhmi.edu

**Connect PASIG members on pre-professional dancer screening. News from Mandy Blackmon, Dancer Screening Chair:** Over the last 3 years, we have seen a significant increase in interest in adolescent and pre-professional screening tools and process. This interest led the PASIG to appoint a Young Dancer Screening Chair and we held our second round table meeting at CSM this year. The meeting has served as an opportunity for students and physical therapists to share about current projects, future projects, encourage collaboration, seek mentorship, and network. We had a significant turn-out this year and there are multiple groups working on many projects, including projects in the gymnastics and circus arts arenas. All of these projects will be included on the Google.doc that we started and shared last year. Additionally, there were multiple posters and platform presentations this year, including one inspired by our meeting last year. This group, with their project entitled, "A Rubric for Evaluating Adolescent Dancer Screens," was also the recipient of our student research award. We recruited volunteers for a committee and Mandy Blackmon will be reaching out to those people soon. If you are interested in being added to the Google doc for further information on screening projects, please send Mandy, MandyDancePT@gmail.com, your email address. Please look over the document when it is updated and feel free to reach out to those professionals and students seeking collaboration and participation. We will schedule another meeting next year at CSM.




**PASIG student poster award recipient Kathleen Sun at CSM 2018.**



**Orthopaedic Section-PASIG poster row.**

Pre-professional Dance Screen Q&A.

PASIG main programming. Plié like a jellyfish!

PASIG Leadership meeting. Clockwise from 6:00 is Lori Michener, Annette Karim, Rosie Canizares, Jessica Fulton, Liz Chesarek, Megan Poll, Laurel Abbruzzese, Mandy Blackmon, Brooke Winder, and Janice Ying.


Athletics Meets Aesthetics. PASIG program speakers Kornelia Kulig, K. Michael Rowley, Steffi Shih, Pamela Mikkelsen, Brooke Winder.

OPSIG ORTHOPAEDIC SECTION, APTA

## PERFORMING ARTS **LEADERSHIP**

| | | |
|---|---|---|
| Annette Karim, President | 2017-2020 | akarim@apu.edu |
| Lori Michener, Orthopaedic Board Liaison | 2017-2020 | lmichene@pt.usc.edu |
| Rosie Canizares, Vice President/ Education Chair | 2016-2019 | Rcc4@duke.edu |
| Jessica Fulton, Nominating Committee Chair | 2016-2019 | jessicafultondpt@gmail.com |
| Brooke Winder, Nominating Committee | 2017-2020 | brookerwinder@gmail.com |
| Marisa Hentis, Nominating Committee | 2018-2021 | marisa.giangrasso@gmail.com |
| Elizabeth Chesarek, Membership Chair | 2018-2020 | echesarek@gmail.com |
| Sarah Edery-Atlas, Research Chair | 2018-2020 | Sarah.Edery-Altas@nyumc.org |
| Laurel Abbruzzese, Fellowship Taskforce Chair | 2018-2020 | La110@cumc.columbia.edu |
| Dawn Muci, Public Relations Chair | 2018-2020 | Dawnd76@hotmail.com |
| Amanda Blackmon, Dancer Screening Chair | 2018-2020 | mandydancept@gmail.com |
| Anna Saunders, Scholarship Chair | 2017-2019 | annarosemary@gmail.com |
| Janice Ying, ISC Chair | 2017-2019 | JaniceYingDPT@gmail.com |
| Megan Poll, Secretary | 2017-2019 | meganpoll@gmail.com |
| Andrea Lasner, Practice Chair | 2017-2019 | alasner1@jhmi.edu |

# Hello Orthopaedic Section and FASIG members, and Happy Spring

*Christopher Neville, PT, PhD*

The FASIG kicked off 2018 with some great energy and initiatives that are aligned with our newly drafted strategic plan. The FASIG leadership met in February to finalize a 6-month process of drafting a strategic plan to align with the mission of the Orthopaedic Section. Part of this plan is to support ongoing research and expert clinical care related to foot and ankle orthopedics as well as collaborate with others who share this vision.

As always, the Combined Sections Meeting (CSM) in February was a great place to build on the exciting work the FASIG is doing. With just over 17,000 people in attendance at CSM, the opportunities for networking to exchange research and clinical ideas were abundant. The CSM also included a wealth of foot and ankle specialized content that was well received by many of the attendees. The FASIG sponsored a session titled, *Integrating New Evidence into Plantar Heel Pain Clinical Practice Guidelines* by Drs. McClinton, Reischl, and Ridge that was attended by more than 500 people! Later in the week another great educational session titled, *Fracture to Arthroplasty: Management Strategies at the Ankle and Hindfoot* was given by Drs. Albin, DiLiberto, and Moon. Finally, two other great foot and ankle sessions titled, *Ankle-Foot Orthoses from Walking to Running: What You Really Need to Know* and *Science Meets Practice: Form Before Footwear Effectiveness vs. Efficacy in Running* also drew large crowds of clinicians and students interested in the foot and ankle topics.

But, these education sessions were just the start of all the great programing at CSM with over 25 other platform and poster presentations related to foot and ankle topics. If you were able to attend CSM, hopefully you were able to see some of this content. If you missed CSM, take a look at the many great titles below. You can anticipate many of these to be developed into published papers in the future but in the meantime these titles may serve to stimulate conversation and thinking about foot and ankle care for our patients. It is wonderful to see so much great foot and ankle work being disseminated. The FASIG will continue to make it a priority to foster the engagement and dissemination of this work going forward.

## FASIG noted CSM 2018 Platform and Poster Presentations:

The relationship between hip strength, running gait foot strike pattern, and running-related injury
A. DeAmara; K. Mynatt; M. Lyons; C.E. Rothschild; P. Pabian

Effect of two types of tape on foot posture and range of motion before and after exercise in healthy individuals
C.M. Young; M.W. Cornwall; S. Raab; T.K. Jain

Combined exercise and barefoot weight bearing program influences measures of foot function in people with asymptomatic flat feet
M.L. Keefer Hutchison; J. Houck; T. Whited; S. Howland; B. Thompson; A. Foster; J. Jarbath; A. Modafferi; J. Brumitt

The assistance of mechanical lumbar traction in reducing persistent plantar foot pain
M. Dreger; A. Carroll; T.J. Manal

A comparison of the kinetics and kinematics of conventional and powered (microprocessor) ankle-foot prostheses during level ground, stair and ramp ambulation: a systematic review
A. Fleer; M. Gibson; K. Stephens; S. Surber

Differential diagnosis and medical screening of a young male with idiopathic foot drop
C. Bolton; A. Hartstein

Optimal sagittal ankle foot orthosis alignment in combination with lower extremity strengthening and progressive walking training leads to ambulation with a walker in a toddler with polymicrogyria: a case report
C. Cherng; K. Mattern-Baxter

Ankle foot orthosis-footwear combination: pilot study modulating ground reaction forces to optimize lower limb kinematics in ambulatory children with cerebral palsy
C. Villarosa; K. Bjornson; S. Apkon; S. Fatone; M. Orendurff; S. Sienko-thomas; K. Do

Examining electromyography activity of the gluteus medius and tensor fascia latae during barefoot and shod walking and running
G. Schindler; H. Brinkman; A. Cygan; C. Fredericks; R.J. Plemel; E. Thorton; A. Yanchek; D.P. Relling

Effects of midfoot joint mobilization on ankle-foot morphology and function following acute ankle sprain. A randomized control trial
J.J. Fraser; R. Koldenhoven; A.H. Jaffri; S.F. Saliba; J.M. Hart; J.S. Park; J. Hertel

Fracture risk of 5th metatarsal increases with neuropathic forefoot adduction deformity
D.R. Sinacore; K.L. Bohnert; D.J. Gutekunst; K.R. Ford; J.E. Johnson

Association of foot pronation with medial knee load in adults with medial knee osteoarthritis
K.D. Gross; R.K. Jones; D. Felson; S. Chong; H. Hillstrom

Effectiveness of running foot strike training in a patient using a dynamic ankle foot orthosis
A. Yoder; B.N. Mazzone; S. Farrokhi

Short and long term effects of forefoot strike and increased cadence gait retraining methods on impact loads in runners
E. Futrell; K.D. Gross; D. Reisman; I.S. Davis

Patients' perspectives regarding ankle-foot orthoses to improve walking mobility for people with peripheral artery disease
E.A. Choma; R.J. Mays; R.L. Mizner; A.M. Santasier

The effect of functional electrical stimulation for foot drop on gait and walking in people with multiple sclerosis: a systematic review
R.R. Dhruve; M.C. Haeuptle; A. Hegel; D. Kutteroff; M. Spinosi; S. Wilbert; E.T. Cohen

The influence of carbon composite and plastic ankle-foot orthoses on balance and gait in individuals with multiple sclerosis: a pilot study
K. Jackson; K.E. Bigelow; H. Goubeaux; C. Macy; T. Trauner; S. Hollis

The effects of hip flexion orthotic vs dynamic ankle foot orthotic on walking ability in patients with multiple sclerosis: a case series
T.H. Lee; A.A. Pinner

Wearable technology may assist in retraining foot strike patterns in previously injured runners
D. Watson; E.M. Miller; E. Szymanek; G. Freisinger; D.L. Goss

Analysis of pelvic and navicular movement during barefoot and shod running
H. Brinkman; A. Cygan; C. Fredericks; R.J. Plemel; E. Thorton; A. Yanchek; J. Rhoades; G. Schindler

The effect of kinesiotape on static foot posture and plantar pressure in individuals with pronated feet: a pilot study
S.K. Holmgren; A.M. Dorri; C.M. Young; T.K. Jain; M.W. Cornwall

Foot strike retraining and functional lower extremity strengthening in runners with anterior and lateral knee pain
L.T. Donlon

Effects of focus of attention instructions on running mechanics and foot strike pattern: immediate and retention effects
K. Varnado; M. Scroggin; J. Irvin; A. Landry; L. Maher; J. Stanich, III; N.G. Moreau

The concurrent validity of two-dimensional video analysis for the characterization of foot strike pattern during running
E.M. Miller; D. Watson; D.L. Goss



*(Continued from page 116)*

pictures-and-press-releases/medicine-occupational. Accessed September 22, 2017.
11. Dictionary of American History. 2003. The Gale Group. http://www.encyclopedia.com/history/dictionaries-thesauruses-pictures-and-press-releases/medicine-occupational. Accessed September 22, 2017.
12. Karwowski W. *International Encyclopedia of Ergonomics and Human Factors*, 2nd ed. Boca Raton, FL: CRC Press; 2006: 1561-1562.
13. Occupational Safety and Health Administration. Medical Screening and Surveillance. https://www.osha.gov/SLTC/medicalsurveillance/surveillance.html. Accessed September 30, 2017.
14. Centers for Disease Control and Prevention: NIOSH. Worker Health Surveillance. https://www.cdc.gov/niosh/topics/surveillance/. Accessed September 22, 2017.
15. Occupational Safety and Health Administration: Safety and Health/Ergonomics/Solutions to Control Hazards. https://www.osha.gov/SLTC/ergonomics/controlhazards.html. Accessed September 20, 2017.
16. Centers for Disease Control and Prevention: NIOSH/Ergonomics and Musculoskeletal Disorders.

# President's Message

*Carolyn McManus, MSPT, MA*

Once again, CSM offered exciting opportunities for physical therapists and physical therapist assistants to connect, share ideas, and learn the latest research, education practices, and treatment strategies for pain. CSM 2018 also brought changes to the PMSIG Board. I want to especially thank outgoing Vice President/Education Chair, Nancy Durban, DPT, MS, for her time, energy, and leadership for the past 3 years. Our new board members are Vice President/Education Chair, Mark Shepherd, DPT, OCS; Public Relations, Chair Derrick Sueki, DPT, PhD, OCS; and Nominating Committee members, Colleen Louw, MSPT, Med; and Brett Neilsen, DPT, OCS. I am continuing to serve as are Research Chair, Dana Dailey, PT, PhD; Practice Chair, Craig Wassinger PT, PhD; Social Media Chair, Tasha Parman, DPT, OCS; and Nominating Committee Chair, Jacob Thorpe, PT, DHS, OCS. In addition, outgoing Nominating Committee Chair, Michelle Finnegan, DPT, OCS, is our Membership Committee Chair, a newly appointed position. We are committed to promoting pain education, treatment, and research by physical therapy professionals and look forward to serving you in the year ahead.

CSM 2018 got off to a tremendous start with a well-attended 2-day preconference course, Keep Calm and Treat Pain: From Research to Clinical Practice, sponsored by the PMSIG, the Orthopaedic Section, and the APTA. Outgoing Vice President/Education Chair, Nancy Durban brought her pioneering vision to a successful outcome. Her tireless efforts to bring together leaders from a wide range of pain-related specialties made for a dynamic, engaging, and informative course. See the photo below for the presenters who shared their expertise on the Science of Pain, Pain Pharmacology, Pain Psychology, Motivational Interviewing, Pain Inventories and Objective Measurement, Mindfulness and Pain Treatment, Mindful Movement, Activity and Exercise, Sleep and Pain, Nutrition and Pain, Clinical Decision Making, and Telerehabilitation. I want to give a big thank you to Nancy Durban for the time and energy she put into this program. Attendees are better-educated and skilled, and countless patients will no-doubt benefit because of her efforts. Thank you, Nancy!

CSM 2018 educational session programming included a wide range of courses addressing pain-related topics. These included the PMSIG session, The Chronic Pain Epidemic: National Research, Education, and Practice Initiatives. This outstanding program brought together Linda Porter, PT, PhD; Kathleen Sluka, PT, PhD, FAPTA; and Kara Gainer, JD, to discuss national initiatives and the key role of physical therapy in addressing the pain/opioid epidemic. Dr. Porter, Director of the Office of Pain Policy at the National Institute of Neurological Disorders and Stroke, discussed the National Pain Strategy and a range of federal initiatives related to pain policy and physical therapy. Dr. Sluka discussed the National Pain Strategy objective to develop a pain education portal that contains a comprehensive array of standardized materials to enhance available curricular and competency tools. In addition, she presented her own pioneering work developing pain education materials for health professionals at the University of Iowa's Center for Excellence in Pain Education. Kara Gainer, JD, Director of Regulatory Affairs at American Physical Therapy Association, discussed specific efforts by the APTA to prevent a new generation of opioid abusers, make nonpharmacological treatments easier to access than opioids and address leading causes of addiction, chronic, and acute pain. Ms. Gainer detailed the steps the APTA is taking to promote public awareness, improve patient access, and increase the understanding of the role of physical therapy in reducing opioid addiction. A lively discussion followed the formal presentation. It was a well-attended, great program! Thank you, Kathleen Sluka for creating this inspiring, thought-provoking session.

I want to thank those members who attended our CSM 2018 membership meeting. The meeting PowerPoint is posted on the PMSIG website. Accomplishments from the past year were highlighted and our strategic plan reviewed. I am delighted to report our membership increased from 482 to 605 since CSM 2017. Craig Wassinger presented on progress by the Education and Orthopaedic Sections to develop clinical practice guidelines for the management and prevention of chronic musculoskeletal pain with education and counseling interventions. PMSIG Board members, Craig Wassinger and Derrick Sueki, along with Joel Bialosky, Scott Euype, and David Morrisette are coordinating and leading this effort. The guidelines will answer the following 4 questions regarding the use of education and counseling in the management of chronic pain:

1. For adults with acute musculoskeletal pain, does patient education and/or counseling reduce the future risk of chronic pain compared with no patient education?
2. In adults with acute musculoskeletal pain what is the effect of patient education and/or counseling on activities of daily living/quality of life compared with no patient education?
3. In adults with chronic musculoskeletal pain, what is the effect of patient education and/or counseling on levels of pain compared with no patient education?
4. In adults with chronic musculoskeletal pain, what is the effect of patient education and/or counseling on the level of function compared with no patient education?

The group is currently completing title and abstract screening of over 10,000 articles and plan full text reviews in spring and manuscript data extraction in the summer. Their timeline includes the writing of the guidelines in late 2018 for potential presentation at CSM, the Orthopaedic Annual Meeting, and the Educational Leadership Conference in 2019. A discussion followed that included topics of how do we best leverage technology to provide online continuing education to our members, the need to define entry level vs advanced practice and develop a Definition of Advanced Specialty Practice for pain.

In addition, PMSIG Board members Craig Wassinger, Mark Shepherd, outgoing VP, Nancy Durban, Orthopaedic Section Liaison, Scott Davis, and I met with Kathleen Sluka, Steve George, Carol Courtney, and Orthopaedic Section President, Steve McDavitt at CSM. We discussed the possibility of alternative models that might allow the PMSIG to have a greater impact across the APTA, including the possibility of collaboration with other Sections who

also have an interest in pain. Steve McDavitt will initiate a discussion with other Section Presidents and APTA leadership to explore possible ways to enhance collaboration across Sections on pain-related issues.

We also discussed the need to review and revise the PMSIG Strategic Plan to broaden the mission and expand the objectives to include an outward or external reach of the PMSIG. The Board will undertake the latter with the goal of completing the Strategic Plan revision at the Orthopaedic Annual Meeting.

The preconference and educational session proposal submission deadline for CSM 2019 has passed; however, the abstract submissions (poster and platform) deadline is June 15, 2018. Visit www.apta.org/CSM/Submissions to submit your abstract for poster or platform presentation. CSM programming offers you a great opportunity to share your expertise with your colleagues, so, if you have ideas and experience that can help us improve our treatment of pain, I hope you will submit a proposal.

In January the PMSIG sent a survey to members requesting their vote on a possible name change of our SIG from Pain Management SIG to Pain SIG. The results were 95.37% in favor, 3.70% opposed and 0.93% had no opinion. The PMSIG Board will develop a motion and a support statement to justify to the Section Board why the Pain Management SIG should be renamed to the Pain SIG. Scott Davis (Board Liaison) will then bring the motion to the Orthopaedic Section Board for a vote.

The Orthopaedic Section has nominated PMSIG Public Relations Chair, Derrick Sueki, to serve on the Joint Commission Technical Advisory Panel developing standards related to pain management in non-hospital settings. The objective of this project is to examine evidence, expert guidelines, and opinions on chronic pain and opioid management and treatment in order to develop requirements for chronic non-cancer pain management in non-hospital organizations. A big thanks to Derrick for contributing his time and expertise and representing the physical therapy profession on this Joint Commission Technical Advisory Panel.

I would like to congratulate PMSIG members Kathleen Sluka, PT, PhD, FAPTA, and Adriaan Louw, PT, PhD, on their upcoming roles as speakers at the International Association for the Study of Pain World Congress on Pain to be held in Boston, MA from September 12 – 16, 2018. Kathleen Sluka will present a plenary lecture at the World Congress on the topic "Does Exercise Increase or Decrease Pain? Underlying Mechanisms and Clinical Implications." Adriaan Louw will present a keynote lecture at a preconference satellite, Pain Mind and Movement: Applying Science to the Clinic, to be held on September 11, 2018. Adriaan's topic is "Pain Neuroscience Education in Clinical Practice: State of the Art and Future Avenues." It is exciting to see PMSIG members sharing their expertise on the international stage. The full programming for the World Congress and Satellite has not been determined at this writing and I am aware of additional PMSIG members who have submitted proposals for presentations and poster abstracts. If you are among those who have submissions and should you be selected, please let me know so I can inform our members in a future President's Message.

If you are interested in additional continuing education opportunities in pain evaluation and treatment, visit the Orthopaedic Section's Read2Learn program at https://www.orthopt.org/content/education/independent-study-courses/read2learn. The Orthopaedic Section compiled Read2Learn CEU exams based on Dr Kathleen Sluka's popular text, *Mechanism and Management of Pain for the Physical Therapist*, 2nd ed (2016). You can read the book or book sections and select the online exam option you would like to take. Disclosure: Dana Dailey is a co-author for one of the chapters.

The PMSIG Board is always open to your ideas on how can we improve the PMSIG to better meet your needs. We welcome your participation in our activities. If you have suggestions, would like to write an article for the PMSIG newsletter in *OPTP*, help with Strategic Plan activities, or contribute a clinical pearl or research topic to our monthly emails, please contact us. Be assured we will take your interest and recommendations into our discussions and activities as we move forward to identify and promote best practice, evidence-based pain treatment. I can be reached at carolyn@carolynmcmanus.com.

**From left to right.**
**Front row: Michelle Finnegan, DPT; Catherine Siengsukon, PT, PhD; Carolyn McManus, MSPT, MA; Kristin Archer, DPT, PhD; Megan Pribyl, MSPT; Janet Bezner, DPT, PHD**
**Back row: Dana Daily, PT, PhD, Stephanie Carter Kelly, PT, PhD; Alexandra Szabova, MD; Nancy Robnett Durban, DPT; Kathleen Sluka, PT, PhD**

## Pain Management Special Interest Group Strategic Plan

### Mission

The Mission of the Pain Management Special Interest Group is to promote excellence in pain education, treatment, and research by physical therapy professionals.

### Vision

The Pain Management SIG will be a leading authority in the role of physical therapy in promoting healing, well-being, and movement by people with pain conditions.

**1. Standards of Practice**

Objective: *Identify and disseminate information on evidence-based practice for pain diagnosis and treatment by physical therapy professionals.*

**Activity**

1. Provide monthly emails to members and website posts on pain-related research and clinical pearl topics.
   **Time Line:** Ongoing
2. Solicit manuscripts on pain-related topics for *OPTP*.
   **Time Line:** Ongoing
3. Involve members in the Orthopaedic Section ICF-based Clinical Practice Guidelines process for pain diagnosis and treatment.
   **Time Line:** Ongoing
4. Add an Education link on the PMSIG web home page linking to a web page that includes recommendations for pain curriculum for DPT programs.
   **Time Line:** Complete by 2/2018
5. Evaluate need for more detailed description of pain curriculum for DPT programs.
   **Time Line:** Complete by 2/2018

**2. Educational/Professional Development**

Objective: *Provide high quality educational content for continuing competence in pain diagnosis and treatment by physical therapy professionals.*

**Activity**

1. Provide education sessions at CSM.
   **Time Line:** Annual activity
2. Develop online pain education programming.
   **Time Line:** Complete by 2/2020
3. Contribute speakers and topics to the AOM programming.
   **Time Line:** When requested
4. Develop online resource database of publically available tools, articles, and book recommendations on pain diagnosis and treatment for physical therapists.
   **Time Line:** Completed by 2/2019

**3. Physician and Additional Health Care Provider Awareness**

Objective: *Increase awareness of physical therapists as experts in the care of people with pain conditions among physician and additional health care provider audiences.*

**Activity**

1. Develop a PowerPoint on the role of physical therapists in the care of patients with pain conditions for health care provider audiences.
   **Time Line:** Completed by 2/2018
2. Have volunteer PMSIG members trained and available to present at physician, other provider, and pain conferences on the role of physical therapy in the treatment of pain.
   **Time Line:** Complete by 9/2018

**4. Public Awareness and Resources**

Objective: *Increase awareness of physical therapists as experts in the care of people with pain conditions.*

**Activity**

1. Serve as a resource to the APTA and Orthopaedic Section on communicating the role of physical therapy in the treatment of pain to the general public.
   **Time Line:** Ongoing

Objective: *Provide pain care resources for the public.*

**Activity**

1. Create a video of a physical therapist explaining pain to be made available at the PMSIG website for viewing by patients and the public.
   **Time Line:** Complete by 2/2019
2. Add a For the Public link on the PMSIG web homepage linking to a web page that will include online and print resources on pain-related topics such as pain science education and how physical therapists treat pain.
   **Time Line:** Complete by 2/2020

**5. Member Engagement**

Objective: *Promote membership and active engagement by members in PMSIG projects and activities.*

**Activity**

1. Include an announcement about the PMSIG in introductory remarks at all Orthopaedic Section CSM and AOM programming that involve the topic of pain.
   **Time Line:** Annual activity
2. Invite members to participate in PMSIG ongoing activities and special projects.
   **Time Line:** Ongoing
3. Establish Facebook and Twitter accounts.
   **Time Line:** Complete by 10/2017
4. Promote PMSIG activities on social media.
   **Time Line:** Ongoing

**6. Expand Access to PMSIG**

Objective: *Broaden access to PMSIG to reach other SIG and Section members*

**Activity**

1. Engage other SIGs and Sections in a discussion and development of a model to (1) access the expertise and interests of members of other SIGS and Sections who share a pain interest and (2) make available our expertise and resources to other SIGs and Sections with members who share a pain interest. This is to include exploring an organizational structure that would enable members of other Sections to be members of the PMSIG.
   **Time Line:** Complete by 2/2020

# Remarkable Developments with AIUM

*Charles Hazle, PT, PhD*

Only a few months ago, all of the official documents of the American Institute for Ultrasound in Medicine (AIUM) effectively excluded physical therapists, citing specifically physicians and chiropractors as the practitioners using diagnostic ultrasound imaging. The new language, adopted in January 2018, is now inclusive of physical therapists. This change resulted from 1½ years of conversation with AIUM by Imaging SIG representatives along with APTA staff. Notably, we began participating in AIUM's educational efforts at their request with two webinars in 2017 by Mohini Rawat (August) and Megan Poll (November) along with Carrie Pagliano.

In 2018, we have 4 webinars with AIUM scheduled. The first on April 19 is by Mohini Rawat presenting "Neuromuscular Ultrasound for Peripheral Nerve Entrapment and Nerve Injuries." This is an expansion of what Mohini covered in August 2017. On June 11, Greg Fritz, one of the first RMSK credentialed physical therapists, is presenting "Musculoskeletal Ultrasound Assessment of Tendinopathy." Two additional webinars with dates pending are Chuck Thigpen presenting on ultrasound assisted examination of the shoulder and Scott Epsley on ultrasound guided dry needling. Please check with the APTA Learning Center (http://learningcenter.apta.org/) or AIUM (http://www.aium.org) for further information. Please note, these events are recorded and available later, if you are unable to attend live.

## Strategizing for Imaging in Physical Therapist Practice

At Combined Sections Meeting in February in New Orleans, the Imaging SIG sponsored programming was entitled, "Referral for Imaging in Physical Therapist Practice: A Pragmatic Vision" and was presented by Scott Rezac, Aaron Keil, Connie Kittleson, and Kip Schick with assistance from APTA staff members, Bill Boissonnault and Angela Shuman. The focus of the session was to inform APTA components of key informational elements to consider when formulating strategies to establish imaging as a part of practice within specific institutions and jurisdictions. Aaron established direct access with imaging privileges for physical therapists at Georgetown University Hospital. Scott has been referring for imaging in Colorado for several years, and Kip and Connie were integral in Wisconsin's recent legislative efforts to specifically designate physical therapists as having referral privileges for radiography. Of great importance, they cited the need to not rush the process, but instead undertake educational initiatives along with informing and building relationships with stakeholders rather than beginning with a legislative initiative. For many states, this is likely to be a multi-year process, perhaps crossing state officer terms, building toward a successful outcome. They unanimously agreed that the educational portion of such a strategy must begin within the physical therapist community and incorporate the technical, procedural, and legal aspects of imaging referral and follow-up subsequent to imaging. The educational process must also include all others with whom physical therapists would interact in referring for imaging. Foremost among these is networking with radiologists, who are often very receptive to communication with physical therapists in the experiences of the panel members. The APTA staff members Bill Boissonnault and Angela Shuman described APTA's current vision and on-going activities toward imaging being eventually incorporated into physical therapist practice on a large scale. Currently, an analysis of state physical therapy and inter-related practice acts is underway to allow for a better understanding of the current legal landscape across the country. Imaging SIG members are encouraged to communicate these perspectives with state chapter leadership to have the best opportunity with success of such local efforts. State leaders are also encouraged to consult with APTA and the Imaging SIG to assist in strategic planning.

## Imaging SIG Scholarship

The inaugural Imaging SIG Scholarship was presented at CSM 2018 to Andrew Sprague for his contribution "Continuous Shear Wave Elastography Quantifies Patellar Tendon Pathology." This scholarship was established with the intent to recognize those investigators contributing particularly noteworthy work with imaging integrated into physical therapist decision-making and patient management. The scholarship is also intended to call attention to imaging as a growing part of physical therapist practice. The selection process will be initiated again once presentations are accepted for CSM 2019. The current scholarship selection committee is Murray Maitland (Chairperson), Byron Smith, Becky Rodda, Meg Sions, Andrew Smith, and Lena Volland. Please see the Imaging SIG's webpages on the Orthopaedic Section's website for further details.

## Nominating Committee

Although early, the Nominating Committee will be preparing for another election process in November. In the coming months, the committee members will be seeking interested individuals for two positions for the Imaging SIG elections: President and Nominating Committee. The Chairperson of the Nominating Committee this year is Paul Beattie with committee members Megan Poll and Mohini Rawat. Each year, a Nominating Committee member is elected for a 3-year term with the final year of that term as Chairperson.

## Strategic Plan Execution

Although the Imaging SIG has been quite busy the last couple of years, the focus in the coming year will be execution of the strategic plan. Several individuals volunteered at CSM to assist in carrying out the plan formulated in 2016. More details on this will be coming later this year. If you are interested in contributing to the efforts on the strategic plan, please contact Chuck Hazle at: crhazl00@uky.edu.

# President's Message

*Matthew Haberl, PT, DPT, OCS, ATC, FAAOMPT*

Spring is finally upon us which is synonymous with new beginnings. For those of you who attended the annual APTA Combined Sections Meeting (CSM) in New Orleans, you know that 2018 will be full of new beginnings in Residency and Fellowship Education. At our meetings in New Orleans, we came in with the expectation that all programs will need to adhere to the new Quality Standards by January 1st, 2019. We are happy to report that after discussion, the American Board of Physical Therapy Residency and Fellowship Education (ABPTRFE) has now extended this until 2020. This extension affects all programs that held accreditation, candidacy status, or were actively undergoing a candidacy review on or before December 31, 2017. We want to thank the board members for listening to the concerns from programs and extending this deadline. We look forward to further discussion and have highlighted some of the meetings from CSM 2018.

## ABPTRFE SIG Leadership Meeting

One of the key positive discussion elements from CSM this year came from the first ever ABPTRFE residency and fellowship leadership meeting held by Kendra Harrington. It was a pleasure to sit at the table with various leaders from the different Sections. We appreciate Kendra's time and efforts in bringing this meeting together to hear the challenges all residency and fellowship programs are having as well as the many advances that have been created in residency and fellowship education. This meeting served as the first of many discussions to come to create a platform for communication between programs and ABPTRFE board members. I look forward to serving our orthopaedic residency and fellowship members alongside Elaine Lonnemann, the AAOMPT President as we will serve as the mediator in bringing information from programs to ABPTRFE.

## ORFSIG CSM Business Meeting

I want to also thank all the members who were able to make it to our annual business meeting. Complete meeting minutes can be found on our website:

- https://www.orthopt.org/content/special-interest-groups/residency-fellowship/communication-whats-happening

## Strategic Planning and Budget

Key highlights from the meeting include developing our new strategic plan and budget. Over the next several months we will be accepting recommendations from members as to how we as a special interest group should move forward. Here are some of the recommended topics:

- Membership Engagement/Recruitment:
  - Orthopaedic Residency/Fellowship Meet and Greet party at other conferences
  - Send representative to National Student Conclave for ABPTRFE Meet and Greet
    - Could include marketing to prospective residents with methods of choosing a program, information on different models for different learners, etc.
  - Swag-pens, notebooks, etc.

- Resources for programs:
  - Content development/resources to new quality standards
  - Mentorship webinars/resources
  - Assistance in developing DFP/DRP
  - Create an independent course/symposia for residency and fellowship education
  - Research development

## Upcoming Meetings

We will be holding more regular webinar meetings to hear your input on strategic planning and the budget. Please make sure to save the date: Wednesday, April 18th at Noon (CST)

More to come on this. Please watch for e-blasts providing details for the meeting.

## Education Academy-RFSIG Updates

Kris Porter and the ORFSIG have been continuing to collaborate with Lisa Black, Jason Zafereo, Christiana Gomez, and Carol Jo Tichenor of the Education Section Residency and Fellowship SIG. We will continue to work on bringing forward some free webinars on mentorship this next year as well as collaboration to continue to create better means of communication across programs and sections. With this we want to thank Lisa Black as she is the outgoing SIG President. Lisa was a key player in developing this SIG and we greatly appreciate the work that she has put in over the past 3 years. Thank you Lisa!

## Clinical Education "Residency Interviews" Task Force

Recently a White Paper was written via a Clinical Education Consortia Task Force regarding some ongoing challenges both clinical sites, clinical instructors, and students were having on their terminal internships as they began to interview for residency positions. This year at the ED-RFSIG meeting Joe Palmer of the Northwest Intermountain Consortia presented some recommendations. This was initially generated from the perspective of ACCEs, DCEs, and CIs. After the ED-RFSIG meeting, an ad-hoc committee was established including ORFSIG member, Kirk Bentzen to provide further program feedback and recommendations. Look for more to come on this.

## Information to Keep You in the Know

Do you feel all residency programs are the same? Are all learners the same? In 2015, the ORFSIG with the assistance of Tom Denninger, Matt Haberl, and Carla Hill set out to identify the commonalities and differences in program make up and focus to assist aspiring residents in choosing a program best suited for them. These results were then presented in Anaheim at CSM by Tom, Kirk Bentzen, Jason Tonley, and John Childs during the course "One Size DOES NOT FIT ALL" exploring the differences in Orthopaedic Residencies. Dr. Denninger has provided an overview of the results below.

# One Size Does Not Fit All- Relevant Comparisons of Orthopaedic Physical Therapy Residency Programs

*Thomas R. Denninger, PT, DPT, OCS, FAAOMPT*
*Regional Director of Clinical Excellence, ATI Physical Therapy, Greenville, SC*
*Thomas.denninger@atipt.com*

## INTRODUCTION

Residency programs in physical therapy are post-professional programs that have been growing in popularity. The American Physical Therapy Association's Best Practices for Physical Therapists Clinical Education Task Force recently recommended the future requirement of a post-professional residency.[1] Programs combine opportunities for ongoing mentorship and course work for advanced practice. Standards are set for programs by the American Board of Physical Therapy Residency and Fellowship Education (ABPTRFE) that are required to be met for accreditation and re-accreditation; however, despite these standards there is a tremendous amount of leeway that exists for programs on the delivery of these standards.[2]

Presently, there are 102 credentialed orthopaedic physical therapy residency programs accredited by ABPTRFE, representing the largest amount of residencies in a given physical therapy discipline. These programs have varied backgrounds and practice settings, with most being able to be classified as occurring in hospital-based programs, hybrid online programs, university-based programs, and private practice-based settings. Categorizing programs as this does allow for a loss of nuance as some programs serve as partnerships between these classifications, for instance a university and private practice partnering.

For prospective residency applicants many factors go into the evaluation of which programs they will apply to. This includes geographic location, program reputation, and board certification pass rate to name a few.[2] One aspect that may be under considered is practice setting due to the implications it may have on several dimensions of the residency experience. The purpose of this paper is to explore and describe relevant differences that exist between orthopaedic physical therapy residencies based upon primary residency setting.

## METHODS

The Orthopaedic Section's Residency and Fellowship Special Interest Group commissioned the development and execution of a 30-item survey to the program directors of existing credentialed orthopaedic residency programs in the fall of 2015 for the purpose of conference programming. Items were determined by an expert panel of residency stake holders in the areas of program design, teaching methods, special opportunities, and salary/tuition. The survey was sent to the 89 existing program directors of orthopaedic residencies in September 2015. The survey was open for data collection for a period of 30 days. After closure of the survey results were analyzed for differences in variables.

## RESULTS

### Survey Responses

Of the 89 surveys sent, there were 54 responses, representing a 61% response rate. All responses were sent by the residency director of the respective programs.

### Program Classification

Programs were asked to classify themselves by program type, selecting one of the following choice, hospital, hybrid, private practice, or university. Twenty-four of the responders classified themselves as hospital-based, representing 44% of the sample. Hybrid accounted for 7 (13%) of the responses, private practice accounted for 9 (17%), and 14 (26%) programs classified themselves as university-based.

## MAIN FINDINGS

### Size and duration

Please see Table 1 for descriptive statistics for the 4 program types. No significant findings were noted due to the large variations in both hybrid and private practice program designs. This finding lends itself to the identification of generally small cohort sizes in hospital and university programs, and wider variability in hybrid and private-based programs. There were no identified differences for the length of programs, with means ranging between 12.0 and 14.2 months.

### Summary of hours

Residencies across classifications scheduled 47 to 50 hours per week. Significant differences did exist in the number of independent clinical hours with hospital-based (31.54 ± 4.89) and university (29.64 ± 7.63) demonstrating fewer clinical hours than hybrid (37.14 ± 3.65) and private (35.22 ± 5.12). That difference in time seemed to be due to differences in didactic hours per week, which were more numerous in university-based programs (6.64 ± 3.65) compared to all others ranging between 4.20 and 4.89, although this difference did not appear to meet significance (Table 2).

### Mentorship experience

There was a no differences in hours of mentorship per week across program types with means ranging between 3.67 and 3.96 hours per week. Trends existed for hybrid programs (1.43 ± 0.79) to have fewer number of clinic sites a resident rotates through (range of others 2.22-2.5). Mentoring in hybrid programs tended to occur less frequently and in longer blocks, leaning toward whole day mentoring every other week or monthly as opposed to approximately 4 hours per week associated with the other program types. There was no difference in the number of different mentors a resident had in a program per program classification, however, there was a trend toward significance with hospital- (3.96 ± 1.57) and university-based (3.71 ± 1.49) programs potentially having more mentors than hybrid (2.57 ± 1.13) or private (2.78 ± 1.72).

**Table 1. Program Size and Duration**

| | Hospital | Hybrid | Private | University |
|---|---|---|---|---|
| Mean (SD) | 2.63(1.44) | 11.29(21.26) | 9(12.20) | 3.14(1.61) |
| Median | 2 | 4 | 4 | 3 |
| Range | 1-6 | 2-60 | 2-40 | 1-7 |
| Abbreviation: SD, standard deviation | | | | |

**Table 2. Description of Weekly Hours**

| | | Hospital | Hybrid | Private | University |
|---|---|---|---|---|---|
| **Total Hours per Week** | Mean (SD) | 47.01(6.23) | 49.29(3.55) | 49.22(5.19) | 50.00(4.95) |
| | Median | 49 | 50 | 50 | 50 |
| | Range | 40-60 | 46-55 | 41-60 | 42-60 |
| **Hours Clinical Care per Week** | Mean (SD)* | 31.54(4.89) | 37.14(3.08) | 35.22(5.12) | 29.64(7.63) |
| | Median | 31 | 37 | 36 | 30 |
| | Range | 29-40 | 32-40 | 25-40 | 20-40 |
| **Hours Didactic per Week** | Mean (SD) | 4.65(2.79) | 4.20(1.05) | 4.89(2.67) | 6.64(3.65) |
| | Median | 4.5 | 3.5 | 4 | 6 |
| | Range | 0.5-12 | 3-10 | 2-10 | 2-12 |
| **Hours Mentoring per Week** | Mean (SD) | 3.95(1.16) | 3.67(3.62) | 3.67(0.87) | 3.96(1.39) |
| | Median | 4 | 2 | 4 | 4 |
| | Range | 3-8 | 1-10 | 2-5 | 2-6 |

Abbreviation: SD, standard deviation

## Modes of didactic learning

Several modes of instruction were consistent among practice settings including onsite lab instruction, onsite didactic presentations, and onsite case presentation. Hospital- (67%) and university-based (79%) settings used journal club formats more commonly than hybrid (43%) or private (44%) settings. As expected, hybrid/distance programs used online didactic (85%) and online case presentations (85%) more commonly than other program types; with ranges of 13% to 44% for online didactic presentations and 13% to 29% for online case presentations.

## Teaching opportunities

Most residencies had opportunities for teaching within their curriculums with consistent responses for continuing education (12-29%), in-house instructing to clinical staff (22-46%), and community teaching opportunities (29-44%). University-based programs uniquely presented to opportunity to teach in entry-level DPT programs, with a mean of 93% of programs having that capability with no other program type having greater than a 30% opportunity for this.

## Scholarly activity

There was no detectable difference in research requirements for completion between program types, however, on average more time was committed to research activities in hospital- and university-based settings. Programs had varied strategies for fulfillment of this requirement (Figure 1).

## Salary and tuition

In examining the salary and tuition factors of programs, 3 patterns emerged. Programs generally fit a classification of reduced salary with no tuition, full salary with no tuition, and full salary with tuition (Figure 2). Trends emerged hybrid and private practice settings tended to pay more with significant reductions for hospital and university. This was however, offset in that the higher salaried settings often had tuition. In all, when combining salary and tuition, hourly wages were not different in programs that had tuition, ranging from $19.89 to $23.08, however in programs that did not have tuition there was wide variance with university based programs tending to pay significantly lower hourly wages ($15.00 ± 3.27) compared to hospital ($20.34 ± 4.73) and private ($22.34 ± 4.24). In all, fewer than anticipated programs had a post-completion commitment (Table 3), with a range of 1 to 2 years with the exception of university-based programs, which did not have commitments, likely accounting for some of the observed decreases in salary.

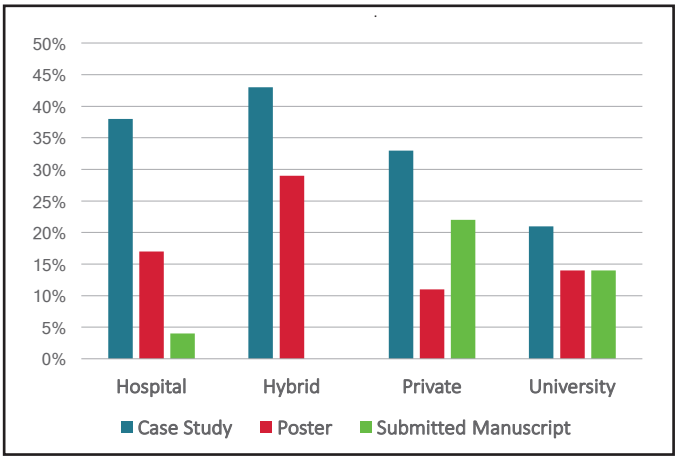



**Figure 1. Description of scholarly activities for completion.**

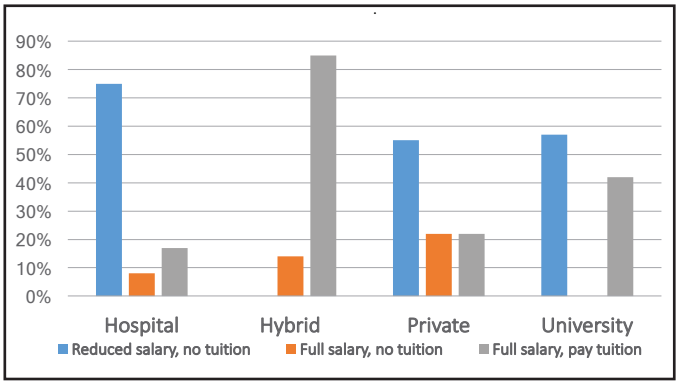



**Figure 2. Description of financial factors by program type.**

**Table 3. Summary of Financial Factors Across Program Types**

| | Hospital | Hybrid | Private | University |
|---|---|---|---|---|
| **Average salary of those with tuition (SD)** | $51,250 (6,291.53) | NA | $60,000 (0) | $49,000 (4.183.30) |
| **Average salary of those without tuition (SD)** | $45,750 (10,166.37) | NA | $55,000 (9,574.27) | $38,125 (7039.43) |
| **Hourly wage of those with tuition (SD)** | $19.89(2.20) | $23.08(0) | $21.15(2.72) | $19.39(3.00) |
| **Hourly wage of those without tuition (SD)** | $20.34(4.73) | $29.26(0) | $22.34(4.24) | $15.00(3.27) |
| **Average cost of tuition if applicable (SD)** | $5,000(2,886.75) | $10,416.67 (3322.90) | $10,000 (3,535.53) | $8,571.43 (4,045.87) |
| **Post residency commitment required** | 8% (2/24) | 28% (2/7) | 22% (2/9) | 0% |
| **Duration of commitment if applicable** | 1.5 years (0.71)<br>Range= 1-2 | 1.5 years (0.71)<br>Range= 1-2 | 2 years (0) | NA |

Abbreviation: SD, standard deviation

## CONCLUSION

Residency education continues to be an expanding option for entry level graduates. The APTA has recently taken the position of exploring the future of a required post-professional residency. This call has been offset by concerns of escalating student debt and time in professional education. Despite this, undeniably the number of orthopaedic residency programs is expanding, as is the pool of residency applicants. The exact outcome associated with programs in terms of patient outcomes and professional trajectory is still uncertain, making vital differences in experience centered factors for programs all the more important.[3]

The findings of this article support the idea that there is variability in programs depending on their practice settings. University- and hospital-based programs appear to have lower hours of independent clinical care that is offset with some increase in didactic activities, including DPT instruction uniquely for university-based programs. Program size and durations are comparable with some variability existing in a handful of larger private practice or hybrid programs. Programs on a whole use similar didactic methods with a logical skew toward online methods for hybrid programs. Mentorship on a whole appears similar in structure throughout program types, with hybrid programs trending for less frequent longer duration mentoring sessions.

To our knowledge, this is the first attempt to describe differences in orthopaedic residency programs based on practice type. The APTA and ABPTRFE conducts yearly data collection of programs but as of yet has not released descriptive statistics in categorizing programs.

There are several limitations to this paper. First, data collection occurred in 2015 and several programs have become accredited since that time. Also, ABPTRFE has released new residency guidelines that may substantially change how programs are meeting requirements. For a survey, there was an acceptable response rate, however, fewer responses in the private and hybrid program designs may have impacted results.

## REFERENCES


1. Best practices for physical therapist clinical education (RC 12-14). Annual report to the 2017 House of Delegates. Paper presented at: APTA House of Delegates; June 21, 2017: Boston, MA.
2. Robertson EK, Tichenor CJ. Postprofessional cartography in physical therapy: charting a pathway for residency and fellowship training. *J Orthop Sports Phys Ther.* 2015;45(2):57-60.
3. Rodeghero J, Wang TC, Flynn T, Cleland JA, Wainner RS, Whitman JW. The impact of physical therapy residency or fellowship education on clinical outcomes for patients with musculoskeletal conditions. *J Orthop Sports Phys Ther.* 2015;45(2):86-96.

# President's Message

*Kirk Peck, PT, PhD, CSCS, CCRT, CERP*

## New Orleans Brings Cajun Fun & 20 Years of Success!

The APTA Combined Sections Meeting in New Orleans this year was a smashing success on many levels. The conference broke another record with over 17,000 in attendance, and the Animal Rehabilitation SIG hit its own major landmark by celebrating a 20-year history. In addition, those who attended the SIG programming were treated to an outstanding presentation by Jeanine Freeberg, PT, DPT, C/NDT, and Amie Lamoreaux Hesbach, PT, DPT, MS, CCRP, CCRT, who addressed treatment options for canine clients with neurologic conditions. The conference room was not only filled to capacity but two additional overflow sections in the hotel were also full. The enthusiasm for animal rehabilitation was clearly present during CSM this year as indicative by a 30-minute Q&A session following the SIG programming.

**Audience attending ARSIG programming at APTA Combined Sections Meeting, New Orleans 2018**

## ARSIG CSM Membership Meeting

This year President Peck updated the membership on several key initiatives the SIG has been focusing on over the past 12 months. During the spring of 2017 the SIG completed data collection from a Practice Analysis Survey tool. Information from the survey is currently being statistically analyzed for the purpose of drafting the first ever description of practice in the United States for the profession of physical therapy in the field of animal rehabilitation.

In addition to the Practice Analysis, a SIG Task Force was organized to develop a new strategic plan to specifically generate 5-year goals for animal rehabilitation. In addition, the SIG also revised its Mission and Vision statements. Below are the 4 primary strategic goals along with brief descriptions:

## Mission

To lead and innovate in the art and science of physical therapy in animal rehabilitation.

## Vision

Serve as the premier resource for excellence in practice, education, research, and advocacy by physical therapists in animal rehabilitation, fitness, and performance.

**Goal A:** EDUCATION: Develop competent physical therapists in animal rehabilitation and provide opportunities for lifelong learning through continuing education.

**Goal B:** POLITICAL ADVOCACY: Influence legislative changes to support the practice of physical therapy in animal rehabilitation in all 50 states.

**Goal C:** EVIDENCE-BASED PRACTICE: Provide evidence to support clinical practice by physical therapists in animal rehabilitation.

**Goal D:** PUBLIC RELATIONS AND MARKETING: Create a brand for physical therapy in animal rehabilitation and disseminate through multiple sources (ie, webpage, social media, printable brochures, published materials).

The SIG officers are seeking volunteers to help accomplish the goals and objectives that are outlined in greater detail in the full strategic planning document. Please contact Kirk Peck (President) or Stevan Allen (Vice President) if you are interested in becoming actively engaged with any new and exciting ARSIG strategic initiative.

## PART III: No Laws - No Regulations - No Historical Precedence - Now What?

In this educational installment of animal rehabilitation, I am going to address an important topic that continues to surface from many personal communications. In fact, this particular topic is one of the top priorities that needs to be addressed by physical therapists in most all states before the practice of animal rehabilitation by physical therapists can legitimately progress in this country. The issue of concern relates directly to state practice laws.

One of the most frequent questions I entertain as SIG President is the following, *"Can I treat animals in my state even though no language to support such practice exists in either the Physical Therapy or Veterinary Practice Acts?"* The simple answer to this question is, *"It all depends on how your state Physical Therapy Licensure Board, Department of Health, and/or possibly the Attorney General interpret questions related to PT scope of practice when statutory and regulatory language does not exist."*

Essentially, all 50 states have different legal language pertaining to physical therapy and veterinary scope of practice, and therefore I must refer state jurisdictional questions to appropriate professional licensing and regulatory boards, or state health departments. Keep in mind that even if language is codified and easy to locate online, it may not always provide the complete story on how things truly function in real life situations. Sometimes there are legal loopholes, unpublished legal interpretations of various laws, and even legal precedence established by prior judicial resolutions that are difficult to locate using open-access web-based searches. This is why it is essential for every physical therapist to review his or her own state laws and contact appropriate personnel who specifically serve to interpret scope of practice laws and regulations.

The key point I am trying to make here is that scope of practice laws do matter, and therefore physical therapists who wish to treat animals as part of practice need to do so within legal parameters. If laws are not currently adequate to address physical therapist scope of practice on animals, then personal action must be taken to invoke change. Colleagues, it sincerely is up to you to make a difference…it is time to engage in political advocacy!

**Contributory Acknowledgment**

In this edition of *OPTP,* Cynthia Kolb, PT, tDPT, CCRT, and William Kolb, PT, DPT, OCS, FAAOMPT, provide an excellent review of using dry needling as an intervention in the canine population. Dry needling has become a popular modality in human physical therapy practice and is now a treatment tool to consider for use in animal rehabilitation as well although future studies are still very much warranted.

***Red Ruffed Lemur from Madagascar***
***Just "chilling" - Ah, what a life!!***

**Photo Courtesy of Kirk Peck,**
**Henry Doorly Zoo & Aquarium, Omaha, NE**

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

# Myofascial Trigger Point Dry Needling – An Effective Treatment Approach for Animal Rehabilitation

*Cynthia Kolb, PT, tDPT, CCRT*
*William Kolb, PT, DPT, OCS, FAAOMPT*

Trigger point dry needling (TDN) is a method used to treat myofascial pain syndrome in humans as well as animals. In this article the model of assessment and treatment of MTrPs in humans is reviewed as a foundation for comparison to the animal model. In humans, myofascial pain syndrome can be a painful and limiting condition that is associated with myofascial trigger points (MTrPs) within bands of skeletal muscles. These trigger points are palpable, hyperirritable spots that when compressed can cause local or referred pain, motor dysfunction, and a possible autonomic phenomena.[1] Myofascial trigger points can contribute to impaired and limited range of motion of a muscle or joint, increased sensitivity to a stretch, weakness and painful contractions. Research indicates that active MTrPs have a lower pH as compared to non-pathological muscle fibers, decreased oxygen levels, increased amounts of nociceptive agents, and a greater concentration of inflammation mediators.[2]

Dry needling (DN) is a procedure in which a thin, solid filiform acupuncture-like needle is inserted into the palpable taut bands of an MTrP and manipulated with the goal being to inactivate the trigger point. In humans, a localized twitch response (LTR) often occurs that may elicit an analgesic effect by interrupting the motor end-plate noise.[3,4] When numerous LTRs are elicited, DN should continue until the frequency or eradication of the LTRs are noted, followed by palpation of the area and reassessment.[5]

Research continues to support the effectiveness of DN in humans as summarized by several recent meta-analysis stating: low to moderate quality evidence exists that DN is more effective than no intervention, sham, or placebo, especially in the short term for the outcome of pain and range of motion.[6-8] All 3 of these systematic reviews used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and PEDRO scoring method to filter only high quality studies. In addition, Gattie and colleagues[6] reported low to moderate evidence for improvements with the use of DN for pain pressure threshold in the short term and low quality evidence for improvements with function when compared to no treatment, or sham, but inferiority when compared to other physical therapy treatments. Espejo-Antúnez and colleagues[7] reported DN also improved quality of life in the short term versus no intervention/sham or placebo. The review of Boyles et al[8] stated that, "for outcome measures related to pain reduction, DN is more effective than stretching and percutaneous electric nerve stimulation and at least equally as clinically effective as manual MTrP release and other needling treatments." In conclusion, more research is needed and future studies need to establish standardized protocols, replicate current studies, and examine functional improvement in order to substantiate current trends with the use of TDN in the human population.

In the canine practice model, MTrP evaluation is exclusive of subjective pain reports, thus requiring increased palpation skill of the examiner and the ability to notice improvements in functional movement using the test, treat, re-test model. Confirmation of canine MTrPs meet the following criteria: location of a taunt band within a muscle and a resultant jump sign observed as vocalization, or withdrawal as increased pressure is applied.[9] Dr. Rick Wall, DVM[9] states "in dogs, muscles make up 44% to 57% of total body weight and can serve as a source of both pain and dysfunction when myofascial trigger points are present. However, rarely is muscle mentioned as a generator of pain in dogs, and even less mentioned is muscle dysfunction." He goes on to state that examination of muscles for myalgia is not part of the standard physical, orthopedic, or neurological examination in veterinary medicine.

Prior pragmatic research confirms the concept that myofascial trigger points in canines effectively respond to a manual therapy model similar to that used in humans. A case series completed in 1991 demonstrates successful treatment of MTrPs in 48 dogs with either dry needling or lidocaine injections (for non-calm dogs) of palpable trigger points.[10] Evaluation of MTrPs in lame dogs was via direct palpation of a taut muscle band, a resultant jump sign, and limited range of motion. Results were confirmed by disappearance of the trigger point and cessation of the lameness. More recently a repeated measures crossover design study where the intervention was blinded to owners demonstrated effectiveness for either manual therapy or acupuncture like needling of MTrPs.[11] In this study, effectiveness was seen when the canine owner noticed changes in play behavior (eg, walking, jumping, descending stairs

and rising from a lying position) which is potentially more meaningful as this outcome replicates actual practice.

Before performing myofascial TDN in a human patient, the therapist must follow protocol and discuss the benefits and effects of DN with a patient. In regards to animals, this conversation is held with the client who deems whether this technique would be tolerated in the patient. As animal rehabilitation therapists, we must take the knowledge that we have gained in working with our human population, employ this to research and validate the most effective and evidence-based treatment program for our patients in order to meet their needs and improve their quality of life. As we develop a research agenda for MTrPs in animals, we have a great opportunity to focus on linking results to functional improvements with use of a test-treat and then re-test model. The need for future research in the area of animal rehabilitation cannot be stressed enough.

**Tess is a 5-year-old Great Dane, demonstrating tolerance and improved symptomatic relief from myofascial trigger point dry needling for her left hind limb lameness issue.**

## REFERENCES


1. Simons D, Travell J, Simons L. *Travell & Simon's Myofascial Pain and Dysfunction: The Trigger Point Manual, Volume 1: Upper Half of Body*. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 1998.
2. Shah J, Danoff J, Desai M, et al. Biochemicals associated with pain and inflammation are elevated in sites near to and remote from active myofascial trigger points. *Arch Phys Med Rehabil*. 2008;89(1):16-23.
3. Dommerholt J. Dry needling in orthopedic physical therapy practice. *Ortho Phys Ther Pract*. 2004;16(3):15-20.
4. Dommerholt J, Fernandez-de-las-Penas C. *Trigger Point Dry Needling. An Evidence and Clinical-Based Approach*. New York, NY: Churchill Livingstone Elsevier; 2013.
5. American Physical Therapy Association. Description of Dry Needling in Clinical Practice: An Educational Resource Paper. http://www.apta.org/StateIssues/DryNeedling/ClinicalPracticeResourcePaper/. Accessed March 6, 2018.
6. Gattie E, Cleland JA, Snodgrass S. The effectiveness of trigger point dry needling for musculoskeletal conditions by physical therapists: a systematic review and meta-analysis. *J Orthop Sports Phys Ther*. 2017;47(3):133-149.
7. Espejo-Antúnez L, Tejeda JF, Albornoz-Cabello M, et al. Dry needling in the management of myofascial trigger points: A systematic review of randomized controlled trials. *Complement Ther Med*. 2017;33:46-57.
8. Boyles R, Fowler R, Ramsey D, Burrows E. Effectiveness of trigger point dry needling for multiple body regions: a systematic review. *J Man Manip Ther*. 2015;23(5):276-293.
9. Wall R. Introduction to myofascial trigger points in dogs. *Top Companion Anim Med*. 2014;29(2):43-48.
10. Janssens L. Trigger points in 48 dogs with myofascial pain syndromes. *Vet Sur*. 1991;20(4):274-278.
11. Lane D, Hill S. Effectiveness of combined acupuncture and manual therapy relative to no treatment for canine musculoskeletal pain. *Can Vet J*. 2016;57(4):407-414.

# Index to Advertisers


AAOMPT..... C3
Ph: 225/360-3124
Fax: 225/408-4422
www.aaompt.org

Align Conference .....68
www.alignconference.com

Barral Institute.....91
Ph: 866/522-7725
www.Barralinstitute.com

Canine Rehab Institute ..... 133
www.caninerehabinstitute.com

D'Ambrogio Institute.....91
Ph: 800/311-9204
www.DAmbrogioInstitute.com

Evidence in Motion..... C2
Ph: 888/709-7096
www.EvidenceInMotion.com

Joint Active Systems .....81
Ph: 800/879-0117
info@jointactivesystems.com
www.jointactivesystems.com

MEDICORDZ ..... 105
Ph: 800/866-6621
www.medicordz.com

Motivations, Inc..... 105
Ph: 800/791-0262
www.motivationsceu.com

OPTP.....75
Ph: 800/367-7393
Fax: 763/553-9355
www.optp.com

Phoenix Core Solutions/Phoenix Publishing..... 107
Ph: 800/549-8371
www.phoenixcore.com

PrePak Products.....67
Ph: 800/544-7257 x287

Serola Biomechanics ..... C4
Ph: 815/636-2780
Fax: 815/636-2781
www.Serola.net

Tekscan.....81
www.tekscan.com/strideway

VHI .....73
Ph: 800/356-0709
www.vhikits.com/apta

**Orthopaedic Physical Therapy Practice**
2920 East Avenue South, Suite 200
La Crosse, WI 54601

ORTHOPAEDIC SECTION