GeriNotes

Academy of Geriatric Physical Therapy

This Issue

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TABLE OF CONTENTS

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

IN HONOR/MEMORIAM FUND

Each of us, as we pass through life, is supported, assisted and nurtured by others. There is no better way to make a lasting tribute to these individuals than by making a memorial or honorary contribution in the individual's name. The Academy of Geriatric Physical Therapy has established such a fund which supports geriatric research. Send contributions to:

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Also, when sending a contribution, please include the individual's name and any other person you would like notified about your contribution. If you are honoring someone, a letter will be sent to that person, and if you are memorializing someone, the surviving family will be notified of your contribution.

In the field of geriatric physical therapy, we receive many rewards from our patients, associates, and our mentors. A commemorative gift to the Academy of Geriatric Physical Therapy In Honor/Memoriam Fund is a wonderful expressive memorial.

President's Message

William H. Staples, PT, DHSc, DPT
Board Certified Geriatric Clinical Specialist (GCS)
Certified Exercise Expert for Aging Adults (CEEAA)

The prevalence of hypertension (HTN) increases with age and a third of adults in the United States have HTN.[1] So, what should be the target range for blood pressure (BP) for our older patients?

I recently participated in a discussion about this question with some of my home health colleagues where I work. We discussed when we should contact the physician about BP readings, and if nurse practitioners should recommend adding or subtracting medications. There is national concern that only half of all patients with hypertension in the United States have achieved adequate BP control of <140 mm Hg.[1] However, being on BP medication raises the risk of a serious fall.[2] This does not mean patients should not take medication for high BP. But it does mean that health professionals should be thoughtful about weighing the benefits and the risks for harm.

In my experience, primary care physicians and nurse practitioners tend to not yet think of the fall risk associated with BP medications in aging adults. Older adults who have had a previous serious fall are at an extra high fall risk because one of the biggest predictors of a fall is a previous fall.[2] Health professionals should be conscientious about safe BP ranges and indications for BP-lowering medications, especially in patients with a history or risk of falling.

Systolic BP guidelines for treatment of older adults with HTN continue to be updated as new findings are published. This can give the appearance of controversy. In 2016, the National Heart Foundation of Australia (NHFA) guidelines were updated from 2008 and 2010, respectively. The Canadian Hypertension Education Program (CHEP) guidelines are annually updated. Both the 2016 NHFA and CHEP guidelines recommend that BP treatment ranges should be based on absolute cardiovascular disease risk and/or evidence of end-organ damage risk: < 140 mm Hg for low risk, < 120 mm Hg for high risk.[3,4] The 2017 American College of Physicians/ American Academy of Family Physicians guidelines for pharmacologic treatment of hypertension in older adults recommend a goal of systolic BP <140 mmHg in adults 60 years of age to reduce stroke risk or cardiac events.[5]

If you are wondering about how you would answer the above question, consider referencing recent published studies on the Systolic Blood Pressure Interventions Trials (abbreviated as "SPRINT"). A summary of frequently asked questions can be found at the following NIH website: https://www.nhlbi.nih.gov/news/spotlight/fact-sheet/systolic-blood-pressure-intervention-trial-sprint-overview.[6] Briefly, a meta-analysis of over 10,000 hypertensive adults 65 years or older combined results from the older subgroup in the SPRINT trial with 3 other large randomized trials evaluating goal BP. At 3-year follow-up, analysis of standard intensive BP-lowering efforts (maintaining systolic BP <150 mmHg) vs higher intensity systolic BP-lowering efforts (maintaining systolic BP <140 mm Hg) found that older adults with lower systolic BPs had reduced rates of major adverse cardiovascular events, cardiovascular mortality, and heart failure, but some participants had an increased risk of renal failure.[7] In the SPRINT population of non-diabetic individuals age 50 years and older, the benefits of intensive drug treatment to achieve the BP goal of <120 mm Hg appeared to exceed the potential for harm, regardless of gender, race/ethnicity, or age.

In summary, there is controversy about how best to treat HTN. In general, the greatest benefit from treating high BP in older adults comes from getting a systolic BP from 170 or higher down to a range of 140-150 mm Hg.[7] Further reductions in systolic BP should include consideration of fall risk and kidney damage over therapeutic benefits of reducing stroke and major adverse cardiac risks. Research efforts are underway to determine primary and secondary impacts of specific targets for lowering HTN, such as heart attack, non-myocardial infarction acute coronary syndrome, heart failure, cardiovascular death, stroke, all-cause mortality, decline in kidney function or development of end-stage renal disease, incident dementia, decline in cognitive function, and small-vessel cerebral ischemic disease.[7]

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Guest Editor's Message

Lise McCarthy, PT, DPT, GCS

Hello!

I would like to introduce this year's *GeriNotes* focus issue by sharing with you one of my favorite quotes, a summary about this issue, and a secret.

First, the quote: "Adopt the pace of nature: her secret is patience." (Ralph Waldo Emerson).

For me, this quote represents the organic process of producing this year's *GeriNotes* focus issue. The theme is: Orthopedic Issues in Aging – considerations of new practice models and care management approaches for complex patient populations. The seeds for this issue were generated and planted back in 2015 as a result of discussions with multiple thought leaders involved in the Cognitive and Mental Health SIG and the Balance and Falls SIG. Practice concerns were identified and ideas were shared for future collaboration.[1] Specifically, there was a strong desire to develop educational projects that could help clinicians improve their care management of complex patients with orthopedic issues and high fall risk co-morbidities (eg, acquired and developmental cognitive and physical disabilities).

For this year's *GeriNotes* focus issue, 8 clinicians, academicians, and researchers were invited to write 6 articles. They were chosen because they have expertise (read their bios) and/or presented well-received clinical lectures at national conferences (ie, CSM and NEXT) over the past two years. Collectively, their participation in published writing projects has varied from "novice" to "significantly experienced," which was similar to the writers who participated in last year's focus issue about Cognitive Issues in Aging. The 2017 *GeriNotes* Author Group has written articles that help answer these questions:

1. How can we improve physical therapy care management practice models for complex patients with orthopedic conditions (eg, post-hip surgery, spinal deformities)?
2. How can we better address the impact of cognitive comorbidities (eg, dementia, delirium) to improve orthopedic recovery?
3. How can we assess fall risk and reduce the prevalence of fall-related orthopaedic injuries (eg, fractures) in people with learning and developmental disabilities?

To start, the 3-part article series by Drs. Mindy Renfro, Joyce Maring, Leigh Hale, and Donna Bainbridge answers the U.S. Surgeon General's call to improve the health and wellness of persons with intellectual developmental disabilities (IDD). As you read their articles, hear them loudly voice their expert opinions about the urgent need for our profession to focus attention on developing physical therapy practice models for reducing the very high fall risk and fall-related fractures in people with IDD. One important orthopedic consideration from Part I is that falls and fractures are common occurrences but very little has been written about how our profession can help adults with IDD reduce these health risks. In Part II, modifiable and non-modifiable risk factors are discussed. Seventeen—Yes, 17!—screening tools are described to help us wisely choose evidence-based care management assessment tools and approaches for identifying and reducing fall risk in people with IDD. Part III is a strong finish to this 3-part series. Rich details about numerous evidence-based fall prevention programs are presented along with resources where you can go to find more information. After reading these 3 articles, you will have a solid foundation for applying your newly gained knowledge to your practice setting. These pioneering women have cleared an impressive path for the rest of us to follow their lead, now in our own ways.

As a Geriatric Clinical Specialist, Jennifer Howanitz has written an article about neurocognitive engagement therapy (NET). She is the regional director spear-heading this program in the northeastern United States. Her article is a fascinating read and so timely. She presents a clinical assessment and treatment path for all clinicians to consider when working with people with neurocognitive impairment. She shows us by example how to use the NET practice model to manage the care of a woman who is recovering from postoperative hip surgery and who also has dementia. If you have not worked with this type of patient, you soon will because in 2020 the largest number of Baby Boomers will turn 65, and the oldest of the old (people 85 years and older) will reach 7 million in the United States.[2] Reportedly, upwards of 5.8 million people living in the United States will have Alzheimer's dementia in 2020.[3] If you want to implement NET into your practice setting, the figures and tables she includes are portable guides to help you.

Dr. Stanley's article discusses how we can address postoperative delirium in older people in the hospital. One key point she makes early on in her article is that cognitive dysfunction is the most common co-morbidity in hospitalized patients with orthopaedic conditions. She describes a particular kind of cognitive dysfunction called postoperative cognitive dysfunction (POCD). As you learn about the importance of physical therapy assessment of physical and cognitive function of people with POCD consider how you might enhance your practice by incorporating her care management intervention recommendations. If you are interested in research, perhaps you will consider Dr. Stanley's call for more outcome and retrospective studies of this complex patient population. If you want to learn how to use the Cognitive Assessment Measure for delirium in the hospital setting, consider reviewing the 2016 *GeriNotes* November focus issue: https://geriatricspt.org/members/publications/gerinotes/index.cfm.[4]

The last article, another strong finish, is about adult spinal deformity (ASD). Drs. Kelly Grimes and Clare Frank describe a movement system diagnostic approach for physical therapy nonoperative assessment and care management of older people with spinal deformities. These authors outline key factors of ASD assessment providing us with details of an objective examination that includes alignment and muscle analysis; single leg stance tests; functional tests; trunk movements; breathing patterns and intra-abdominal pressure regulation; joint, muscle, and movement pattern tests; scoliosis specific measures; and radiographical assessment. Care management approaches are discussed and include interventions focused on the Schroth principal of auto-elongation in all 3 cardinal planes, the Scientific Exercise Approach to Scoliosis, Physiotherapeutic Scoliosis-specific Exercise, and Vojta Therapy and Dynamic Neuromuscular Stabilization. Careful readers will come away with a good clinical grasp of how physical therapists can diagnosis, examine, and treat their patients with ASD.

Now for my secret: I have over 17 years of clinical experience, but my published writing and editing experience falls solidly in the "novice to very limited experience" category. The *GeriNotes* projects I have participated in over the last several years have helped me expand my critical thinking and writing skills. I am a happier person because these writing projects help me creatively contribute as a professional, and writing makes me feel intellectually and emotionally connected to a larger, national and international group of professional people who share the same vision for the growth of our profession as I do.

As a Guest Editor and past contributor to *GeriNotes*, I hope to inspire and encourage you to share your writing with others by publishing your written work, even if you think you are a novice or inexperienced writer like me. We are all pioneers in our own life story. We all have good ideas and experiences that can have a significant impact on others and on our profession, but only if we share them. For me, there was something very exciting and hopeful about the idea of participating in my first published writing project. My feelings about the writing-to-publish process have not changed, and this process of creating, crafting, and collaborating on a clinically-focused article continues to be a very satisfying experience for me. Maybe you share these same hopes and feelings.

If you are interested in participating in a writing-to-publish project and want more support developing the concept or content of your written work, talk with your mentors and colleagues. If you want to write an article for a clinical magazine, such as *GeriNotes*, first take a look at the author guidelines and submission deadlines; they are typically listed within the magazine. If you need a little more encouragement to try your hand at writing and to professionally share your written work, please look at Table 1 and read the quotes from this year's *GeriNotes* Author Group about their experiences.

In closing, here is an extensive list of the many thoughtful and generous people who shared their ideas, written work, and/or time to help make this *GeriNotes* issue a good harvest:

- The Planters (a.k.a. the thought leaders in 2015): Jan Bays, Alisa Curry, Mary Gannotti, Jill Heitzman, Joyce Maring, Lise McCarthy, Jen Nash, Margo Orlin, Mindy Renfro, Christy Ross, Michele Stanley, and Mike Studer.
- The Farmers (a.k.a. the authors): Donna Bainbridge, Clare Frank, Kelly Grimes, Leigh Hale, Jennifer Howanitz, Joyce Maring, Mindy Renfro, and Michele Stanley.
- The Pruners (a.k.a. the editors and publisher): Jennifer Bottomley, Karen Curran, Meri Goehring, Jill Heitzman, Sharon Klinski, Lise McCarthy, and Ken Miller.

A special thanks to the Editorial Board (especially Meri Goehring, Jill Heitzman, and Bill Staples) for their fellowship and for the opportunity to share these wonderfully written works with you.

I enthusiastically pass the Editor's hat to my colleague, Michele Stanley, our next *GeriNotes* Editor! She will publish her Editor's Message in the 2018 January *GeriNotes* issue.

To all of you: Happy Reading!

And to those of you who choose to meet the writing-to-publish challenge: Happy Writing!

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Lise McCarthy has a private gerogeriatric (population age 80+ years) practice in San Francisco, CA. She is an Assistant Clinical Professor, Volunteer, at the University of California at San Francisco. She is the founding Chair of the Cognitive and Mental Health Special Interest Group of the Academy of Geriatric Physical Therapy.

Table 1. Quotes Shared by the *GeriNotes* Author Group About Their Writing Experience

"I have only had one item published and it was 20 years ago, so it has been awhile. I would consider my experience to be at the novice level. My participation has been great. Your reminders and guidance have allowed me to be successful in preparing the article." *~Jennifer Howanitz*
I have considerable experience participating in and publishing writing projects in both peer and non-peer reviewed forums (articles, news articles, and book chapters). Participating in this project has been great! My coauthors and I are passionate about improving services to this underserved population group and it was a pleasure to work with them in an effort to advance practice in this area. We really appreciated the invitation to expand the audience. We found *GeriNote's* editors/reviewers to be very responsive and helpful throughout the process! *~Joyce Maring*
"I have had significant experience over the years with publishing. I have published requested articles like this *GeriNotes* sequence, as well as chapters in books. And I have submitted and published peer-reviewed articles based on research in which I have been involved. This has been a wonderful process. The group with whom I worked, both the authors and the *GeriNotes* principals, have been very enthusiastic and supportive. *GeriNotes* has been very timely with responses to questions, and very helpful throughout the process. Thanks for the great experience!" *~Donna Bainbridge.*
"I have limited practice with pubs...with these, I am still under 10 total. I find that working with an experienced team makes all the difference! This was a bit pressured simply because of the assigned timeline. Usually, you just look for due dates and select the best one for you. However, with a good team, it was far less daunting. I strongly encourage novice authors to find a well-published partner/mentor for the first few attempts." *~Mindy Renfro*
"I have little publishing background. My colleagues and I at Columbia have just submitted a book chapter for what will become an electronic access book on Spine Deformity and Postural Disorders. Clare has done more publishing and so it was most helpful to collaborate with her on this project and have her guidance/mentorship along the way. I felt honored to be asked to participate in this year's *GeriNotes* Author Group. It was a challenge to synthesize and articulate the content we presented at CSM into written form, but a valuable experience. This is a great group to be part of. I've been a Geriatrics Section member for several years now and have benefitted from *GeriNotes* so felt fortunate to be able to contribute." *~Kelly Grimes*
We were both very honored by this opportunity. Thank you. I have been involved with publishing a few articles and was a co-author of a book on Muscle Imbalances. I will echo Kelly's comments - it's always a challenge to synthesize and articulate content into a written form." *~Clare Frank*
"Most of my writing projects have been as an editor of church and PTA newsletters, writing for the CVP newsletter and *GeriNotes*, and editing Emergency Medical Services/EMT publications and webpages. I am excited and honored to be the next Editor of *GeriNotes*." *~Michele Stanley*

Orthopedic Issues in Aging: A Continuing Education Module for the Academy of Geriatric Physical Therapy

MODULE CHAPTERS

1. Addressing the Issue of Fall Risk for Adults with Intellectual Developmental Disabilities
   Part I: A Call to Physical Therapists to Improve Access to Physical Therapy
2. Addressing the Issue of Fall Risk for Adults with Intellectual Developmental Disabilities
   Part II: Selecting and Analyzing Fall Measures for Adults with Intellectual Developmental Disabilities
3. Addressing the Issue of Fall Risk for Adults with Intellectual Developmental Disabilities
   Part III: Creating Solutions with Community Fall Prevention and Inclusive Recreation Programs for Adults with Intellectual Developmental Disabilities
4. Initial description of a Rehabilitation Care Model for Patients with Neurocognitive Impairment and Orthopaedic Injury
5. Orthopaedic Surgery: A Cognitive Health Challenge
6. Considerations in Working with the Older Adult with Spine Deformity

AUTHORS

1. Joyce Maring, PT, DPT, EdD
2. Leigh Hale, PT, PhD
3. Mindy Renfro, PT, PhD, DPT
4. Donna Bainbridge, PT, EdD
5. Jennifer Howanitz, BS, MPT, GCS
6. Michele Stanley, PT, DPT
7. Kelly Grimes, DPT, GCS, OCS, FAAOMPT
8. Clare Frank, DPT, MS, OCS, FAAOMPT

REFERENCE LIST

References can be found at the end of each chapter in the module.

OBJECTIVES

1. Understand the risks and consequences of falls for older people with intellectual and/or developmental disabilities (IDD).
2. Discuss the needs of older adults with IDD with high fall risk for physical therapy and fall prevention programs.
3. Justify fall risk screening assessment tools that are appropriate to administer to older persons with IDD.
4. Outline a proactive approach to screen, assess, and prescribe individualized and targeted community-based intervention programs for people with IDD.
5. Describe the principles of neurocognitive engagement theory (NET).
6. Construct a NET care plan for a patient with dementia who is also recovering from hip surgery.
7. Explain postoperative cognitive dysfunction (POCD) and state how POCD it can be managed by physical therapists.
8. Study key elements of an examination of a person with adult spinal deformity (ASD).
9. Construct an ASD care plan approach.

TARGET AUDIENCE

Physical Therapists and Physical Therapist Assistants

CONTACT HOURS/CONTINUING EDUCATION UNITS

Completion of the CE Module is equivalent to 4 contact hours. This converts to .4 Continuing Education Units.

CONTINUING EDUCATION CERTIFICATE OF COMPLETION

A Continuing Education certificate will be provided to each participant after successful completion of the course requirements (post-test and module evaluation) and payment of a processing fee. The Academy of Geriatric Physical Therapy is a recognized component of the American Physical Therapy Association. The Academy has not applied to any state licensure agency for prior approval of this course. The module has all the components (content, objectives, qualified instructors, reference lists, and post-test) that will allow participants to submit the certificate of completion to meet CE requirements in some states. Participants are urged to check with their State Licensure Board to see if this course counts towards continuing education credit.

HOW TO OBTAIN CEUs

To obtain CEUs for this continuing education unit, participants must complete the ONLINE post-test as well as the ONLINE evaluation form. Go to http://geriatricspt.org/exams/

A processing fee of $40.00 for Academy of Geriatric Physical Therapy members and $80.00 for non-members is required. Read the module and complete the post-test and the evaluation online and provide payment online. **Test and evaluation forms must be completed online no later than December 31, 2018.** Upon submission of materials and a passing score of 80% or higher on the post-test, the Academy will email you a continuing education certificate for .4 CEUs. Those with incomplete submissions will be notified via email and given the opportunity to re-take the exam. There is only ONE correct answer for each question. NOTE: This is to be performed ONLINE ONLY at http://geriatricspt.org/exams/

Addressing the Issue of Fall Risk for All Adults with Intellectual Developmental Disabilities

Part I: A Call to Physical Therapists to Improve Access to Physical Therapy

Mindy Renfro, PT, PhD, DPT; Donna Bainbridge, PT, EdD; Leigh Hale, PT, PhD; Joyce Maring, PT, DPT, EdD

BACKGROUND

In 2015, a group of concerned physical therapists came together to address the issue of lack of access to physical therapy (PT) for the growing population of adults living with intellectual developmental disabilities (IDD). It was understood that children with IDD are generally well-served by school-based pediatric physical therapists but tend to "fall off the radar" during transition to and during their need for adult care. Realizing that adults with IDD experience a much higher fall rate than their non-cognitively impaired peers further increases their need for PT and prescribed physical activity.

Recognizing that this is not an issue known to many physical therapists, the group decided to "spread the word." First steps were combining the efforts of the Pediatric and Geriatric Sections of the APTA and to present baseline education at CSM 2017. This 3-part publication is step 2. Sharing of this publication and information in your community will become critical step 3. Thank you.

INTRODUCTION TO THE SERIES

Addressing the Issue of Fall Risk for Adults with Intellectual Developmental Disabilities will include:

Part I: *A Call to Physical Therapists to Improve Access to Physical Therapy*: Overview of the epidemiology and current state of care of this marginalized population and approach to caring for adults with IDD in Physical Therapy.

Part II: *Selecting and Analyzing Fall Measures for Adults with Intellectual Developmental Disabilities*: Update on the best fall risk assessment and outcome tools currently validated for adults with IDD.

Part III: *Creating Solutions with Community Fall Prevention and Inclusive Recreation Programs for Adults with Intellectual Developmental Disabilities*: Review of the evidence-based fall prevention (EBFP) and inclusive community recreation (ICR) programs currently in use with adults with IDD will provide a forecast of future needs in the role of physical therapy.

ABOUT IDD

Definitions

Intellectual developmental disabilities (IDD) is defined by the Developmental Disabilities & Bill of Rights Act of 2000 (DD Act, Public Law 106-402)[1] to mean a severe, chronic disability that occurs before an individual is 22 years old that is likely to continue indefinitely, and results in substantial functional limitations in 3 or more of the following areas of major life activity: self-care, receptive and expressive language, learning, mobility, self-direction, capacity for independent living, and/or economic self-sufficiency. These impairments require the individual to sustain lifelong or extended support or assistance. Diagnosed conditions may include, but are not limited to, autism spectrum disorders (ASD); Down's syndrome; cerebral palsy; spina bifida; toxic, traumatic, and genetic disorders. Traumatic brain injuries occurring before age 21 and fitting the criteria above are included within this group of diagnoses. The National Association of Councils on Developmental Disabilities estimates that over 5 million Americans have a developmental disability.[2]

Epidemiology and Etiology of IDD

According to the Center for Disease Control (CDC), developmental disabilities (DDs) are common, about 1 in 6 children, in the United States had a developmental disability in 2006 to 2008 and the prevalence had increased to 17.1% - about 1.8 million children.[3] Compared to a decade earlier, prevalence of autism increased 289.5%, prevalence of attention-deficit/hyperactivity disorder (ADHD) increased 33%, and hearing loss decreased 30.9%.[3]

Findings by Boyle et al include[4]:

- Males had twice the prevalence of any DD than females and more specifically had a higher prevalence of ADHD, autism, learning disabilities, stuttering/stammering, and other developmental disabilities;
- Hispanic children had a lower prevalence of several disorders compared to non-Hispanic white and non-Hispanic black children, including ADHD and learning disabilities;
- Non-Hispanic black children had a higher prevalence of stuttering/stammering than non-Hispanic white children;
- Children insured by Medicaid had a nearly two-fold higher prevalence of any DD compared to those with private insurance; and,
- Children from families with income below the federal poverty level had a higher prevalence of DD.

The number of adults in the United States with IDD aged 60 and older is projected to nearly double from 641,860 in 2000 to 1.2 million by 2030.[5] However, exact numbers are difficult to find for this demographic. With longevity comes increases in chronic diseases and co-morbidities increasing the need for PT intervention, physical activity, and appropriate management. These adults experience higher rates of obesity, sedentary behaviors, and poor nutritional habits compared with the general population.[5]

Health Care and Residential Settings for People with IDD

Adults with IDD are still living in flux as we move towards deinstitutionalization of this population back into their home communities. The history of this evolution in the United States can be quickly reviewed through the 2012 report from the Center for Health Care Strategies.[6] The current system of care is striving towards effective transition from school to adult services and trying to include meaningful day activities and integrated employment. Person-centered planning with self-actualization is the goal for this population. However, the daily PT/OT school-based services (which typically included positioning, stretching, standing/walking, and/or functional training) may be lost in the transition to adult care. Unfortunately, until an injury or illness occurs, PT services may just be a memory.

Health care for people with IDD is a mosaic of related but distinct component parts, is frequently uncoordinated, and can be extraordinarily difficult to access. People with IDD are thus confronted with fragmented health care in which primary and specialty health care professionals are unable to meet their needs. There are too few health care systems in which system components are integrated,[7] and this includes the provision of PT across the life span.

IMPROVING ACCESS TO PHYSICAL THERAPY FOR ADULTS WITH IDD

Locating the Adult with IDD

If you are thinking this population does not exist in your community, you may be surprised to find out they are present but not necessarily visible. Locate IDD service providers at the University of Colorado's "State of the States in Developmental Disabilities" at: http://www.stateofthestates.org/links#MR/DD and/or locate your state agency contact person at the National Association of State Directors of Developmental Disabilities Services at: http://www.nasddds.org/state-agencies/. By locating local IDD service providers, providing residential and/or employment services, you can learn how to intervene with fall risk clinics, provision of evidence-based fall prevention programs, inclusive community recreation programs and/or individualized PT, as well as support the expansion of community recreation to effectively include adults with IDD.

Another resource available to you and your community are local University Centers for Excellence in Developmental Disabilities (UCEDDs). The Association of University Centers on Disabilities (AUCD) maintains an interactive directory of these programs on their website at: http://www.aucd.org/directory/directory.cfm?program=UCEDD. There is a UCEDD in each U.S. state and most territories. This site allows you to search for specific areas of expertise as well as by location.

Another excellent locator of service providers and networks for adult with disabilities are the Centers for Independent Living. Their interactive map is located at: http://www.ilru.org/projects/cil-net/cil-center-and-association-directory. Centers for Independent Living provide training, technical assistance, and information dissemination on a number of topics and in a variety of formats. On-location, online and on-demand trainings, webinars and teleconferences provide timely information on a wide range of topics. Technical assistance is provided on-demand as needs are identified. Materials and resources on a wide array of topics are available for download from this website.

Issues for Physical Therapists

The entry-level physical therapy curriculum is demanding and offers limited time to introduce students to the vast array of neurologic disabilities including IDD. Patients with IDD can present challenges for physical therapists and their staff who may have limited training and experience with the population. When young adults with IDD age out of the educational system, their care is picked up by community-based physical therapists. In areas with limited PT services, such as rural or low-income areas, the general practice physical therapists may find themselves treating adults with IDD and feeling ill-prepared to do so. This requires us to "step-up" and gain the training to meet the need.

Meet the Challenges

Physical therapists may experience barriers to providing care that require us to find the opportunities for expanding services to this marginalized population. Challenges and remedies may include:

1. Adults with IDD may use Medicaid and/or Medicare as their primary insurance(s) which may not be accepted in all settings. We must advocate for open access for all where we choose to practice.
2. Limitations in communication and cognition oftentimes seen in adults with IDD may impact treatment, education, and home programs. This may be overcome by having adults with IDD attend PT with a family member or caregiver and establishing a team-based approach to ensure supervised carryover at home. Communication basics include:
   a. Use simple words and speak respectfully and directly to the adult with IDD.
   b. Face people, maintain eye contact, and keep yourself at their height (eg, if they are sitting, then you should sit down to communicate at their level).
   c. Be ready to rephrase or repeat important information. Be open to having the caregiver interpret for you if needed.
   d. After an important direction, ask the adult with IDD to repeat the instruction back to you or to "teach" the caregiver. Listen to be sure your point was received. If needed, rephrase and repeat.[8]
   e. Observe the adult with IDD carefully for signs of pain, fear, anxiety, etc and respond proactively and appropriately. People in this population may not report pain for many reasons.

f. Keep visits appropriately paced for each visit and frequent enough to meet specific goals in a reasonable timeframe.

3. Autism is one type of IDD. Adults with a diagnosis on the Autism Spectrum of Disorders (ASD) may present behavioral issues requiring advanced planning. Prior to the first visit, speaking to a care provider or family member who knows the individual well may allow for planning to circumvent challenges. Some accommodations to consider[9]:
   a. Have a quiet room free of distractions, comfortable temperature, with closed and covered windows. Lighting should be diffuse and not direct. Avoid blinking lights or noisy alarms/notifications. Quiet your cell phone.
   b. Schedule PT at the peak of any psychotropic medications.
   c. Avoid lengthy appointments or scheduling at the end of the day.
   d. Gather needed information over the phone from a caregiver or referring provider.
   e. Schedule PT during your patient's "best" times of the day and avoid interruptions such as support staff knocking or entering.
   f. Avoid change of staff and/or surroundings between appointments.
   g. Avoid having this individual wait in a busy room by having them wait in a quiet and comfortable treatment room.
4. Frequent missed appointments or late arrivals may negatively require targeted time management practices. Transportation to and coordination of PT appointments can provide great challenges for adults with IDD and/or the caregivers. Caregivers may change by shift, day and/or might turnover frequently. Your office staff may need to assist with planning of transportation services, explaining locations and parking, meeting people at first appointments, and allowing longer appointment slots.
5. If you would like further training in working with IDD, please consider applying to the Leadership Education in Neurodevelopmental and Related Disabilities programs, through the AUCD.

FALLS AND FALLS IN ADULTS WITH IDD

Definition of a Fall

Regardless of the population considered, before we can discuss falls, we must be clear on our definition of a fall. A fall is "an unplanned and unexpected contact with a supporting surface." In this definition, a supporting surface can be the floor, a wall, a chair, a bed, or another surface that is used unexpectedly to aid recovery of balance.[10] A fall does not include a fall to the ground as the result of a push from an external force (push or shove) or a medical event such as fainting.[11] Falling back into a chair while attempting to stand up is a fall. When you ask anyone if they have fallen, take the time to define what you mean by a "fall."

Fall risk is multifactorial and requires a comprehensive plan for fall risk modification.[12] This will be discussed in detail in Part II of this series.

Fall Reporting

Falls are grossly underreported for many reasons. Older adults may fear loss of independence and institutionalization. A caregiver or provider may not report for fear of retribution and/or loss of pay. An adult with IDD may not report in an effort not to disappoint you or a caregiver. Anyone may simply forget a fall that occurred without injury. You may need to ask the individual and then also check with caregivers and medical records.

However, falls are also not always reported in medical records. Edelberg, Lyman and Wei[13] studied fall records for hospitalized elders. The study revealed that 74% of the 76 fallers were not noted to have fallen by the medical staff. Moreover, 47% of the recent fallers and 64% of the multiple fallers' incidents were not reported. In conclusion, elders fall more frequently than recognized. One could reasonably assume that this is true as well for older adults with IDD and other subpopulations.

Fall Risk Factors

Incidence and prevalence in adults with IDD

Falls among people with IDD occur at a younger age than the general population and are a significant cause of injury and/or hospitalization.[14] We have very limited research on this population especially for those living with their families in the community. Fall risk appears to be equal for those living in institutions and those at home.[14] According to Cox et al,[14] the greatest fall risk factors for adults with IDD include seizures in the past 5 years, history of fracture, and increasing age.

More is known about adults with IDD living in institutional settings. In studying prevalence of falls among German institutionalized adults with IDD, Salb et al[15] found that falls are a problem for both older and younger adults with intellectual disability living in a residential care setting. Falls of 147 residents, ages between 21 and 89 years and with different grades of IDD, were recorded prospectively over a 12-month period using a digital fall report form. For all participants, a total of 140 falls were reported and high fall rates per person-year were found in the younger (0.85) as well as in the older aged residents (1.06).[15]

Glick et al[16] reported that fractures are more prevalent among people with severe and profound developmental disabilities. Fracture locations and statistics differ for the IDD population with 85% of fractures involving the distal extremities rather than proximal joints such as the hip in non-IDD elders.[16] Fracture rate increased as mobility increased; but femur fracture was common in the least mobile. Overall fracture rate was not associated with age or gender in adults with IDD. Fracture experience in people with IDD is different from the older adult population and requires further research.[16]

CONCLUSIONS

Adults with IDD have barriers in accessing much needed PT services. Living with a higher fall risk and rate than their non-disabled age-matched peers, their need for PT and fall prevention is critical. It is imperative that physical therapists and physical therapist assistants answer the call to seek out, screen, and treat this marginalized population.

SUGGESTED READINGS

Part II: *Selecting and Analyzing validated fall measures for Adults with IDD:* Update on the best fall risk and evaluation/outcome tools currently validated for adults with IDD.

Part III: *Creating Solutions with Community Fall Prevention and Inclusive Recreation Programs for Adults with Intellectual Developmental Disabilities*: Review of the evidence-based fall prevention (EBFP) and inclusive community recreation (ICR) programs currently in use with adults with IDD will provide a forecast of future needs in the role of PT.

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Joyce Maring has an educational background in curriculum and instruction and motor control and learning. She is active in educational research with a focus on factors and educational practices aligned with opt-imal student and program outcomes. Her clinical re-search emphasizes examination of motor control dys-function in a variety of populations, and examination and intervention of health and wellness, including falls, in persons with developmental disabilities. She has been a practicing physical therapist for more than 30 years and has an extensive clinical background in physical therapy management of pediatric and adult populations with neurological dysfunction. She has multiple publications in her areas of interest and expertise.

Addressing the Issue of Fall Risk for All Adults with Intellectual Developmental Disabilities

Part II: Selecting and Analyzing Fall Measures for Adults with Intellectual Developmental Disabilities

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INTRODUCTION

Physical therapists play a significant role in performing screens, examinations, and evaluations for persons with intellectual developmental disabilities (IDD). This population experiences a number of health conditions associated with limitations to body structure and function, ability, and participation in community activities. As pointed out in Part I of this series, persons with IDD experience high fall rates with subsequent injuries. Physical therapists are well-positioned to identify and, when possible, ameliorate risk factors for falls in this vulnerable population.

The physical therapy profession and its membership organizations, the World Confederation for Physical Therapy and American Physical Therapy Association (APTA), support the use of standardized measures as best practice in physical therapy. Standardized measurement tools provide a common language for helping therapists establish a baseline status, quantify change, and evaluate the success of an intervention.[1] Yet, the availability of validated and reliable standardized tools to measure fall risk and functional status in persons with IDD is limited. The U.S. Surgeon-General in a *Call to Action to Improve the Health and Wellness of Persons with Disabilities* identified the need for health providers to have the knowledge as well as the appropriate tools to effectively screen, diagnose, treat, and evaluate outcomes for persons with disability.[2] Although we have made progress in reaching that goal, tools and resources available to provide high quality physical therapy care management to persons with IDD continues to lag behind those available for other population groups.

SCREENING FOR FALL RISK

Screening is an important aspect of assessment by the physical therapist.

It permits the therapist to identify the need for services and to determine if further examination or consultation by a physical therapist is indicated. Results of a screen may also potentially result in a referral to another practitioner. Screenings are typically focused on identifying risks or potential problems, and are a relatively quick method for collecting and analyzing data in order to determine if more formal investigation is needed.[3] Screening for fall risk in aging persons in community centers, homes, or other facilities is an example of a common screening practice. Fall risk screening tools may identify persons at high risk for falls, but do not usually diagnose the reasons or isolate specific factors that contribute to an elevated fall risk. Results from such screens may lead the physical therapist to recommend a multifactorial examination of fall risk.

Screening Instruments

Standardized screening tools identifying fall risk are readily available for persons without IDD. A common tool for screening fall risk in aging adults is the "Stopping Elderly Accidents, Deaths & Injuries" (STEADI).[4] The STEADI is likely familiar to many health providers and it is a tool that is publically available on the Centers for Disease Control website. This screening instrument was extensively validated for community-dwelling older adults who are able to walk with or without an assistive device and who can respond to several self-administered questions.

Another evidence-based fall risk screen is the Fall Risk Assessment Screening Tool (FRAST).[5] The FRAST is easy to use with yes/no questions and can be self-administered. This tool screens for the presence of several well-established fall risk factors (eg, medical history or fall experiences, depression, home safety, and fall efficacy). The FRAST also includes one objective physical measure, the Timed Up and Go.[6]

Standardized screens and instruments are less available or accessible for persons with IDD who may experience difficulty in responding reliably to directions or answering questions related to self-assessment. In those instances, screening methodologies must incorporate the input of the person with IDD, as well as his or her knowledgeable caregiver. Additionally, directions for performance measures may require modification to facilitate the ability of the person to complete the task. The FRAST is a questionnaire that shows promise as a fall risk screening tool that could be easily modified for persons with IDD by involving family members or caretakers to answer the questions. Work to validate this modification is currently underway.

Screening for Risk Factors

Therapists conducting screens of people with IDD should be aware of fall risk factors that are modifiable and nonmodifiable. Examples of nonmodifiable risks for falls include increased age, history of falls, impaired sensation that is permanent, and low cognition/distractibility not related to delirium.[7] Modifiable risk factors may include physical inactivity; weakness, especially of the lower extremities; poor balance; impaired walking skills; orthostatic hypotension; medication issues (eg, polypharmacy); low vitamin D or other anemias; fear of falling; poor self-efficacy; and social isolation.[8]

EXAMINATION AND EVALUATION RELATED TO FALLS

An evidence-informed physical therapy approach should include, whenever possible, the use of standardized and validated screening tools to help gather information in order to establish baselines, measure progress towards goals, and assess the effectiveness of an intervention. A limited number of validated tools are available to assess fall risk in persons with IDD who are aging. Several promising instruments have been modified or validated and may be easily incorporated into routine examinations. These screening tools should be considered when identifying important elements for examination of people with IDD at risk for falls.

Balance Measures

The Performance-Oriented Mobility Assessment I (POMA I) also known as the Tinetti Gait and Balance Instrument was modified and validated for use with persons with IDD.[9] The modifications to the test are straightforward and easy to administer. Covered sunglasses can be used as a compensatory aid when a person with IDD is unable to follow instructions for the eyes closed task. Simple visual cues can be used to facilitate comprehension of instructions to completely turn 360° and to stand with feet together. The scoring procedures for the POMA I were unchanged and persons with IDD with recent falls scored in ranges consistent with medium to high risk in other populations.[9] Using the Tinetti Gait and Balance Instrument, Chiba et al[10] tested 144 participants and found 82% had moderate-to-profound IDD. The authors reported that only two participants were unable to comprehend what they had to do and could not complete all tasks of the measure. These authors found that when applying a threshold score of 25, the scale had a sensitivity of 89% and specificity of 92% to discriminate between "fallers" and "non-fallers."

Videotaping and quantifying observations of strategies used by persons with IDD is another potentially appropriate measurement tool of balance capabilities for persons with IDD.[11] The Balance Scale for Persons with Intellectual Disabilities (BSID) is such a measure. To use the tool, the person being assessed is videotaped performing standardized motor tasks, specifically chosen as familiar tasks commonly performed in daily routines that challenge balance. The assessor observes the video and quantifies the recorded performance using a rating scale. Good interrater reliability was found for the Tinetti Gait and Balance Instrument and the BSID (ICC = 0.91 – 0.98).[11]

The Berg Balance Scale (BBS) is a reliable and valid measure of balance in many populations[12] and demonstrated reliability for use with adults with IDD.[13] Although scores that predict falls in persons with IDD are not specifically available, the tool is very familiar to most physical therapists and is fairly straightforward to administer. The study conducted by La Porta et al[12] included several populations with neurological injury typically associated with cognitive impairment such as traumatic brain injury. They found the BBS to be both a reliable and valid measurement tool across population groups. When considering a measure to assess balance in someone with minimal-to-moderate cognitive impairment, the BBS should be considered.

Gait and walking measures

A variety of standardized walking measures focus on related and different aspects of walking disability in community-dwelling older adults. Lower scores on most walking measures are associated with increased risk of falls. A walking measure that has been modified and validated in persons with IDD is the 2-minute walk test (2MWT).[9] Persons with IDD performing the 2MWT in place of the more common 6MWT were able to maintain their focus throughout the duration of the test. One additional minor modification included a person who provided ongoing verbal instructions and encouragement. Persons with IDD with a history of a recent fall and/or hospitalization have been found to walk significantly shorter distances over the 2 minutes than those without such history. The 2MWT may be an excellent easy-to-administer instrument for monitoring fall risk, as well as changes over time.

Another gait assessment tool used with older adults is the modified Gait Abnormality Rating Scale (GARS-M). This tool was found to discriminate between fallers and non-fallers in older adult populations.[14,15] The GARS-M scores are based on a scale of 0 (normal) to 3 (severely impaired) in 7 categories that describe participants' walking impairments.[15] Good interrater reliability (ICC = .85) for the GARS-M has been established with adults with IDD.[16] The GARS-M is a tool that screens for falls risk and provides a detailed assessment of gait deficits, and thus, it is potentially useful in guiding targeted physical therapy interventions.

Walking speed is a fairly easy test and a validated measure of risk for adverse outcomes, such as falls in many populations.[17] Although not yet validated for use in persons with IDD, it is otherwise a reliable and easy test to administer. The most frequently used test to measure gait speed is the 10 meter Walk Test.[18] Assessing and monitoring changes in gait speed is likely a useful measure in persons with IDD that can provide insight about changes occurring over time.

Functional Independence

The modified Barthel Index (BI)[19] has good psychometric properties, including that of interrater and test-rest reliability for use in screening for the need for basic activities of daily living assistance in adults with IDD.[13] The BI requires no special training and can be administered in less than 5 minutes. This instrument can be administered to people with IDD and/or knowledgeable caretakers and does not require modifications. Scores on the BI successfully distinguished between persons with IDD who had a recent history of a fall or hospitalization from those who did not have such histories.[9] The tool includes a 10-item list of basic self-care tasks. It is quick, standardized and provides a useful score for identifying the need for further examination and intervention planning.

OTHER TESTS AND MEASURES RELATED TO PHYSICAL FITNESS

Hilgenkamp et al[20] investigated the feasibility of 8 tests to measure physical fitness in adults with IDD who were over 50 years of age. The investigators used fitness test completion rates as the primary measure of the feasibility for using this test for this population. All 8 tests had reasonable completion rates and included the box and block test, response time test, BBS, walking speed, grip strength, 30-second chair stand, the 10-meter incremental shuttle walking test, and the extended modified back saver sit and reach test. Persons with profound IDD were unable to complete the response time test and Berg Balance Test, but the authors found all tests generally feasible for measuring physical fitness in older persons with IDD.

The Special Olympics Healthy Athletes® program offers free health screenings and health literacy information to persons with IDD. A core component of this program is FUNfitness, a fitness screen developed in collaboration with APTA.[21] FUNfitness can be used by physical therapists, physical therapist assistants, and students to assess flexibility, functional strength, balance, and aerobic condition by using validated and/or reliable tests for older sedentary adults in large generalized populations. Special Olympics is currently in the process of developing normative test ranges for people with IDD based on their collection of data.

CONCLUSIONS

Given the high incidents of falls in this population, screening for fall risk should be implemented at consistent intervals by health providers in regular contact with persons with IDD. When a screen indicates an elevated risk is present, physical therapists should conduct a comprehensive examination to reach a diagnostic opinion as part of the evaluation process. That evaluation subsequently forms the basis for an individualized plan of care. Implementing an evidence-based approach that includes tests and measures validated for this population allows physical therapists to assess treatment effectiveness by comparing performance outcome measurements at baseline and over time. A comprehensive evaluation may include analysis of tests and measures beyond the tools listed above as the therapist's judgement of which measures are appropriate will be formed based on the evidence and the therapist's clinical reasoning.[3] Although we are making progress towards the U.S. Surgeon General's call to action to develop tools to screen, diagnose, treat, and measure outcomes in persons with disability, there is much more work to be done.

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Addressing the Issue of Fall Risk for All Adults with Intellectual Developmental Disabilities

Part III: Creating Solutions with Community Fall Prevention and Inclusive Recreation Programs for Adults with Intellectual Developmental Disabilities

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BACKGROUND

Adults with intellectual developmental disabilities (IDD) are living longer and aging, thus experiencing higher rates of chronic disease and falls. This precarious situation underscores the need for accessible and cost-efficient evidence-based fall prevention (EBFP) programs in their communities. Acceptance of an inactive lifestyle and restrictions on activity by resource or caregiver preference can no longer be tolerated as the norm.

EVIDENCE-BASED FALL PREVENTION PROGRAMS

Several excellent EBFP programs have been validated for cognitively-intact older adults who live in the community and ambulate independently with or without a device. The Centers for Disease Control and Prevention and the Administration on Community Living have provided some grant funding for dissemination of these key EBFP programs. Although some of the EBFP programs are intended for different target populations, these programs can be sequentially used to transition the aging adult from high to low fall risk. The choice of initial program depends on client history, responses to questions, plus scores on fall risk screening or physical performance testing.

For the older frail adult with high fall risk and/or who has fallen, demonstrates poor balance, slow velocity of gait, and/or decreased lower extremity strength, the program of choice is the *Otago Exercise Program (OEP).*[1-3] The OEP is a one-on-one EBFP program included as part of a comprehensive fall treatment plan designed and supervised by an OEP-certified physical therapist (PT). Certification is available to PTs and PTAs online for a nominal fee through the North Carolina Geriatric Education Center (http://www.aheconnect.com/newahec/cdetail.asp?courseid=cgec3). This program, when referred by the primary care physician to a PT as part of a fall prevention home program, is usually covered by Medicare. Newer models of delivery by other health care professionals have shown success, and may encourage coverage by other insurers including Medicaid.[4] The program delivers a remarkable 35% to 40% reduction in falls for frail elders age 80+ years.[5]

Stepping On (SO)[6] is the next option for community-residing elders who are at risk for falls or have fallen.[7] Stepping On meets for 2 hours, once per week for 7 consecutive weeks in a safe and accessible community setting for a group of 8 to 12 older adults with a trained SO leader. Each week includes an expert guest (PT, OT, pharmacist, etc.) in classes that address the multifaceted issues of fall prevention, including vision, footwear, and medications. Each session includes a lesson followed by exercises for balance and strength similar but more challenging than those in the OEP. The group also discusses fall risk issues, and self-assessment of environment and lifestyle.

Research demonstrates a 31% reduction in falls with a 64% return on investment.[8]

Tai Ji Quan: Moving for Better Balance[9] is appropriate for higher functioning, active older adults who ambulate without an assistive device and can stand on one foot safely. The program translates the martial art form into a therapeutic program presented in two 1-hour sessions weekly for a minimum of 24 weeks. Positive outcomes include increase in SLS time, functional reach, grip strength, and 10-meter walking speed. The program demonstrated a 49% reduction in falls with total implementation costs of $917 per fall prevented – a 509% return on investment.[8,10,11]

Matter of Balance[12] is a program that is successful at activating sedentary elders who have a fear of falling and limit activity as a result. Classes meet weekly for 2 hours per week for 8 consecutive weeks to problem-solve, develop goal-setting skills, improve self-efficacy, learn to alter their environments, and begin physical activity (PA). Participants report greater comfort with increasing PA (97%), and 99% plan to continue exercise.[13] A reduction of 7 falls in 140 participants per year produces a full return on investment.[14]

These programs, although currently validated only for adults with no cognitive impairment, have been widely used with aging adults, many of whom most likely have early undiagnosed stages of mild cognitive impairment. Hence, the utilization of these programs with adults with mild intellectual disability, although untested, is a choice in many situations, especially if a companion or caregiver is involved.

RESEARCH IN FALL PREVENTION FOR ADULTS WITH IDD

Several researchers have attempted to re-conceptualize activity as integral to everyday living by developing structured programs that incorporate activity as

part of daily life of persons with IDD. Martinez-Zaragoza et al[15] provided a baseline and follow-up assessment with an intervening program of both education and treatment; the treatment group were adults with mild to moderate IDD who addressed both healthy eating and physical activity with end of the week weights, celebrations, tokens, and planning for the week ahead. They noted reductions in weight and diastolic blood pressure. Similarly, Oviedo et al[16] designed a combined program of aerobic, strength, and balance activities that ran 3 days per week for 14 weeks; significant ($p < .05$) improvements in cardiovascular fitness (+2.5 ml kg min), handgrip (+2.7 kg), leg strength, and balance were documented. Decreases in body weight (2 kg) and body mass index (0.8 kg m) were also significant in the intervention group while the control group demonstrated no changes in any parameter.

Other programs developed to incorporate PA were shown to be feasible and well accepted by the participants. Shields et al[17] developed a twice weekly student-led program at a local gym for a total of 10 weeks with demonstrable increases in lower extremity strength, while Mitchell et al[18] conducted a 12-week walking program using pedometers, and interspersed with 3 consultations with a "walking advisor." van Schijndel-Speet et al[19] used the American College of Sports Medicine and American Heart Association framework to develop a 32-week program that met 3 times per week for activity sessions developed from a menu of endurance, strength, balance, and flexibility exercises individualized for the person's needs. Finally, Lante et al[20] used the "active support" approach in which an exercise specialist engaged each participant in individually tailored activities that were enjoyable and functional with maintenance by the staff service provider.

The key lessons learned from all these programs[15-20] were:

- support staff and families must value PA and provide consistent input and engagement;
- adults with IDD require slow introduction to new activities, familiar environments and instructors, and consistent support to set goals and self-monitor their behaviors;
- both peer and student age-appropriate mentors were successful; and
- all possible barriers (transport, accessibility, equipment) must be ameliorated.

Challenges to these structured programs include:

- freedom of choice regarding change in activity requires understanding of the risks and benefits of participation;
- both participant and/or caregiver might need to consider change in behaviors; and
- groups may not be heterogeneous in physical or cognitive function;

Based on these initial findings about successful programming for those with IDD, we will now explore the evidence-based fall prevention and fitness programs that have been validated for persons with IDD.

EVIDENCE-BASED FALL PREVENTION PROGRAMS FOR ADULTS WITH IDD

As extensive research (111 trials with 55,303 participants) has demonstrated physical activity and exercise are a stand-alone fall prevention strategy for older adults,[21] researchers in New Zealand designed and tested the Falls Prevention Intervention for Adults with IDD (PROFAID) program to prevent falls in adults with IDD; the program integrated physical activity and exercise into daily living activities.[22]

The intervention comprised 2 parts: (1) a training workshop for support staff/families, and (2) 3 visits and ongoing phone or email support from a physical therapist. Training workshops for staff and family underscored the importance of regular exercise, supported by an easy-to-read brochure for participants. During the 3 visits, the physical therapist facilitated 2 to 3 individualized exercises aimed at increasing lower limb strength and improving balance capabilities, exercises that the person would do every day as part of his or her normal daily routine. People were also encouraged to attend a physical activity of choice once a week, such as swimming or walking.

The PROFAID feasibility study demonstrated a significant decrease in the video-based balance scale for IDD (BSIDD) at 6-month follow-up. The BSIDD rates video recordings of 7 common motor tasks with standardized scoring criteria. The BSIDD has concurrent validity with the Tinetti Gait and Balance Instrument and the modified Gait Abnormality Rating Scale, and interrater reliability with 19 physiotherapists.[23] Results were best maintained in adults with mild IDD who had supportive workers. Designing creative forms of exercise (like games or competitions) and education about the value of exercise and activity were vital to program success, as were supportive documentation like logs and messaging.

Crockett et al[25] did a service evaluation of a physiotherapy-led falls pathway service for adults with IDD, similar to OEP. They evaluated a 12-week home-based program tailored from domains of exercise type (ie, balance, strength, aerobic) developed from OEP and clinical judgement. Clients and physiotherapists discussed these exercises, presented in symbols and pictures, and chose 2 to 3 specific exercises to be performed daily with one aerobic activity done 2 to 3 times weekly for the 12 weeks. The PT visited every 4 weeks to review the program, issue leaflets about fall prevention, and perform a home hazard assessment. The PT was also available to provide multidisciplinary cross-referrals as indicated. Reduction of the number of falls and improvement in balance and mobility were noted at the post-exercise assessment. The results suggested both a role for physiotherapists in fall prevention, and positive outcomes for clients in fall reduction or prevention.

Renfro, Bainbridge, and Smith[26] delivered and studied a modified group version of OEP to 15 participants with various levels of IDD and physical disabilities for one hour weekly over 7 weeks. Each participant attended with a caregiver or exercise partner and 5 OEP-trained nursing students with 2 trained PTs were used. Multiple staff assured safety, individual approach, and effective learning. Pre- and post-tests from the STEADI toolkit in addition to a 2-minute Walk Test were administered. Discharge planning with consumers and caregivers included home exercise, walking, and an optional home assessment. Significant improvements were noted in the 30-second Chair Stand Test, the 4-Stage Balance Test, and the 2-minute Walk Test. Additionally, 3 individuals demonstrated a reduction in assistance required for safe ambulation (2 moved

from walker to cane, while 1 was able to stop using a cane and ambulate without device). No falls were reported during the study period. This peer-reviewed publication is the first substantive validation of a fall prevention program in adults with IDD. Hale et al,[27] in delivering a group-based OEP to 3 individuals with mild-moderate IDD, noted that several instructors were necessary to ensure safety secondary to varied behavioral and mobility characteristics, such as acting out and aggression or hemiparesis and spasticity. Several strategies were found to enhance program delivery. One such strategy was the creation of a friendly environment that included all participants in social interaction. Other strategies that promoted success were active inclusion of all participants in the class process, and provision of positive feedback.

Shubert et al[4] conducted a study of the OEP administered by other health care professionals, in this case an occupational therapist and exercise physiologist. Those who completed 6 months of the OEP demonstrated significant improvements in all physical function assessments and self-perceived functional improvements. A subset of this group that demonstrated improvements in the ability to rise from a chair also reported significantly fewer falls during the 6-month intervention. This study suggests that other models of provision of the OEP might be successful and require fewer resources and cost.

No other EBFP programs have yet been validated for adults with IDD, but the need is obvious. Validation of other programs in adults with IDD provides great doctoral-study opportunities for the physical therapy community.

COMMUNITY-BASED PROGRAMMING FOR FITNESS

Inherent in programming for fall prevention are PA and exercise for balance and strength. These components are also present in most fitness programs, so the transition to community-based fitness programming is a logical step for many adults with IDD. The development of fitness programs has been very active and productive in recent years, culminating in the emergence of many fitness program models.

Several programs combine the elements of PA and nutrition. *Health Matters,* developed by the University of Illinois, is a program targeted for persons with IDD with the goal of developing and sharing tools for health promotion and disseminating these services more broadly (http://www.healthmattersprogram.org/).

This 12-week program motivates and engages people with IDD about PA and nutrition. Instructors implement and tailor the program to the needs of the participants, and do pre- and post-testing. The program is still in the early stages with programs in Alaska, Illinois, Kentucky, Maryland, Missouri, North Carolina, and Nebraska. Data collection to validate the efficacy of this program is just being initiated in these sites.

14 Weeks to a Healthier You! was developed by the National Center for Health and Physical Activity in Disability as a web-based, personalized 14-week program with weekly exercise, tips on PA and nutrition, recipes, tracking tools, reminders, and other opportunities to connect with coaches and other participants(http://www.nchpad.org/14weeks/). This program has been piloted by the Montana Disability and Health Program for efficacy as a facilitated group program with adults with IDD, and is now being re-piloted to identify which materials, resources, and supports need modification or expansion for participants with IDD.[28]

Special Olympics International and its programs (SO program) have expanded health efforts from screening and referral to the development of targeted community programs for wellness. Each community develops programs that fit their specific needs, but many of these programs revolve around fitness and nutrition. Also, most programs engage persons with and without IDD to promote inclusion and mentoring. These programs are new, so participant numbers remain small. Initial unpublished results demonstrate encouraging data, but numbers are too small for significant conclusions.

Other validated programs could easily be expanded and validated in adults with IDD. These include *Active Living Every Day* (Cooper Institute), *Enhance Fitness* (University of Washington), ***Fit and Strong, and Walk with Ease*** (Arthritis Foundation). *Tai Ji Quan: Moving for Better Balance* has been well researched in persons with Parkinson's disease; pilot studies of this program have been conducted in older adults with cognitive impairment with some promising outcomes, but these results are still preliminary.[29,30]

CONCLUSIONS

Fall risk is a significant problem as adults with IDD continue to live longer lives. Falls are a risk associated with possible injury, loss of independence, and medical liability. Awareness of the risk and consequences of falls by professionals and the public can lead to actions that may reduce the risk and financial burdens associated with falls and injuries. A proactive approach to screening, assessment, and individualized and targeted intervention programs will lead to more productive and active lives for all older adults with IDD, regardless of their functional abilities. Validation of well-known and disseminated EBFP programs for this population is a high priority.

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Initial Description of a Rehabilitation Care Model for Patients with Neurocognitive Impairment and Orthopedic Injury

Jennifer Howanitz, BS, MPT, GCS

INTRODUCTION

Anna* was 85 years old, living at an assisted living facility enjoying puzzles, sewing, listening to music, and dancing on occasion. One morning Anna fell in her bathroom. When the staff came to help, she was experiencing severe pain in her right side. She was transported to the hospital where it was discovered she fractured her right hip. Anna's journey through the health care system at an advanced age would be a challenge. However, Anna's challenge was even greater due to symptoms of neurocognitive impairment. While in the hospital as she was undergoing treatment to repair the fracture, Anna became agitated and combative. She was medicated to address the challenging behaviors and 7 days later transferred to skilled nursing for rehabilitation. Upon arrival she was confused, and she would not engage with others or in the therapy process.

Anna's story is not uncommon to clinicians who treat geriatric clients. One in 2 women and 1 in 5 men will suffer fractures after the age of 50.[1] When looking specifically at fractures that cause hospitalization in those over 65 years of age, hip fractures rank the highest.[2] In a systematic review it was found that 41.8% of those with hip fracture are cognitively impaired.[3] Older adults with Alzheimer's disease and related disorders (ADRD) present a challenge to health care systems. They require greater staff time due to behaviors, have longer lengths of stay, and are at greater risk for complications.[4] Cost estimates for care nationwide of those with ADRD was $159 billion to $215 billion in 2010.[5,6] There are suggestions that as the U.S. population continues to age, costs could rise an additional 80% by 2040.[5] Recent studies suggest a declining incidence of ADRD, but due to the sheer numbers of older Americans, the impact to society will still be very large.[7] The greatest cost of care is not attributed to direct medical care, but the need for institutional and home-based care.[5,8] Anna's situation required institutional care for short-term rehabilitation after an orthopedic injury. The challenge for rehabilitation professionals treating patients similar to Anna is to provide effective care that facilitates return of prior function and discharge to a lower care level. Unfortunately, it is not uncommon for those with dementia to remain institutionalized after short term rehabilitation has ended.[9-12] Using innovative ways to improve functional outcomes for patients with dementia can improve mobility and reduce the need for institutionalization.[13-15] Currently there are clinicians using techniques to improve functional outcomes, but there is no consensus in the literature on the best methods of providing rehabilitation to patients living with dementia, especially those with severe cognitive impairment.[3,13,15] In the absence of consensus, clinicians continue to work to develop tools that will help frontline therapists. The goal of this article is to highlight a model of rehabilitation care that was created to provide treatment options for patients with moderate to severe cognitive impairment and illustrate how it can be used in the clinic to improve outcomes.

NEUROCOGNITIVE ENGAGEMENT THERAPY

Neurocognitive engagement therapy (NET) is an innovative approach developed for rehabilitation of individuals with middle-to-late stage cognitive impairment. Middle-to-late stage cognitive impairment is characterized by loss of executive functions, the need for assistance for safety and poor insight up to dependency for all activities of daily living with no ability to sequence tasks. Neurocognitive engagement therapy incorporates best practices in dementia care into the rehabilitation process. Seitz and Gill examined the literature and summarized consistencies in rehabilitation programs developed for those with cognitive impairment.[12] The researchers found most programs contain elements of enhanced communication within a multidisciplinary team (ie, discharge planners, nurses, physicians, psychologists, social workers, and therapists), individualized activities, and dementia education for caregiving staff.[3,12,15,16] Neurocongnitive engagement therapy was designed to utilize the above mentioned elements as well as other biopsychosocial approaches (Table 1) described in the literature.[17,18] Neurocognitive engagement therapy structures interventions for clinicians to use in treatment sessions based on the severity of a patient's cognitive impairment (Figure 1). Severity of cognitive impairment can be assessed using various tools such as the Global Deterioration Scale (GDS), Functional Assessment Staging Tool (FAST), or Montreal Cognitive Assessment (MoCA). These cognitive-based assessments can be used to develop an understanding of a patient's cognitive impairment and how it impacts the ability of a person to function. Tools such as the FAST can help differentiate Alzheimer's disease related dementias from other dementias.[19] Although it is not the focus of this article, it is important to note that in the development of a plan of care, clinicians need to understand the etiology of a patient's cognitive impairment. A patient with a cognitive impairment caused by delirium will have different cognitive abilities than a patient with Alzheimer's disease. Using Anna's experience, application of the NET model into clinical practice will be described.

Table 1. Neurocognitive Engagement Therapy Intervention Descriptions and Suggested Cognitive Levels

Intervention Level	Suggested Cognitive Level	Biopsychosocial Approach	Description
Traditional Therapy	MoCA ≥ 22; FAST ≤ 3; GDS ≤ 3	Person Centered Care[20,21]	Focusing on the process of caregiving versus an exclusively task-oriented approach. Successful person centered care is deeply rooted in the knowledge, understanding, and respect for the unique characteristics of the individual.
NET Level 1	MoCA = 18-21; FAST = 4; GDS = 4	Life Story[22]	Recording aspects of a person's past and present life, and then using this information to benefit the person in his/her present situation.
		Interdisciplinary Team Collaboration[23,24]	An ongoing process that includes shared assessments, treatment planning, implementation of care, and regular review and revision to insure optimal outcomes.
		Pain Management[25]	Due to changes in perception and processing, the neurobiology of pain is affected; assessment of pain requires observational skills and tools designed for cognitive deficits; pain and behavioral interventions provide benefits in the treatment of pain.
		Family and Caregiver Education[26,27]	A dementia capable workforce requires effective education; Families require effective dementia education to reduce stress.
		Spaced Retrieval[28-31]	Spaced retrieval is a technique using repetitive retrieval to strengthen cognitive and motor skills in mild-to-moderate stages of dementia.
NET Level 2	MoCA = 17-9; FAST = 5-6.5; GDS = 5-6	Communication Skills[32]	Evidence-based interventions are used to enhance communication with patients with Alzheimer's disease and related disorders such as using touch, eye contact, and the resident's name; reduction of speech rate, etc.
		Environmental Alterations[33,34]	Use of environmental changes to enhance function and manage behavioral expressions such as ambient music, aromatherapy, visually complex environments, bright light therapy, etc.
		Familiar Functional Activities [35]	Life story, interests, and preferences of the individual are used to select familiar enjoyable activities that can be incorporated into therapy.
NET Level 3	MoCA ≤ 8; FAST > 6.5; GDS = 6-7	Behavior Management[36,37]	Behaviors in those with Alzheimer's disease and related disorders can stem from unmet needs, environmental overload, and interactions of individual, caregiver, and environmental factors. Strategies to address needs are beneficial non-pharmacologic techniques for behavior management.
		Montessori for Dementia Principles[38,39]	The principles include task breakdown, guided repetition, and progression from simple to complex using activities that enable patients to practice.

Abbreviations: MoCA, Montreal Cognitive Assessment; FAST, Functional Assessment Staging Tool; GDS, Global Deterioration Scale

Clinical Application of Neurocognitive Engagement Therapy

Anna was admitted to the skilled nursing facility with a repaired right displaced femoral neck fracture. The repair was completed surgically with a bipolar hemiarthroplasty. Anna's complications after the repair were postoperative anemia and increased confusion with a pre-existing history of dementia and depression. Guidelines for rehabilitation were to allow weight bearing as tolerated on the right leg and maintain total hip precautions during all movement. Upon admission to rehabilitation, Anna received comprehensive assessments by the interdisciplinary team which included Activities, Medicine, Nursing, Occupational Therapy, Physical Therapy, Social Services, and Speech Therapy. Neurocognitive deficits were assessed using several tools: FAST, GDS, MoCA, Brief Interview for Mental Status (BIMS) (Table 2). All the assessments were in agreement, and symptoms of severe cognitive impairment were present. In the presence of severe cognitive impairment, NET level 3 interventions were used. The NET model for rehabilitation professionals follows a strategic approach

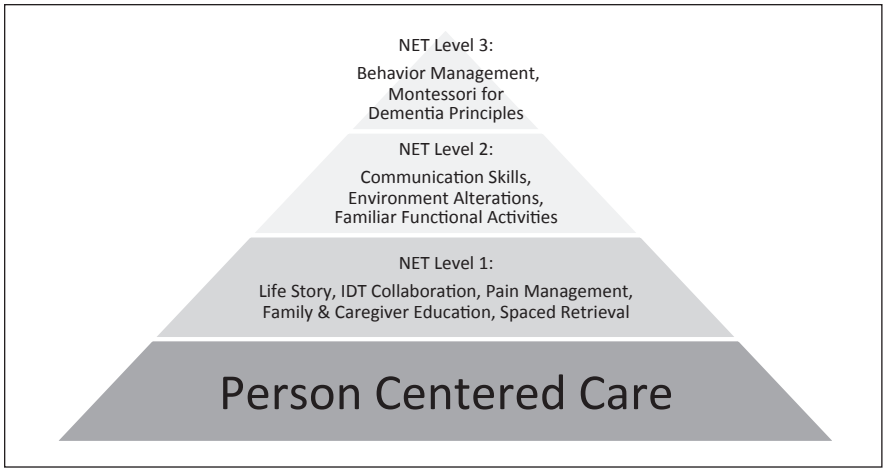

Figure 1. Neurocognitive engagement therapy interventions for patients with neurocognitive impairment.

beginning with a comprehensive therapy assessment. Prior level of function and the current level of function are identified as well as the underlying impairments. Based on this information, a plan of care is defined. The identified impairments serve as the focus for therapeutic activities. In Anna's case, due to her hip repair, she presented with the following impairments: aerobic capacity/endurance, balance, muscle strength, and range of motion. The utilization of life story and knowledge of cognitive impairment severity directs the selection of activities. Table 3 describes specific applications of the interventions that were used with Anna. Activities were progressed in difficulty to maintain a training effect using assessment of repetition maximum and target heart rate. Addition of cuff weights onto the wrist and ankles or even carried in a purse are simple ways to increase the difficulty of a functionally based activity. Anna was seen for physical therapy for a total of 8 sessions, with an average length of 51 minutes; occupational therapy for a total of 9 sessions, with an average length of 52 minutes, and speech therapy for 7 sessions, with an average length of 41 minutes.

Outcomes of Neurocognitive Engagement Therapy Interventions

The utilization of the NET model's specialized modalities provided a supportive and enriched environment for Anna. Through the life story process, the team learned Anna liked to sew and travel. Other areas identified to develop engaging activities were polka music, farming, and spiritual traditions. The first week of treatment required intensive use of pain management and communication techniques, and alteration of the environment to increase engagement. By the end of the first week, Anna was smiling from ear to ear, walking 100 feet with contact guard, and achieved a Timed Up and Go score of 27 seconds. On day 18 she returned to her assisted living facility at supervision level. Anna's functional gains using the NET model were significant (Table 4). Fall risk was reduced and behavior changes assessed at the initiation of care were no longer present.

Table 2. Anna's Interdisciplinary Cognitive Assessment Scores and Associated Interpretation

Cognitive Assessment	Score	Interpretation
Global Deterioration Scale (GDS)	6	Severe cognitive decline; Occasionally forgets name of primary caregiver (eg, spouse). Largely unaware of recent personal events. Substantial assistance required with activities of daily living and travel to familiar locations. Often unaware of surroundings (eg, year or season). Can still recall her own name and distinguish a familiar face.
Functional Assessment Staging Tool (FAST)	6.8	Moderately severe disease; difficulty dressing, requires assistance for bathing, unable to handle the mechanics of toileting, urinary and fecal incontinence.
Montreal Cognitive Assessment (MoCA)	3	Late stage/severe Alzheimer's disease.
Brief Interview of Mental Status (BIMs)	4	Severe cognitive impairment.

CONCLUSION

Neurocognitive engagement therapy is an effective option for clinicians looking for a comprehensive rehabilitation approach for patients with cognitive impairment. Clinicians continue to see significant numbers of elders with cognitive impairment and dementia presenting in a variety of in-patient and out-patient settings. Anna is an illustration of how the NET model can apply to elders with orthopedic injuries; however, NET can also be applied to other medical diagnoses that require rehabilitation interventions. Neurocognitive engagement therapy uses a robust selection of best practices in dementia care to support quality outcomes. In the absence of a best practice in rehabilitation literature, clinicians need to continue to develop treatment approaches, like NET, to address the needs of patients with neurocognitive impairments. Effective rehabilitative care is critical to enhancing quality of life and reducing health care costs for those with ADRD. Neurocognitive engagement therapy was recently studied over a 4-month period using patients from 3 skilled nursing facilities. The results of this research are promising and will be published in the upcoming months. Anna is one of many success stories emerging from the use of NET. With a team approach and advanced knowledge of how neurocognitive impairments affect the rehabilitation process, NET is able to provide an environment for people in need of rehabilitation that allows return to meaningful function.

Table 3. Example of Activities Used in Anna's Neurocognitive Engagement Therapy Interventions

Neurocognitive Engagement Therapy Interventions	Example of Anna's Activities
Communication Skills	Reduce rate of therapist speech; Use simple phrases; One step commands; Utilize patient's name in communication as well as biographical information; Greet patient prior to treating with happy emotional tones; Approach communication from the front of the patient.
Environmental Alterations	Treatment in room or quiet space; Polka music playing during sessions; Lavender aromatherapy scent diffused during treatment; Patient room labeled with Anna's name.
Life Story	Patient's interests posted on colorful poster in her room; Memory book.
Familiar Functional Activities	Rolling scans of yarn while standing; Polka dancing; Visiting /travelling to various locations through wall pictures in the facility; Cleaning table; Returning dishes to the kitchen cabinets.
Behavior Management	Team meeting to determine Anna's unmet need or source of agitation. Team assessed the source to be sleep disruption, over stimulation and pain.
Pain Management	Use of Wong Baker Scale; Observation of nonverbal signs of pain; Obtain scheduled pain medication routine for the first 5 days.
Montessori for Dementia Principles	Activities have structure and order; Immediate feedback is provided; Activity developed with high probability of success; Activity is broken down into simple steps and repeated.

Table 4. Anna's Functional Gains Using the Neurocognitive Engagement Therapy Framework

Functional Performance Measured	Baseline	Discharge Level
Gait	5 feet with RW and Minimum Assist	140 feet with RW and distant supervision
Balance	Unable to complete TUG	TUG 24 seconds
Modified Barthel	24	46

Abbreviations: RW, rolling walker; TUG, Timed Up and Go

*The patient's name has been changed to maintain privacy.

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Orthopedic Surgery: A Cognitive Health Challenge

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Whether orthopedic surgery is elective (total hip arthroplasty) or the result of trauma (hip fracture pinning), acute and often persisting cognitive deficits have been reported. Deficits range from acute delirium to noted reported diminishment of broad cognitive problems (Postoperative Cognitive Dysfunction) that include reduced attention and concentration, word finding problems, and difficulty learning information relative to presurgery abilities. Delirium may or may not precede longer lasting cognitive changes.[1,2] Cognitive dysfunction is present more often in orthopedic patients than in any other hospitalized group.[3]

DELIRIUM

Acute delirium is characterized by usually transitory disturbances of consciousness, attention, cognition, and perception. It develops over a short period of time and tends to fluctuate during the course of the day.[4] It can occur at any age, but it occurs more commonly in patients who are elders and have a previously compromised mental status. Prevalence of postoperative delirium following general surgery is 5% to 10% and as high as 42% following orthopedic surgery. Delirium significantly worsens prognosis and is associated with increased mortality at discharge and at 12 months. A significant proportion of patients with delirium during their hospital admission continued to demonstrate symptoms of delirium at discharge and 6- and 12-month follow-up.[5] Accumulating evidence shows that delirium is not only a transient, reversible acute confusion, but also can give rise to a persistent long-term cognitive impairment.[6]

Delirium is diagnosed by observation and bedside examination, it is not defined by laboratory or imaging studies. Physical therapists can be instrumental in reporting suspected delirium as we often work more consistently on new learning tasks and observe motor responses more closely than nursing or surgical staff. The Confusion Assessment Method (CAM or CAM-S) can be used during the extended postoperative period.[7] Delirium has been reported to develop within weeks of surgery although most commonly appears within 48 hours.[8] If the older patient does not have a history of dementia or cognitive impairment, the Mini-Cog[9] can be used to identify patients at high risk for in-hospital delirium during early hospitalization or presurgical consults. Low or changing Mini-Cog scores alert all members of the team to heighten observation and to institute prevention strategies. Environmental controls such as monitored light and noise levels, enforced sleep schedules, frequently scheduled sensory stimulation to maintain reality orientation, and alerting family or familiar caregivers to potential problems and requesting their assistance in staying with those patients identified as at risk are all strategies identified as helpful in prevention of delirium.[7-10]

People experiencing delirium and confusion pose special challenges for physical therapists, especially in the acute setting where the inability of the patient to follow commands (and weight-bearing restrictions) may lead even experienced clinicians to "hold" treatments or interventions. In fact, clinical practice guidelines from the Society of Critical Care Medicine recommend early mobility as 1 of 6 evidence-based steps to improve patient outcomes. Even as delirium is medically addressed through adjusting medications and environmental controls for better-quality sleep, additional physical and mental stimulation can make a huge difference in recovery.[10] Physical therapists, because of their advanced knowledge of movement system science, can help manage the mobility needs of those patients with evolving health status or with complex needs that are too challenging for nursing staff to manage alone.

A meta-analysis of 7 studies investigators found 4 interventions (ie, physical or occupational therapy, daily reorientation, and avoidance of sensorial deprivation) were effective in significantly reducing the incidence of delirium in older in-patients.[11]

Postoperative Cognitive Dysfunction

Postoperative cognitive dysfunction (POCD) is the subtle impairment of memory, concentration, and information processing.[12] The symptoms of POCD vary from mild memory loss to the inability to concentrate or process information.[11] The nature of postoperative cognitive disorders is frequently subclinical and no changes in diagnostic imaging are present.[13] In many cases, only the patient and/or partner/family can recognize the onset of the pathology.[12] Postoperative cognitive dysfunction is associated with increasing age, lower education level, a history of a previous cerebral vascular accident with no residual impairment. Postoperative cognitive dysfunction at hospital discharge is an independent risk factor for POCD 3 months after surgery.[2]

In one study (N=95),[3] the incidence of POCD after big joint arthroplasty was found to vary from 16% to 45%, although it has been reported[14] as high as 72% at 6 days and 30% at 6 months, postoperatively. The etiology of POCD is puzzling, particularly after "elective" orthopedic surgeries in presumably otherwise healthy older adults. Speculated factors for development of POCD in orthopedic patients include prolonged immobilization, thromboembolic complications, the influence of anesthesia, the influence of pain in the postoperative period, and long bone fractures.[3,14-16] Perioperative stress and increased levels of cortisol have also been postulated to influence development of POCD.

The high incidence of cognitive changes associated with orthopedic surgical care has huge implications for rehabilitation and physical and occupational therapists. Postoperative cognitive dysfunction impairs memory, concentration, and information processing speed in varying degrees. These changes in executive function affect safe hospital

discharge and long-term care planning. The result of any of these complications to cognitive function causes increased cost and mortality implications as older adults with even isolated executive changes (independent of physical impairment) experience more functional limitations and increased caregiver burden.[13] Postoperative cognitive dysfunction is not an independent predictor of dementia.[17] Time and appropriate individualized treatment enable people with POCD to recover cognitive function.

As the trend for reimbursement of total joint and hip fractures continues in bundled mode and moves to greater emphasis on quality outcomes, physical therapists should consistently assess and document changes in the cognitive abilities of all older patients. G31.84 is a billable/specific ICD-10-CM code that can be used to indicate a diagnosis of POCD/mild cognitive impairment for reimbursement purposes.[18] Standards of practice supporting billable services include (1) establishing a baseline measure to for guiding medically necessary and reasonable goals of treatment, (2) comparing measures taken at baseline and as indicated throughout the episode of care, (3) improving the health literacy of patients and caregivers/family so expectations about recovery and goal setting are more realistic, and (4) developing targeted cognitive strategies to reduce patient frustration, promote new learning, and improved memory.

Post-orthopedic Cognitive Changes

Postoperative cognitive dysfunction and delirium are common complications of hospitalizations in older patients (>65 years old), especially after orthopedic surgeries.[1,2] Physical therapy services can improve functional and cognitive performance in people with POCD, prevent or mitigate conditions that favor development of or worsening of delirium, as well as help reduce nursing and caregiver burdens. Standards of physical therapy practice should include assessment of movement and cognitive dysfunction, and the provision of medically necessary and reasonable care management interventions that help promote optimal physical and cognitive function. Physical therapists have advanced knowledge and skills making them ideal clinical care managers and researchers of this complex patient population. More investigations (eg, outcome and retrospective studies) are needed.

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Considerations in Working with the Older Adult with Spine Deformity

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Clare Frank, DPT, MS, OCS, FAAOMPT

INTRODUCTION

Adult spinal deformity (ASD) describes a heterogeneous spectrum of spinal conditions that present in adulthood. Adult spinal deformity is characterized by a structural change in any one or combination of the coronal, sagittal, and transverse planes.[1] It is estimated that up to 68% of older adults have a spinal deformity based on its current definition.[2] With baby boomers (born between 1946 and 1964) now approaching older adulthood, the 65 and older age group's share of the total population will nearly double to 24% in 2060 from its current 15% as of 2016.[3] Therefore, it is important to increase consumer and clinician awareness of best practices to assess and manage this population. This article intends to introduce the reader to the potential role of a skilled physiotherapist as part of the health care team in the nonoperative assessment and management of an older adult with spine deformity particularly from a movement system framework.

INTRODUCTION TO THE MOVEMENT SYSTEM

In July 2013, APTA's House of Delegates adopted a new vision for the profession of physical therapy, "Transforming society by optimizing movement to improve the human experience."[4] Central to this vision is the call for physical therapists and physical therapy assistants to take responsibility for the evaluation and management of their patient/client's movement system. The movement system is defined as the collection of systems (cardiovascular, pulmonary, endocrine, integumentary, nervous, and musculoskeletal) that interact to move the body or its component parts.[5]

PHYSIOTHERAPISTS' ROLE AS LIFESPAN PRACTITIONERS

One of the pioneers of the physical therapy profession, Shirley Sahrmann, has long espoused the view that physical therapists should elevate themselves to the role of "birth to death practitioners," with a keen understanding of the role of the movement system at various phases of the life span. A skilled pediatric physical therapist may provide valuable primary and secondary preventative education and intervention. At the other end of the spectrum, a highly qualified geriatric clinical specialist with an in-depth understanding of age-related changes and effects on multiple systems, may identify pertinent areas of attention to optimize a client's movement system specific to his stage in life.

AGING AND THE MUSCULOSKELETAL SYSTEM

Like all body systems, the neuro-musculoskeletal system undergoes changes with age, which are influenced by several factors such as disease states, genetics, and lifestyle factors including physical activity and nutrition. Physiotherapists' knowledge of key age-related changes in the older adult with musculoskeletal pain and spine deformity may help in planning assessment and management strategies.

Bone, which is a specialized form of connective tissue, is composed of cancellous and cortical bone. Bone loss typically first occurs in cancellous bone, and is exaggerated in women during menopause and can also occur with the presence of other factors, such as hormonal changes, nutrition, certain disease states, and lifestyle factors.[6]

Sarcopenia, or decrease in muscle mass, is related to decreases in bone mass.[7] A combination of sarcopenia and osteoporosis can increase fall risk and subsequently fractures and functional movement. Other types of connective tissue such as articular cartilage tend to undergo age-related changes as well, including loss of elastic properties and degenerative changes.[6]

RELATIONSHIP BETWEEN STRUCTURE AND FUNCTION

Wolff's Law states that, "changes in the form and function of bones, or changes in function alone, are followed by changes in the internal structure and shape of the bone in accordance with mathematical laws."[8] Thus, there is an intimate relationship that exists between structure and function, which is all driven by the brain and central nervous system.[9]

Physiotherapists with scoliosis-specific knowledge use Wolff's Law during development, when the skeletal structures are still malleable, to introduce gradual alignment changes with specific exercises to create a more neutral alignment and better joint centration. This knowledge base can also be applied to adulthood, but with a stronger consideration for age-related changes.

ADULT SPINAL DEFORMITY AND ALIGNMENT FACTORS

It is only in recent decades that ASD began to be attended to both in the literature and in clinical practice as a distinct diagnostic entity. Much of the early work around spine deformity focused on its occurrence in the child/adolescent.[10] It is now well recognized that the assessment/management of ASD is much different than that of a child/adolescent. Classification systems long since in place to drive management of early-onset and adolescent idiopathic scoliosis were found to be inapplicable to the adult population. Typically, the impetus for an orthopedic consult for spine deformity in a child/adolescent is the deformity itself, which then directs intervention strategies. In the adult and older adult, the impetus for a consult is typically pain and/or disability.[11] Classification systems specific to ASD are now in place.[11]

Adult spinal deformity diagnoses are numerous, and include adolescent idiopathic scoliosis (AIS), adult onset or "de novo" scoliosis, iatrogenic scoliosis, neuromuscular scoliosis, as well as primary sagittal deformities such as hyper-kyphosis, hypo or hyper-lordosis.[1,12] Adult spinal deformity pathogenesis is often due to accumulated degenerative changes occurring with age, specifically, asymmetrical disc degeneration along with facet degeneration and ligamentous laxity leading to a loss of stability in the spinal columns. This instability may manifest in one or multiple planes.[12,13]

Our current knowledge base about ASD management has been primarily derived from the orthopedic surgery community. Historically, surgical intervention to address ASD focused on the coronal or frontal plane deformity. Though early instrumentation proved to be effective in this regard, postoperative outcomes demonstrated often deleterious effects on the sagittal and transverse planes.[14] These surgical outcomes of "flat-back syndrome" or "iatrogenic spinal deformity" (characterized by a fixed forward inclination of the trunk due to the loss of normal lumbar lordosis) created increased attention to the role of the sagittal plane in influencing pain and quality of life in adults with spine deformity.[14] Additionally, alterations in the sagittal plane, particularly loss of lumbar lordosis in ASD leading to an anterior sagittal imbalance (forward inclination of the trunk in relation to the pelvis) were seen to be correlated with increased pain and decreased quality of life.[15]

In evolutionary terms, the structure of the pelvis and lumbar spine to help create a lordotic lumbar curve enabling righting of the trunk over the pelvis allows humans to achieve bipedalism (the ability to walk on two feet).[16,17] The evolutionary need for lumbar lordosis to allow for upright stance and gait is helpful in understanding why loss of lumbar lordosis, as commonly seen in ASD, can be detrimental to an individual's quality of life.

The identification of pelvic incidence (PI) in the late 1990s has led to a better understanding of the relationship between the femur, pelvis, and spine, and has driven better operative decision making. Surgeons are using their increased understanding of spinopelvic parameters to match a patient's anatomical PI with a healthy lumbar lordosis.[18] There is no evidence surrounding the application of PI to the nonoperative community. Thus, at this time, we are only to theorize about the utility of this parameter in clinical practice.

Pelvic incidence, which describes the relationship between the femur and the sacrum, is a morphological parameter that, after growth, remains consistent throughout life. It dictates the range of healthy lumbar lordosis (LL) we are to then expect from a particular individual.[19] A "match" occurs when the two numbers fall within 10° of each other. For example, given a pelvic incidence of 44, a normal range of lordosis would be anywhere from 34° to 54°. A low pelvic incidence will optimally relate to a low lumbar lordosis or a hypo-lordosis or flat back. A high pelvic incidence will correlate most optimally with an increased lumbar lordosis.

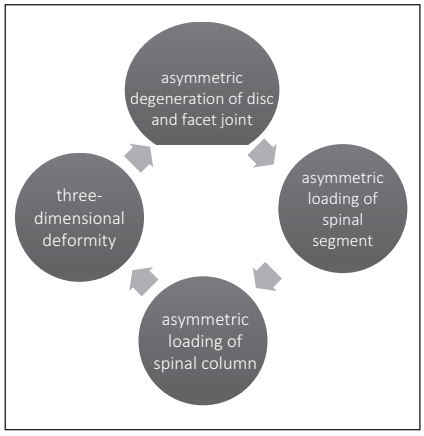

Figure 1. Pathophysiology of adult spinal deformity.

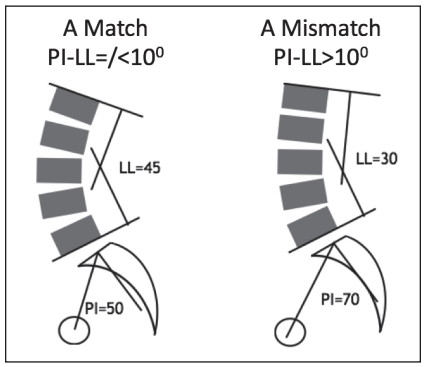

Figure 2. Representative drawing of a harmonious relationship between pelvic incidence and lumbar lordosis (left) and a disharmonious relationship between pelvic incidence and lumbar lordosis (right).

The identification of PI has helped us appreciate that a high variability exists in sagittal alignment. There is not one ideal. Outside of these ranges, the structural changes become too great for our compensatory mechanisms to overcome. For example, when PI and LL fall outside of the 10° range, the scenario is labeled a "mismatch" and evidence has demonstrated that a higher rate of pain and disability is present in individuals where either PI is low with LL high, or vice versa.[20] Additionally, this structural mismatch typically leads to a cascade of compensatory changes both proximally and distally and from an alignment and muscular standpoint.[21]

Other factors that have thus far been identified as being predictors of pain/disability in the adult with spine deformity include:

1. Anterior sagittal imbalance measured by sagittal vertical axis (SVA): a radiographic parameter measuring the difference between a vertical line dropped from the center of C7 and a vertical line from the postero-superior corner of S1[15,22,23] - a value of > 4 cm is associated with increased pain/disability (Figure 3);
2. Loss of lumbar lordosis[23];
3. Presence of thoracolumbar or lumbar scoliosis (measured clinically via visual inspection as well as utilizing the Adam's forward bend test, and radiologically via the Cobb angle and amount of vertebral rotation)[15,24];
4. The presence of a sagittal, lateral, or rotatory listhesis (measured radiologically)[23]; and
5. Coronal imbalance > 3cm (measured clinically via visual inspection and a coronal plumbline, as well as radiologically on a calibrated x-ray via the horizontal distance between a vertical line dropped from C7 and a vertical line from the central sacral line).[18]

Interestingly, although much of the management decisions around scoliosis treatment decision-making have long focused on the Cobb angle, the Cobb angle indeed is not a strong predictor of pain/disability in adulthood.[22, 23]

KEY ASSESSMENTS

The patient's chief complaint, behavior of symptoms and effect on func-

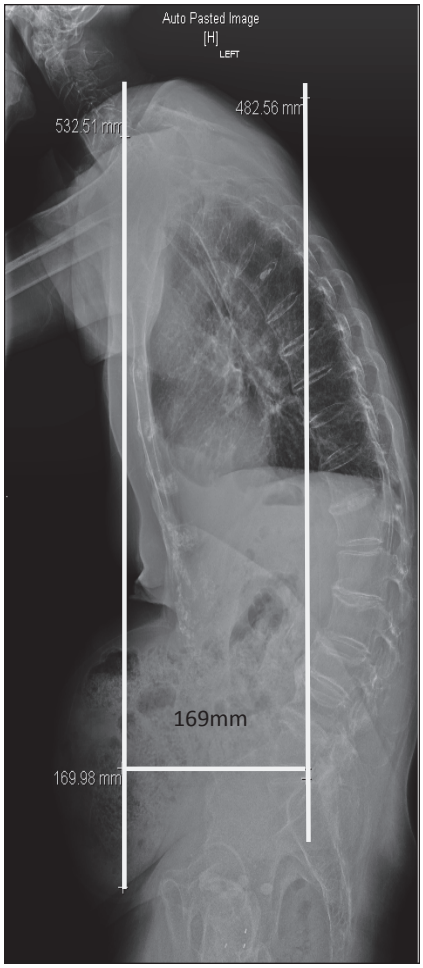

Figure 3. Example of anterior sagittal vertical axis exceeding the identified 4 cm norm, indicating an increased probability of pain/disability in this individual.

tion, perspective on the main concern, pertinent medical history, and goals and aspirations drive the subjective examination to develop working hypotheses to both the source and the cause of the patient's complaint. Once medical screening questions and a brief review of systems have been performed, the objective examination is performed in a systematic manner to confirm or refute the working hypotheses.

Alignment/Muscle Analysis

The objective examination begins with a thorough assessment of alignment from the coronal, sagittal, and transverse views. A key concept in the teachings of Katharina Schroth is the ability to visualize alignment in terms of geometrical shapes representing parts of the body, to understand alignment norms in each plane, describe, and eventually intervene when alignment falls outside of the norm.[25]

In the coronal plane (visualizing the patient/client from the back or from the front), the body should be "well stacked," with each body part (ie, head on neck, neck on thorax, etc.) centered on top of the other. Coronal alignment may be assessed using a plumbline through landmark structures of C7 or T1 and the top of the gluteal cleft.

In the transverse plane view, best viewed as if from a "ceiling camera angle" looking down on the patient from above, the body parts should rest in the same transverse plane relatively, without one body part significantly rotated against the next.

In the sagittal plane view, the plumbline may be used as a reference to analyze alignment. Although as stated, a high level of variability exists in sagittal alignment, clinicians may use reference landmarks as described by Kendall.[26] The reference line should fall through the external auditory meatus, the acromion, the bodies of the lumbar vertebrae, sacral promontory, posterior to the hip joint, and anterior to the knee and ankle joints. Sagittal alignment may be assessed in a variety of ways, using a posture grid as a standard backdrop and using tools such as an inclinometer, a kyphometer, a flexiruler, or a plumbline.

Particularly key is the relationship between the pelvis to the lumbar spine. A structural loss of lumbar lordosis will lead to compensatory changes in the orientation of the pelvis and lower extremities, with the pelvis reactively posteriorly tilting along with hip/knee extension and ultimately hip/knee flexion, in an effort to maintain the body's head aligned over the feet. Proximally, a variety of strategies may be employed to maintain overall alignment and horizontal gaze. The clinician must then make predictions and test out the rigidity or stiffness of the alignment changes observed.

Static alignment changes and muscle analysis should direct physiotherapists to include various tests in the physical examination, eg, accessory or physiological joint movements, muscle length and/or performance, movement patterns, etc. to confirm their contribution to the alignment changes.

Functional Tests

Functional movements, or movements identified to be problematic for the patient and or provocative for a patient's chief complaint, may be included in order to observe and analyze how the individual's scoliotic alignment and curve pattern manifests in movements. These same functional tests may also serve as outcome measures to assess the effectiveness of intervention strategies.

Common movements to analyze may include a squat, step up/down, strategy to rise and get into bed, strategy to get down to and up from the floor, reaching with both arms, one arm, etc. Carefully observe the spine in particular during these movements and look for movement patterns that perpetuate the scoliotic alignment as well as movement patterns that improve the scoliotic alignment.

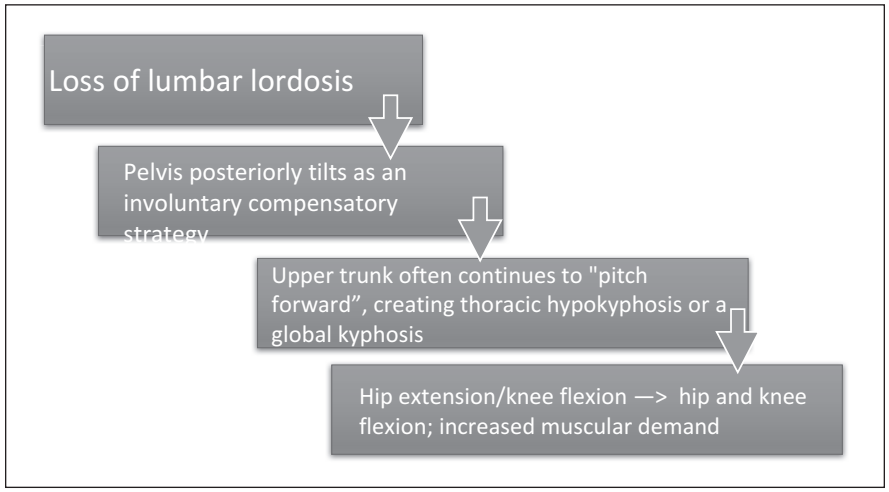

Figure 4. Potential cascade of events occurring with loss of lumbar lordosis.

Single Limb Stance

As 40% of the gait cycle is spent in single limb stance, assessing the ability of an individual to balance on one leg provides valuable information about movement strategies and helps direct the clinician to more specific tests. A common finding is the observation of a Trendelenburg sign, where a pelvis drop is noted contralateral to the stance leg. This observation would prompt the clinician to further assess the lateral stabilizers of the pelvis such as the hip abductors and extensors.

Trunk Movements

Trunk movements give an opportunity to observe spinal movement in various planes. Clinicians should analyze these movements to determine which segment(s) are normal, hypo or hypermobile. This may be indicated by hinges or appearances of "kinks" in the smoothness of a curve. This information should be integrated with knowledge of patient symptom behavior as well as to drive further testing.

Breathing Pattern and Intra-abdominal Pressure Regulation

The diaphragm has a dual respiratory and stabilizing function.[27] The diaphragm works synergistically with the pelvic floor, abdominals, and thoracolumbar extensors to regulate intra-abdominal pressure (IAP), that is central for deep spinal stabilization.

Consensus and literature support the role of healthy IAP for promotion of spinal stability and axial elongation or auto-elongation, as well as a potential role in unloading the spine. Similarly, a foundational principle advocated by Katharina Schroth in the assessment and management of spine deformity, is the ability of the individual to create self-elongation or auto-elongation.[25] Initial patient assessment includes the analysis of the patient's baseline breathing pattern, to include ribcage expansion as well as forced vital capacity using a spirometer.

The clinician should have a baseline of patient's spontaneous breathing pattern as well as the patient's ability to coordinate breath with muscular co-activation of the deep stabilizers to create IAP. Common faults in the older adult with spine deformity include an altered resting position of the ribcage, for example, the ribcage sitting too close to the pelvis, and/or asymmetrical ribcage position caused by the scoliotic curve pattern. This resting ribcage position may be influenced by muscle length impairments or vice versa. Another common finding is reduced lateral ribcage expansion during respiration and uncoordinated IAP regulation in the lower, lateral, and posterior abdominal wall. Substitution with cervical muscles, accessory respiratory muscles, as well as shoulder elevation may be visualized.

Joint, Muscle, and Movement Pattern Tests

Joint (eg, passive accessory and/or physiological) and muscle (eg, length, performance and/or recruitment) tests may be conducted to confirm or refute predictions generated based on findings from the subjective history, alignment analysis, and functional movement analysis.

Special tests

Special tests may be used to rule in or out specific structural pathology. Selection of special tests is based on hypotheses generated from the subjective and objective examination.

Scoliosis-specific Measures

To clinically rule in a structural scoliosis, the Adam's forward bend test is used. To confirm suspicion of structural scoliosis, ask the patient to perform a forward bending movement. Three criteria must be fulfilled to accurately conclude the presence of a structural change:

1. Presence of an angle of trunk rotation (ATR): one side of the ribcage or trunk is higher than the other.
2. Lateral deviation of the spinous process line.
3. From a side view, an area of flatness in the typical distribution of flexion of the spine that corresponds to an area of suspected structural scoliosis.[28]

Radiographical Assessment

Radiologists, physicians, surgeons who typically manage scoliosis, orthotists, and physiotherapists trained in the assessment and management of scoliosis will perform a detailed radiographical assessment to confirm or refute what is observed clinically to make a final confirmation of the presence of a structural scoliosis. Specifics on the radiographical assessment process are beyond the scope of this article; however, the following key terminology is important to recognize.

1. Cobb angle: the cobb angle identifies the magnitude of a lateral curve measured on an anterior-posterior full spine radiograph. It is measured in degrees.
2. Vertebral rotation: the presence of vertebral rotation is necessary to rule in the presence of structural scoliosis, as defined by the SRS. Vertebral rotation can be measured in a variety of ways.
3. Location of apices: often a radiologist report or a medical doctor report will identify the scoliotic curve(s) based on the location of the curve apex/apices. The SRS has defined the following criteria when identifying curve apices:
   a. Thoracic: apex between T2 and disc space between T11/T12,
   b. Thoracolumbar: apex at T12, L1 or the disc space between,
   c. Lumbar: apex L2-5, and
   d. Lumbosacaral: apex L5/S1.
4. Presence of listhesis: A "listhesis" is a change in the alignment of a vertebrae in relation to the vertebrae below or above it. A "listhesis" may be present in any one or combination of the 3 cardinal planes:
   a. Sagittal plane: antero- or retro-listhesis,
   b. Coronal plane: lateral listhesis, and/or
   c. Transverse plane: rotatory listhesis.
5. Degenerative changes as identified by the medical doctor.
6. Sagittal measures as described earlier in this article: pelvic incidence and other spinopelvic parameters, global sagittal balance, coronal balance.

INTERVENTION

Intervention in this population follows a thorough history, review of systems, and objective examination to identify the most relevant impairments to the individual's chief complaint and movement system problem.

For the adult with ASD, a key intervention principle is to train the patient to create self-elongation, or auto-elongation as well as axial extension/

elongation. Auto-elongation must occur from a stable base. For example, in a seated position, a stable base means both feet on the floor with lower extremities in the best neutral alignment given the patient's individual structure, and the patient supported on his ischial tuberosities with the spine in the best starting alignment. This can occur with or without back support. Keep in mind that the structural changes that occur in ASD often involve a combination of cardinal planes. Therefore, to influence one plane is to inevitably influence another. Careful attention must be paid as to not worsen another plane of alignment in an attempt to correct the plane one is focused on. Additionally, it is imperative to recognize that there is a wide variability as to the stiffness of structural changes in the adult population as well as a common finding of varying levels of listhesis. Adult spine deformity is inherently an issue of dynamic and structural instability. Therefore, interventions that rely on primarily passive forces to create traction/distraction/elongation, such as hanging and traction, in this population are contraindicated, due to a potential of increasing instability. The ultimate goal of a clinician trained with a solid foundational knowledge in scoliosis management is to create a healthy balance of muscular co-activation in the deep stabilizing system of the spine and healthy IAP in coordination with respiration.

The international Society on Scoliosis Orthopedic Rehabilitation and Treatment (SOSORT) is a multi-disciplinary organization founded in 2004 consisting of surgeons, physicians, orthotists, physiotherapists, nurse practitioners, physician assistants, and educators where clinical practice is devoted to scoliosis management. The organization has identified multiple rehabilitative approaches that use assessment and strategies to manage scoliotic alignment, posture, and movement patterns. For example, Schroth and the Scientific Exercise Approach to Scoliosis (SEAS) being two of them. These approaches use physiotherapeutic scoliosis-specific exercise (PSSE) designed to affect scoliotic alignment. Clinicians trained in PSSE undergo extensive training in foundational knowledge of scoliosis, including etiology, natural history, mechanics of scoliosis progression, risk factors of scoliosis progression, as well as training in clinical and radiographic assessment of the patient with scoliosis. Regardless of the particular approach, all PSSE approaches include the principle of auto-elongation in all 3 cardinal planes. Evidence to support the use of PSSE in the adolescent with idiopathic scoliosis is growing, with recent randomized controlled trials demonstrating its effectiveness in influencing curve progression in this population.[29-32] Application of PSSE to adults with scoliosis and spine deformity is lacking, although current research demonstrates its potential effectiveness.[33]

Other rehabilitative approaches, such as Vojta therapy and Dynamic Neuromuscular Stabilization also use the principle of auto elongation or axial elongation in the management of scoliosis as well as other movement dysfunction. These approaches are based on a knowledge of developmental kinesiology and muscle interplay to promote axial elongation and a stable base upon which optimal movements can occur.[27]

Manual therapy strategies may be employed with this patient population in light of precautions and contraindications (to reduce stiffness and/or pain). Evidence does not support the use of manual therapy alone to alter curve progression in scoliosis management.[34]

Last but not least, it is also important to include interventions to address other impairments found during the objective examination, to include correction of muscle imbalances, joint restrictions, balance training to reduce fall risk and aerobic endurance training to optimize the cardiovascular system.

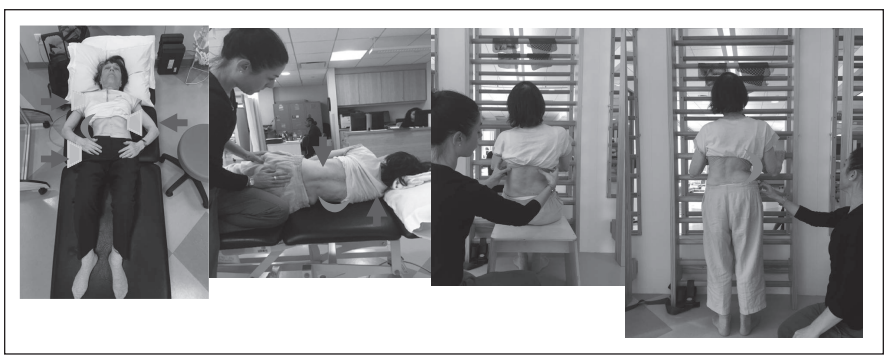

Figure 5. Example of respiration/intra-abdominal pressure training in various positions in an older adult with spine deformity.

CONCLUSION

This article has provided a brief introduction to the growing body of knowledge surrounding adult spinal deformity and its potential application to the physiotherapy assessment and management of the musculoskeletal pain, movement dysfunction, and/or spinal deformity. Physiotherapists interested in further education and training with this particular patient population are encouraged to pursue further coursework in scoliosis-specific assessment and management.

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FOR FURTHER EDUCATION AND TRAINING

Scoliosis Management
Schroth Barcelona Institute
http://www.schroth-barcelonainstitute.com/

Movement System and Musculoskeletal Pain
Movement System Impairment (MSI) model
https://pt.wustl.edu/education/movement-system-impairment-syndromes-courses/movement-system-impairment-resources/

Janda Approach to Musculoskeletal Pain Syndromes
http://www.jandaapproach.com/the-janda-approach/jandas-syndromes/

Dynamic Neuromuscular Stabilization
http://www.rehabps.com/REHABILITATION/Home.html

Vojta Approach
https://www.vojta.com/en/organisation/internationeral-vojta-society/

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- Entrant handouts must be emailed to kate.herron@geriatricspt.org by November 15. Please include contact information for all students who worked on the brochure. If the brochure was created in a class, we would also like to have the professor's name and e-mail.
- The top 3 entrants will each receive a year's student membership to the Academy of Geriatric Physical Therapy.

Winning handouts will be displayed at the Academy booth at APTA's Combined Sections Meeting. Authors will be recognized through the display, in *GeriNotes,* and on the Academy's website. The handouts will be available for clinicians to download and print for client care and instruction.

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The final award winners will be drawn during the business meeting at the Combined Sections Meeting in February of 2018. There will be up to 5 PTA and 5 PT students selected to receive a free-one year membership to the Academy.

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Honor research published in peer-reviewed journals based on clarity of writing, applicability of content to clinical geriatric physical therapy, and potential impact on both physical therapy and other disciplines.

Adopt-A-Doc Award
Recognize outstanding doctoral students committed to geriatric physical therapy, provide support to doctoral students interested in pursuing faculty positions in physical therapy education, and facilitate the completion of the doctoral degree.

Clinical Excellence In Geriatrics Award
Recognize a physical therapist for outstanding clinical practice in geriatric health care settings.

Distinguished Educator Award
Recognize an Academy of Geriatric Physical Therapy member for excellence in teaching.

Outstanding Physical Therapist Assistant Award
Recognize a physical therapist assistant who has significantly impacted physical therapy care in geriatric practice settings.

Lynn Phillippi Advocacy for Older Adults Award
Recognize projects or programs in clinical practice, educational, or administrative settings which provide strong models of effective advocacy for older adults by challenging and changing ageism.

Volunteers in Action Community Service Award
Recognize the exceptional contribution of a physical therapist or physical therapist assistant in community service for older adults.

Joan Mills Award
Presented to an Academy of Geriatric Physical Therapy member who has given outstanding service to the Academy.

Nominations are due November 15, 2017 and all awards will be presented at the Academy Membership Meeting at CSM in February of 2018.

For additional information on the criteria and selection process for academy awards, please visit the Academy of Geriatric Physical Therapy website at **www.geriatricspt.org** or contact the office by email at karen.curran@geriatricspt.org or by phone at 866/586-8247

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