

Orthopaedic Division of the Canadian Physiotherapy Association Presents:

Orthopaedic Division Review March-April 2015

Clinical Tid Bits: Q&A on Seniors Physiotherapy

1) Why do many seniors walk with a narrow base of support? Is this due to muscle and joint changes or another reason(s)? I can cue my patients to take wider steps but what else should physiotherapy look at to address this?

What an interesting question!

I tend to find my older patients have a wider base of support (i.e. step width) particularly during ambulation rather than more narrow – and this does seem to be borne out by the evidence, i.e. as people age, their base of support tends to widen. Narrow base of support or decreased step width during ambulation tends to indicate an underlying neurological issue (e.g. Parkinson's Disease and related conditions, peripheral neuropathy). It could also relate to hip weakness, postural issues, osteoarthritis, condition of the feet and cognitive impairments.

We do know that decreased step length is directly associated with increasing age. However, despite all the kinetic and kinematic research that has been and is being conducted, we still do not really know why this happens! Currently there are a variety of potential factors. For one, shortening step width could be a stabilization strategy due to your patient's fear of falling. For example, imagine walking on very slick ice; what is your strategy to stay safe, assuming you're not changing your footwear? Most people take shorter and slightly wider steps with less heel strike, perhaps keeping their arms out away from their body to increase their stability. Another factor is ankle, knee and hip range of motion which tends to decrease with age. It's also important to consider pain and/or arthritis (e.g. hip, knee, ankle) as well as neurological issues such as Parkinson's. It's always useful to remember that gait is a complex motor-cognitive task – as such, your thorough history and physical examination will help inform what you observe.

Improvement in gait pattern can be achieved through balance training, centre of gravity control exercises (seated and standing), postural correction and strengthening where weakness is noted. Gait patterning exercises are also helpful. In her course Bone Fit™, Dr. Judi Laprade

suggests an effective way of lengthening strides; instruct your patient to walk a specific distance (say to one end of your clinic) and count the number of strides it takes. Then instruct your patient to walk the same distance in 2-4 shorter steps. This exercise is good for cognitively-intact clients. Another exercise she suggests for dynamic balance is the “V-step”; ask your patient to step forward with wide steps and then two narrow steps, then two steps wide, then two narrow and so on, always progressing forward. This is great for dynamic balance and can help with walking confidence.

Thanks for such an interesting question and feel free to email me if you would like more discussion. mclang@osmh.on.ca

LaPrade, J. Bone Fit™ Clinical – for Rehabilitation Specialists in Clinical Settings. Workshop Materials. 2014.

Schrager MA, Kelly VE, Price RB, Ferruccio L, Shumway-Cook A. The effects of age on medio-lateral stability during normal and narrow base walking. Gait & Posture. 2008; 28(3): 466–471.

2) I am wondering what is currently considered the best outcome measure to use for fall risk assessment for seniors?

Falls continue to be the leading cause of injury-related hospitalizations in older adults in Canada with an estimated 20-30% of seniors falling each year. (*Public Health Agency of Canada, 2014*)

An older adult’s risk for falls is influenced by a complex interaction of biological, behavioural, environmental and socioeconomic conditions. (*Scott et al 2007*)

To address this public health issue, the 2011 American Geriatrics Society/British Geriatrics Society guidelines recommend that any older adult who presents with an acute fall, has fallen in the past year, or has difficulty with balance or gait receive a comprehensive fall risk assessment. (*Kenny et al 2011*) However, given the multifactorial nature of falls, no single outcome measure has been shown to accurately predict falls in all populations or settings. (*Scott et al 2007, Kwan and Straus 2014*)

There are numerous assessment tools in the literature that aim to predict falls in older adults. For example, the Falls Risk for Older People in the Community (FROP-Com) screening tool is an

option – it has 13 different areas of inquiry and has been shown to have good inter-rater reliability and predictive value. However, most tools you'll find are screening tools, not outcome measures; they are meant only to identify those at increased fall risk, not to use as a pre-post assessment. In addition, it is important to remember that there are many other important factors in falls prevention e.g. the MOCA for cognition.

When selecting an appropriate outcome measure, physiotherapists must consider their clinical setting and patient population, psychometric properties of the tool and the feasibility of incorporating the tool into their practice. Recent systematic reviews have examined a few commonly used functional mobility assessment tools.

Timed Up and Go (TUG)

The TUG is a quick screen test that requires the person to stand from a chair, walk three meters and return to the chair to sit down. (*Podsiadlo and Richardson 1991*) It is a go-to test for functional mobility; with it you can assess sit-to-stand transfers, ambulation as well as short radius turns (as well as your patient's ability to follow multi-step instructions). The TUG is also valuable in providing a standardized method for observing and qualifying your patient's gait.

One word of caution though; several research articles report different cut-offs for increased fall risk (e.g. 10, 12, 14, 20, 30 seconds!) so be careful in your interpretation of the number you receive. In a systematic review and meta-analysis, Barry and colleagues examined the predictive validity of the commonly cited cut-off score of ≥ 13.5 seconds. (*Barry et al 2014*) Although the TUG is easy to administer and widely used, the authors do not recommend solely using the test as a fall risk assessment due to its limited ability to predict falls in community-dwelling older adults. (*Barry et al 2014*) Instead, TUG scores are more associated with previous falls. (*Beauchet et al 2011*)

Gait Speed

An alternative to the TUG is the measurement of gait speed (GS). It is an excellent and underused outcome measure. It has been suggested as "a sixth vital sign" (*Fritz and Lusardi 2009*) with its potential to predict adverse health outcomes. There is variability in the protocols

used to measure GS including distance walked, static or dynamic start and use of gait aid. Either the 4-metre walk test or 10-metre walk test are reliable and valid both as a predictor of hospitalization, institutionalization, dementia and functional decline.

In their systematic review, Peel, Kuys and Klein (2013) did not find distance walked or type of start to significantly affect GS. In an effort to standardize the measure, the recommended protocol proposed by an expert panel is a 4-meter walk at usual pace. (*Van Kan et al 2009*) Changes in GS as small as 0.1 m/s are thought to have a significant impact on older adults without normal GS. (*Purser et al 2005*) As little as 0.1m/s increase is needed to improve chances of well-being; 0.1m/s decrease predicts increased hospital stays, disability as well as cognitive and functional decline. Dr. Kara Patterson and Dr. Susan Muir have done a first-rate review of this in their research and presented it in a CPA teleconference just over three years back (if you didn't get a chance to participate, ask CPA for a copy – it's worth it!). Gait speed is recommended for its simplicity and predictive value but make sure you stick to the protocol and use an acceleration/deceleration zone to keep your data robust!

Berg Balance Scale (BBS)

The BBS is a well-known, reliable and valid 14-item assessment of static and dynamic balance that requires minimal equipment and 15 minutes to complete. (*Berg et al 1991*) Neuls et al (2011) conducted a systematic review in which they found variability in sensitivity and specificity depending on the cut-off score used. A range of scores may be used to identify individuals at increased risk for falls; however, the authors were unable to determine a conclusive cut-off score to discriminate fallers from nonfallers. The authors therefore recommend that the BBS be used along with other assessments to identify risk factors. (*Neuls et al 2011*)

In addition to these systematic reviews, preliminary studies on relatively recent measures have demonstrated promising results and are worth consideration by physiotherapists.

Short Form Berg Balance Scale (SFBB)

To address limitations of time, patient tolerance and redundancy, Chou et al (2006) developed a simplified 7-item Short Form Berg Balance Scale which has been tested in a prospective study on stroke subjects. The SFBB uses a 3-level scale and includes the items from the original BBS with the highest internal consistency and greatest responsiveness. The authors found the SFBB to be psychometrically similar to the original BBS and recommend its use on people with stroke. *(Chou et al 2006)*

Fullerton Advanced Balance (FAB) Scale

The Fullerton Advanced Balance (FAB) Scale is a 10-item multisystem balance assessment for higher functioning older adults. The test includes items such as standing on foam with eyes closed, jumping on two feet, and walking with head turns. *(Rose et al 2006)* A few cross-sectional studies have been published which suggest the FAB is a reliable and valid tool with the potential to reduce the ceiling effects of other balance assessments. *(Klein et al 2011)* However, in the absence of a prospective study, the ability of this measure to predict falls in isolation is limited. *(Muir and Speechley 2010)*

The Tinetti Assessment Tool is another option for testing balance. Ultimately, your choice of balance assessment also depends on your patient's needs and time constraints.

To assess functional lower extremity strength, a 30-second sit-to-stand test is useful and has normative values established for those over 60 years of age. One of the benefits of this is that you can use the normative values chart to give your patients an idea of their strength objectively. The 30-second arm curl test can be used to assess functional upper extremity strength. Additional manual muscle testing can be performed if you think it's necessary and if your patient has the energy for it.

Although no single measure can be recommended as the gold standard for predicting falls in older adults, it would be inappropriate to dismiss the clinical utility of these outcome measures solely on the limitations identified by the studies discussed. Regardless of whether basic

screening questions, individual test items or more in depth assessment tools are used to identify fall risk, it is equally important that physiotherapists examine best practice interventions in order to effectively reduce the individual risk factors identified.

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Hardy SE, Perera S, Roumani YF, Chandler JM, Studenski SA. Improvement in usual gait speed predicts better survival in older adults. J Am Geriatr Soc. 2007; 55(11): 1727-1734.

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Watson NL, Rosano C, Boudreau RM, Simonsick EM, Ferrucci L, Sutton-Tyrrell K, et al. Executive function, memory, and gait speed decline in well-functioning older adults. *J Gerontol A Biol Sci Med Sci.* 2010; 65(10): 1093-1100.

3) Over the past 2 years I have had a few cases (three women, one male) with diagnoses and clinical presentations consistent with both osteoporosis and neurogenic claudication secondary to spinal stenosis. One condition contraindicates flexion biased exercise and activity, and the other condition can respond well to the same routine. With an aging population of somewhat sedentary people, I wonder if I will be seeing these kinds of cases more often in the years to come. I was wondering if the Seniors division may have some tips or ideas for dealing with this dilemma.

This is a difficult type of case to deal with, much like those clients who present with discogenic pain and facet syndrome simultaneously in which you might want to do McKenzie protocols for the disc bulge but a flexion regime to relieve the aggravated facets.

In either case, it challenges the physio to come up with the creative solution which can make some gradual inroads for both conditions. Tips for the current case would be that you may need to try two options for managing the stenosis and minimizing the impact for the OP. First, you may try a more 'neutral flexion' to manage the stenosis (perhaps with traction); that is, come just out of a lordosis, to a flat back but not reversal of the curve. Second, you might make a clinical judgement that for a short time, some amount of flexion be incorporated but that you perform it in positions of least load on the spine (e.g. supine) and avoid doing it to end-range, repeatedly or with additional weights.

Recently Dr. Laprade and her colleagues published new exercise and osteoporosis guidelines (*Giangregorio et al 2015*) and part of the recommendations is how we can encourage our clients to continue to bend and rotate safely. The other aspect of the recommendations is considering positioning to minimize the load on the vertebra and if a supine position can be utilized to do careful neutral-spine into flexion. We also can do isometric erector spinae muscle activation and strengthening in this position - it doesn't have to 'bird-dog' or 'supermans' to make a difference in this muscle group.

A final consideration for this is the vertebral level of the stenosis vs. the osteoporosis. A stenosis often occurs at the lumbar vertebra level and while loss of bone density in the spine is measured at the lumbar level, the majority of vertebral fractures will be found at the T7-T8 and T12-L1 levels. If this is true for your cases, it may be possible to incorporate a focussed flexion program for the lumbar region (again, supine lying is recommended) while keeping the thoracic region relatively protected in neutral/slight kyphosis.

More cases of osteoporosis/spinal stenosis are anticipated with our aging population. However, this is not always related to sedentary individuals; many patients have been quite active and the pain associated with the spinal stenosis promotes the sedentary activity. Some patients respond well to injections for pain management which then allows them to participate in exercise to strengthen core, lower extremity (avoiding hip extension exercise) and postural musculature including balance work.

Giangregorio LM, McGill S, Wark JD, Laprade J, Heinonen A, Ashe MC et al. Too Fit to Fracture: outcomes of a Delphi consensus process on physical activity and exercise recommendations for adults with osteoporosis with or without vertebral fractures. Osteoporos Int. 2015; 26(3): 891-910.

Siminoski K, Lee KC, Jen H, Warshawski R, Matzinger MA, Shenouda N, et al. Anatomical distribution of vertebral fractures: comparison of pediatric and adult spines. Osteoporos Int. 2012; 23(7): 1999-2008.

4) I want to know more about osteoporosis and manual therapy. What are the most current published guidelines available to inform our practice?

This question is very timely, as Dr. Laprade just finished submitting her contribution to the CPA's '30 Rep' month and her 'rep' was on this very topic. (www.physiotherapy.ca/Practice-Resources/Professional-Development/Online-Courses/30reps) This is something that she's been looking into over the past few years, really digging into research as it is something that she wanted to add to the Bone Fit™ workshops that she teaches, in particular with respect to the spine. To answer this question, she tried to pull together anatomy basics and biomechanics research and blend this in to her decision-making model. Hopefully this provides some helpful guidelines to you as well.

In applying mobilizations to the vertebrae, typically it is to the spinous or transverse processes which make up the posterior bony arch. This is not at all where OP vertebral fractures typically occur – it is the anterior body which succumbs to wedge-fractures. The posterior bony arch is built for multidirectional forces to be applied – muscle pull, ligamentous tethering and of course movement forces through the articular pillars. So is there risk in creating a fracture through the posterior column? To answer those questions, Dr. Laprade needed to know two things: how much force does it take to do a PA mobilization? And how much force does it take to fracture a spinous process? Dr. Meena Sran through her research in both OP and spinal forces with mobilizations has provided some answers. In short, her findings were that thoracic PA forces in vivo ranged from 106-233 N of force. (*Sran et al 2004*) Sran's research further tested the failure point on cadaveric specimens and found this to be in a range from 200-728N of force. The researchers' conclusion was that there is a reasonable margin of safety but that

the upper end of therapist PA forces could cross into that failure range for the spinous processes. (Sran et al 2004)

Dr. Laprade then went one step further to see whether any clinical trials have been published on the topic of vertebral mobilizations in osteoporosis. As a follow-up to the 2004 biomechanical study, Sran and Khan (2006) conducted a case study using the guidelines established in their earlier study and demonstrated safe application of mobilization in an individual with prior vertebral fractures. In 2010, both Bennell et al and Bautmans et al conducted randomized controlled trials in osteoporotic women (Bennell's group included fractures) and determined that a combination of taping, manual therapy and exercise resulted in reduction in pain, improved function and a small reduction of thoracic kyphosis. In 2012, Roberts and Wolfe reported a case study of chiropractic Activator intervention (set between 161 and 182 N of force) in an elderly man with osteoporosis, low back pain and multiple fractures with positive results and no adverse events.

Overall, it appears encouraging that there are some biomechanical as well as trial data to feel confident in introducing PA mobilizations (perhaps a progression from grades I-III) in conjunction with exercise and taping where indicated but this all needs careful assessment and clinical judgement for each case.

Bautmans I, Van Arken J, Van Mackelenberg M, Mets T. Rehabilitation using manual mobilization for thoracic kyphosis in elderly postmenopausal patients with osteoporosis. J Rehabil Med. 2010; 42(2): 129-135.

Bennell KL, Matthews B, Greig A, Briggs A, Kelly A, Sherburn M, et al. Effects of an exercise and manual therapy program on physical impairments, function and quality-of-life in people with osteoporotic vertebral fracture: a randomised, single-blind controlled pilot trial. BMC Musculoskelet Disord 11:36.

Roberts JA, Wolf TM (2012). Chiropractic spinal manipulative therapy for a geriatric patient with low back pain and comorbidities of cancer, compression fractures, and osteoporosis. J Chiropr Med Mar 11(1): 16-23.

Sran MM, Khan KM, Zhu Q, McKay HA, Oxland TR. Failure characteristics of the thoracic spine with a posteroanterior load: investigating the safety of spinal mobilization. Spine. 2004; 29(21): 2382-2388.

Sran MM, Khan KM. Is spinal mobilization safe in severe secondary osteoporosis?-a case report. *Man Ther.* 2006; 11(4): 344-351.

Sincere thanks to the members of our expert panel who volunteered their time in providing such comprehensive responses to our questions;

HELEN JOHNSON BScPT, MSc

Helen Johnson has served on the executive of the Seniors Health Division, Canadian Physiotherapy Association (CPA) in a number of capacities, as Newsletter Editor, Chair and currently Past-Chair. Her clinical experience spans 30 years, from hospital to comprehensive geriatric assessment and in home rehabilitation in the community, as well as administrative roles. She completed a Masters' degree in Health and Rehabilitation Science, Health and Aging at Western University in 2011, and the CPA Clinical Specialty Program in Seniors Health in 2012. Currently, she works as a Rehabilitation Network Lead in a local health region in Ontario, Canada, developing and implementing best practice care pathways on a regional level, for patients with stroke, hip fracture and frail/medically complex seniors.

MELISSA LANG PT MSc PT BScKin

Melissa Lang is a registered physiotherapist; she holds a Master of Science, Physiotherapy from Queen's University and a Bachelor of Science, Kinesiology from the University of Waterloo. She is part of the team that conceived and currently delivers an Integrated Regional Falls Program for the North-Simcoe Region. The North Simcoe-Muskoka region reaches from Innisfil to Huntsville, through to Collingwood and Penetanguishene. As one of only two physiotherapists practicing in this regional falls prevention program she works closely with geriatric patients to reduce the incidence of dangerous falls. Her background in senior acute care and outpatient rehab at Orillia Soldiers' Memorial Hospital are well suited for this. Her passion is geriatric rehabilitation with a focus on neurological issues, in particular stroke and Parkinson's disease.

Melissa volunteers on the executive of the Seniors' Health Division, a national division of the Canadian Physiotherapy Association dedicated to the advancement of seniors' health through physiotherapy. She welcomes contact and questions from others interested in improving the health of geriatric patients through physiotherapy.

JUDI LAPRADE BA, BScPT, MSc, PhD

Judi Laprade obtained her Physical Therapy degree from Queen's University and went on to complete her Master's and PhD in Anatomy also at Queen's. Always involved in teaching, she has held academic and teaching positions at Queen's University, the Hong Kong Polytechnic

University and the University of Toronto, teaching musculoskeletal content to PT students. Currently, she is a Senior Lecturer in the Division of Anatomy at University of Toronto. In the past few years, she has been a project manager and consultant on programs about osteoporosis early screening and education, culminating in taking on the development of the Bone Fit™ program and instructing those workshops.

ROBIN MACDONALD BScPT

Robin currently works for Island Health in Victoria B.C. in the area of Seniors Health. Her clinical practice focuses on fall prevention and exercise prescription 1:1 and in class settings transitioning patients to community classes. Her senior patients present with complex comorbidities / frailty.

Robin graduated from the University of Saskatchewan in 1985 and has worked in both private and public practice in Alberta and B.C.

ADRIAN SALONGA BMR-PT

Adrian is a Clinical Service Leader at Deer Lodge Centre in Winnipeg, Manitoba. Adrian graduated from the University of Manitoba with a Bachelor's of Medical Rehabilitation in Physiotherapy in 2008 and has practiced in acute, rehabilitation, and long-term care settings. He was a past executive committee member on the Seniors' Health Division (2007-2011), Global Health Division (2007-2008), and Manitoba Physiotherapy Association (2009-2013) board. Adrian is currently completing a Master's degree in Health Management through McMaster University.