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Supportive Care for Older Adults

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**WANTED:**

**ARTICLES FOR GERI NOTES**

**TOPICS:** Anything related to older adults

**CLINICIANS:** Send me an article or an idea

**STUDENTS AT ANY LEVEL:** Send me papers you wrote for class

**EDUCATORS:** Send me student papers

Everyone loves to publish and it is easy!

Contact Meri Goehring, GeriNotes Editor
goehrnm@gvsu.edu
I would like to wish everyone a Happy New Year from the Section! Over this winter break I got to catch up with some of my backlog of readings. I came across a great article in the Journal of the American Medical Society entitled “Reliable and sustainable comprehensive care for frail elderly people.” Dr. Joanne Lynn writes about how the current Medicare system fails to meet the needs of our frail and disabled older adults. The quote that describes the situation best is: “The current ‘care system’ provides disjointed specialty services, ignores the challenges of living with disabilities, tolerates routine errors in medications and transitions, disdains individual preferences, and provides little support for paid or volunteer caregivers.”

Older people and their families dealing with the problems of late life disability are faced with a Medicare system that offers many resources to spend on disjointed disease-focused medical care. Approximately 25% of all monies are spent on medical care keeping less than 5% of Medicare recipients alive for their last year, and one-half of that for the last month. But older persons and their families also need supportive care. This includes help with basic activities of daily living, such as bathing, dressing and meals, mobility issues, and transportation assistance. Medicare does not pay for these services, which are often far more important to the comfort and survivability of the person than the medical procedures that frail, older adults receive. While it is a health system for older patients, it has essentially been designed as if it were caring for well-functioning younger patients. The system provides care on a disease-by-disease basis, but ignores the facts that with advancing age many older persons have multiple co-morbidities. The single disease model of care often fails the complex older patient.

Dr. Lynn also notes this issue is virtually ignored in the media, political discourse, and professional education. Smith et al noted, “Those who live to an older age are likely to be disabled and thus in need of caregiving assistance, many months or years prior to death. Women have a substantially longer period of end-of-life disability than men.” As physical therapists we know that a majority of persons who live into their 80s and 90s will live with a prolonged period of disability in which they will need help because of physical and cognitive problems.

Dr. Lynn recommends 4 things that need to be done to assure better care for frail older persons:

1. Recognize that frail older adults have different priorities. We should stop deluding the public with the message that late life frailty is a preventable problem. Of course good health habits should be encouraged. But most people who do all the right things may still have a period of disability when they reach advanced age. Let’s stop telling the public that exercising and eating blueberries will avoid this problem. Let’s instead talk about how to maintain good quality of life in elders with late life disability.

2. Each frail older adult has unique problems and priorities. They need better advanced care planning based on each elder’s goals that targets care and services based on each elder’s individual needs. This needs to be done interdisciplinary.

3. Care delivery in the elder’s home where they can be done at less cost. For disabled elders, just making it to a doctor’s office can be an insurmountable hurdle.

4. A care system that embraces long term supportive services and medical care as equal partners. Both are at least equally important in the older adult. As Dr. Lynn notes, “food, transportation, and direct personal services are often more important than diabetes management or chemotherapy.”

We anxiously await the clarification Settlement Agreement Jimmo v. Sebelius due January 23, 2014. The settlement agreement is intended to clarify that when skilled services are required in order to provide care that is reasonable and necessary to prevent or slow further deterioration. Coverage is not supposed to be denied based on the absence of potential for improvement or restoration. This might enable many older adults to receive therapy services where they have previously been denied. Increased access to these services would make a huge difference for these individuals. We will see.

I believe the central focus of care needs to shift as older persons become more frail and disabled. What would be traditional medical care for each younger individual’s disease or illness is sometimes dangerous, unwise, or at least, over-care in older adults. The focus needs to shift from each disease noted on the problem list to focusing on the impact of the illness burden on the elder’s functional status. We can complement these with a palliative model of care that is focused on quality of life. Yes we do have hospice care, but those rules of care require a person to have only 6 months to live. Many of our patients flounder for years. How many of your frail patients could benefit from a change in direction in payment policies? Some thoughts for the new year, especially as our health care system evolves.

REFERENCES

Hello GeriNotes Readers,

It is with great pleasure that I have successfully completed my second issue of GeriNotes as Editor! As this March issue comes out, I will have just returned from a week in Bangkok, Thailand, attending and presenting at the Prince Madihol Award Conference on Transformative Learning for Health Equity followed by a week in Las Vegas at CSM. I hope to report on both of those experiences in a later issue. For now, I am happy to have so many wonderful contributions from our members.

This issue has some very interesting and insightful articles. First, you will see that sarcopenia is on the rise. This excellent article highlights the importance of recognizing sarcopenia in the patients we serve. Additionally, there is an article that comes from one of our members that provides all of us with an important, and timely, fire safety reminder. I found it very poignant and think that our readers will as well. This article will provide readers with some very useful resources that might prevent a future disaster.

Student articles are often a part of GeriNotes, and I am happy to report that there are two articles providing information on osteoporosis. These articles give our readers additional resources regarding this common problem. A big thanks goes to Jennifer Bottomley, who assisted these students in their writing efforts.

The PTA corner this month includes an award winner. Congratulations to Briana Allen, the recipient of the American Physical Therapy Association (APTA) Section on Geriatrics’ Outstanding Student Award for 2014. I know that there are great PTAs out there including Briana, and hope that they will consider submitting articles to GeriNotes. Physical therapist assistants are a very important part of the physical therapy community and our members would like to hear from you!

Additionally, this issue of GeriNotes includes something a bit different. I have chosen to include 4 reflection papers by students mentored by Chris Childers. These students provide readers with a novel way to consider the approach to the geriatric population. Each student reflection paper reminds us that we have much to learn when working with the geriatric population. Thank you, Chris, for these contributions. Additionally, Chris has decided to join the Editorial Board of GeriNotes. Although she was not able to attend the Editorial Board Meeting at CSM, she is looking forward to continuing to contribute articles in the future.

Finally, this issue includes the first of a series of articles about research. Please take a look at our new feature entitled, Research to Practice Corner. This series of articles will help readers to further understand the research process. Thanks to our author, Jill Heitzman, for starting this important and informative series.

Please keep reading and suggesting ideas for the future. Again, I’d love to hear from PTs and PTAs working in the field of geriatrics. This is YOUR section newsletter. I’d like it to continue to provide enjoyable and informative reading.

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INTRODUCTION

Given the projected growth of the elderly population within the United States, it is important for clinicians to remain up-to-date with the prevalent health concerns of older adults. Just as falls and delirium are common health-related issues within the geriatric population, so is the loss of skeletal muscle mass and quality, leading to a decline in physical performance and functional independence. Although it is generally accepted that with advancing age also comes a decline in muscle size and strength, clinicians should ask themselves the question, “When is this no longer a simple consequence of aging and actually a pathologic process that compromises one’s health-related quality of life?” Although there is a high level of awareness among clinicians and investigators concerning age-related muscle wasting, there have been barriers to the formal recognition of sarcopenia as a clinical diagnosis. These barriers are related to the evolution of the sarcopenia definition and the ongoing efforts to establish a consensus on screening and diagnostic criteria. Moreover, despite the general awareness of sarcopenia by clinicians, they may be less informed about the specific consequences of this geriatric syndrome and the proposed methods for identifying it in clinical settings.

WHAT IS SARCOPENIA?

The term sarcopenia was derived from Greek, where *sarx* is flesh and *penia* is loss, and coined by Irwin Rosenburg, a Senior Scientist at Tufts University. The use of skeletal muscle mass to objectively identify sarcopenia was first initiated by Baumgartner and colleagues who used appendicular skeletal muscle mass (aLM) derived from dual-energy x-ray absorptiometry (DXA). Baumgartner further refined the sarcopenia definition by expressing aLM relative to stature (kg/m²) and identifying the diagnostic criterion as being less than two standard deviations (SD) below a young reference group. While this cut off value was determined to be 7.26 kg/m² for men and 5.45 kg/m² for women, other methods to establish a criterion value have been published. The operational definition of sarcopenia began to evolve with the general recognition of the multifactorial causes of age-related impaired muscle function and the observation that the association between muscle mass and strength may decrease as one ages. Various investigators and international working groups have noted that sarcopenia is influenced by shifts in muscle fiber type profile, the muscle fiber: motor unit ratio, low level chronic inflammation, changes in endocrine function, disuse atrophy, nutritional deficiencies, comorbid conditions, and other factors. Contemporary definitions of sarcopenia typically describe this geriatric syndrome as an age-related loss of muscle mass accompanied by impairments of strength, power, and functional performance. These additional elements, along with recent considerations of the impact of body fat levels on functional performance in older adults, have influenced the development of proposed sarcopenia diagnostic categories (Table).

HOW IS SARCOPENIA IDENTIFIED?
The European Working Group on Sarcopenia in Older People (EWGSOP) highlighted categories best suited for the clinical and research oriented identification of sarcopenia. There has been tremendous growth in area of sarcopenia research (Figure) and many investigators are exploring various methods of assessing muscle mass, muscle strength, and physical performance. According to the EWGSOP, handgrip strength is a good simple measure of muscle strength. Some investigators have found it to be significantly associated with leg strength, but other study findings indicate that lower extremity performance may improve without a change in handgrip strength. Nonetheless, utilizing a validated method of hand dynamometry (with normative data) may be a viable alternative to the more cumbersome methods of muscle strength assessment involving the upper arms or legs. The criterion values for grip strength as established by the EWGSOP are different for each sex (men < 30 kg, women < 20 kg). Also, a 6-m customary gait speed test has been recommended for sarcopenia screening in both clinical and research settings. A gait speed criterion of < 0.8 m/s has been suggested by the EWGSOP as the easiest and most reliable way to begin sarcopenia screening based on physical function in clinical practice. A slightly different recommendation has been posed by the International Working Group on Sarcopenia (IWGS) as they take the presence of low muscle mass into consideration along with a gait speed criterion of < 0.8-1 m/s. It should be noted that in a study comparing the IWGS and EWGSOP criteria among older adults, walking speed was strongly affected by leg length, which may warrant differences in criterion values by gender and ethnicity. While many consensus groups and investigators agree that gait speed is an

### Table. Stages of Sarcopenia as Described by the EWGSOP

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<td>LBM loss criterion only</td>
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<td>Sarcopenia</td>
<td>LBM loss criterion, and strength loss or performance level criteria met</td>
</tr>
<tr>
<td>Severe sarcopenia</td>
<td>All criteria are met</td>
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appropriate method of assessing physical function when screening older individuals for sarcopenia, some debate persists concerning test methodology.

TYPES OF SARCOPENIA

There has been research concerning sub-types of sarcopenia which can be generally grouped by cause, severity, and body composition. According to the EWGSOP, it may be clinically useful to categorize sarcopenia as primary or secondary. Sarcopenia is considered primary when there are no causes evident besides advancing age, as opposed to secondary sarcopenia when there are one or more other causes contributing to the condition along with advancing age. The EWGSOP has also recommended the use of diagnostic stages to identify the severity of sarcopenia (Table). These stages include pre-sarcopenia, sarcopenia, and severe sarcopenia.

In the pre-sarcopenia stage, there is loss of muscle mass but no impact on muscular strength or performance. In the sarcopenia stage, there is loss of muscle mass in addition to low muscle strength or low physical performance. Thus, in the severe sarcopenia stage there is low muscle mass, low muscle strength, and poor physical performance. Body composition must also be considered when determining the different manifestations of sarcopenia. There can be an increase in fat mass with a loss of skeletal muscle mass which can result in normal or near normal body weight and body mass index (BMI) – this constitutes sarcopenic obesity. The Skeletal Muscle Index (SMI) has been proposed to diagnose sarcopenic obesity based on the Third National Health and Nutritional Examination Survey data. Accounting for both muscle mass loss and body size \((\text{LBM/body mass} \times 100)\), values of \(< 37\%\) and \(< 28\%\) have been identified for men and women, respectively. However, an alternative modeling approach to the diagnosis of sarcopenia features adjustments for both height and body fat has been shown to be more strongly associated with functional deficits in comparison to SMI. As a result, this method may become more widely adopted by upon further study. Another proposed definition for this geriatric syndrome is, dynapenia, a term proposed by Manini and Clark to describe the age-related loss of strength and power independent of LBM levels. The dynapenia definition is a stark contrast to the European consensus definition of ‘pre-sarcopenia’ given that dynapenia is marked by little to no loss of muscle mass, and pre-sarcopenia is solely defined by a loss of muscle mass. Nevertheless, the current terminology used by the EWGSOP, based on the staging approach to diagnosis, essentially incorporates the concept of dynapenia into the more severe stages of sarcopenia.

WHAT ARE THE CONSEQUENCES OF SARCOPENIA?

The consequences of sarcopenia are far reaching and have a negative impact at both a personal and financial level. Declines in functional status are more closely related to losses of muscle strength in comparison to losses of muscle mass alone. This observation illustrates why the elements included in the sarcopenia definition can determine its relationship with the disablement process. Sarcopenia sequelae may range from metabolic dysfunction to activity of daily living limitations and disability.

Fall and Fracture Risk. Diminished muscle size and strength adversely affects mobility tasks that are dependent on lower extremity performance. One of the most notable consequences of sarcopenia is an increased risk of falls. With an increased risk of falls comes an increased risk of injury resulting from bone fracture. In a cornerstone study in sarcopenia by Baumgartner and colleagues, the investigators reported the epidemiology of sarcopenia among the elderly population in New Mexico. Their findings also shed light on the relationship between sarcopenia and fall/fracture history. Approximately 20% of the men and 30% of the women reported a fall in the past year and after adjustment for age, ethnicity, obesity, comorbidity, and alcohol intake. While the odds ratio for falls was significant in men at 2.58 (95% CI: 1.42-4.73), the odds ratio was not as significant in women at 1.28 (95% CI: 0.60-2.27). However, the odds ratio for fracture risk in women was higher at 1.31 (95% CI: 0.56-2.89) with 24% of women reporting a history of fracture.

Functional Limitations and Physical Disability. Age-related changes to muscle lead to increased difficulty with simple tasks, such as standing from a seated position or maneuvering a flight of stairs. While there have been studies that indicate losses of muscle strength are more closely related to a functional decline in comparison to losses in muscle size, other investigators have determined that a decrease in muscle size still has an association with physical disability and should not be ignored. A study by Jensen et al assessed physical disability via questionnaire and skeletal muscle mass via bioimpedance. The investigators set the cut-points of “high risk” LBM levels as ≤5.75kg/m² for women and ≤8.50 kg/m² for men. For women in the high-risk LBM category, the adjusted odds ratio for physical disability was 2.93 (95% CI: 1.66-5.19; \(p < 0.001\)). In comparison, the adjusted odds ratio for physical disability in men in the high-risk LBM category was 4.71 (95% CI: 2.28-9.74; \(p < 0.001\)). The authors concluded that the likelihood of physical disability in-
Deemed to have occurred at a high degree when these cut-points were met for LBM. In another study, functional impairment also has been associated with older adults who present with Class II sarcopenia, which is defined as SMI being below 2 SD of the young adult reference values. This study found that functional impairment was 3 times greater in older women with Class II sarcopenia and two times greater in older men with Class II sarcopenia in comparison to older men and women with a normal SMI. Although the methods used to determine body composition cut-off values differ among investigators, many have reported the impact of LBM and body mass on functional limitations and physical disability.

**Diminished Insulin Sensitivity.** The consequences of sarcopenia may also include insulin resistance and other forms of metabolic dysfunction. Independent of obesity, sarcopenia has been associated with adverse glucose metabolism in individuals under 60 years of age. Preliminary findings also suggest that poor muscle quality and aberrant glucose homeostasis may be an early predictor of diabetes susceptibility in racial/ethnic minorities. Miljkovic and associates reported that men of African descent have significantly higher levels of intramuscular adipose tissue in comparison to Caucasian men, and that muscle quality was associated with type 2 diabetes prevalence within their sample. Moreover, findings from a recent population-based study involving a European cohort indicated that diabetes is associated with low muscle strength and poor muscle quality (i.e., kg/cm²). Much remains to be understood about the relationship between age-related skeletal muscle changes and glucose homeostasis. Nonetheless, the current evidence suggests that screening for sarcopenia may have health implications beyond mobility status given the complications associated with uncontrolled diabetes.

**Frailty and Mortality.** Sarcopenia has also been noted as a contributing factor in the development of frailty. Frailty is a complex geriatric syndrome with physical, social, and psychological components, which leads to hospitalization and an increased risk of mortality. Criteria linked to frailty have included weight loss, exhaustion, strength loss, and decrease physical activity. However, while weight loss is often cited as one of the criteria for frailty, and also associated with some forms of sarcopenia, both geriatric syndromes may be marked by excessive body weight. Emerging research has linked obesity to the development of pre-frailty and frailty, and excessive body fat coupled with stable or declining LBM levels characterize sarcopenic obesity. Additionally, the components of sarcopenic obesity have been shown to be critical to health outcomes as both high body fat and low LBM are independent predictors of all-cause mortality. Despite the overlap between these geriatric syndromes, sarcopenia may still be considered a distinct geriatric syndrome and it is estimated to have approximately twice the prevalence of frailty. Also, given the comprehensive definition of sarcopenia embraced by the major consensus group, it is important to note the influence of low muscle strength on mortality. Population-based studies have demonstrated that lower grip strength is associated with an increased risk of mortality in men (hazard ratio (HR), 1.36; 95% CI: 1.13-1.64) and women (HR, 1.84; 95% CI: 1.28-2.65). Therefore, both low muscle mass and low muscle strength may be important modifiers of general health and longevity.

**THE CLINICAL DIAGNOSIS OF SARCOPENIA IN REHABILITATION SETTINGS**

The majority of evidence points to DXA, CT, and MRI as the current best methods of screening and diagnosing sarcopenia based on LBM. Nonetheless, these imaging methods are not always available to rehabilitation specialists, and can be time consuming and costly. Furthermore, it makes sense that the screening and diagnosis of sarcopenia is centered on physical performance and functional capacity in the clinical setting, and then interpreted with the addition of muscle mass values obtained from DXA or other imaging modalities. International consensus groups have recommended utilization of specific performance measures for the screening of sarcopenia, and these measures may be obtained by physical therapists. Assessment of usual gait speed over 6 meters has been suggested by the EWGSOP as the most simple and reliable method.

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**SECTION ELECTION RESULTS**

The Nominating Committee would like to thank all of the candidates that agreed to run for office this year! It was a fabulous slate of candidates! Your commitment to the Section and your willingness to serve in an elected capacity is much appreciated. The results from the 2013 election, for offices starting at CSM in 2014 are:

**Secretary:**
Ann Medley

**Section Delegate:**
Steven Chesbro

**Nominating Committee:**
Veronica Southard

**Director:**
Danille Parker

We look forward to working with the new officers in the coming year. If you are looking to become more involved in the Section and are interested in running for office, please contact a member of the Nominating Committee.

Thank you,
Ken Miller, Chair
Mary Thompson
Veronica Southard
to begin sarcopenia screening in clinical practice, with a criterion value of >0.8 m/s. It should also be noted that usual gait speed is a component of the Short Physical Performance Battery (SPPB), which has also been described by the EWGSOP as a standard composite measure of physical performance for clinical practice and research. Regarding strength assessment, isokinetic dynamometry is known to be the ‘gold standard’ for measuring muscle strength and power. However, the device and equipment required are expensive and not available in typical outpatient rehabilitation clinics. It has been suggested in various studies that low handgrip strength has a relationship with poor health outcomes. Cooper et al have described in detail how handgrip strength should be measured, and the evidence supporting its use, for muscle strength assessment in clinical practice. Mounting evidence indicates that the most effective and efficient methods of screening sarcopenia within a clinical setting revolve around physical performance measures and muscular strength assessment. In clinical environments featuring a well-supported rehabilitation team and appropriate medical facilities, the most valid diagnostic approach to sarcopenia involves the combination of patient data from imaging studies (eg, DXA, CT, MRI, or other methods), muscle strength assessment (eg, handgrip dynamometry), and physical performance measures (eg, gait speed, gait distance, or SPPB).

ACKNOWLEDGEMENTS

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Michael Harris-Love is the Deputy Director of the Polytrauma/TBI Research Rehabilitation Fellowship at the Washington, DC VA Medical Center, and an Associate Professor in the Exercise Science Department at George Washington University. He is the immediate past Vice Chair of the APTA Neurology Section – Degenerative Diseases SIG, and he currently serves the Section on the Task Force for Neurological Fellowship Education. Michael can be reached by e-mail at Michael.Harris-Love@va.gov.

Haniel Hernandez is a Polytrauma/TBI Research Rehabilitation Fellow at the Washington, DC VA Medical Center (DC VAMC), and a post-doctoral investigator in the Muscle Morphology, Mechanics and Performance Laboratory (M.A.P. Lab) within the Physical Medicine & Rehabilitation Service at the DC VAMC. He received his DPT degree from Howard University (Washington, DC) in 2012. Haniel is currently providing clinical care to veterans with polytrauma injuries, and conducting research involving eccentric exercise for arthritic conditions. He can be reached by e-mail at Haniel.Hernandez@va.gov.
CLOSE TO HOME
I opened up this morning’s newspaper to read the headline, “Woman found dead in burning trailer.” It caught my eye because there was a map next to the headline that looked familiar. In reading the body of the article, it became too familiar and I realized that the woman they were describing, “former nurse,” “cancer survivor,” “lived alone,” “mobility problems,” and “walker outside the home” was a former home health client of mine. I was in shock. Although we screen for home safety risks including fire hazards every time we admit a home health client, I never considered that one of my clients would be a victim. We are tasked with maintaining and improving our clients’ safety, function, and independence in their home.

THE IMPORTANCE OF SAFETY
The most crucial element to fire safety is the presence of working smoke detectors. Fire investigators in our state report that a “working smoke detector had been present in only 10 percent of the fire fatalities this year.”1 The recommendation is to have at least one smoke detector on every floor of the home, but ideally, there is one in every room. When we perform our home safety assessment, do we merely ask the client if the smoke detectors work, or do we test them for ourselves? Do we provide verbal and written instructions about changing the batteries twice per year (when you change the clocks)? Many fire departments provide free smoke alarms and will even come to your home if it is the presence of working smoke detectors, as our families about providing adequate ventilation to prevent the risk of carbon monoxide poisoning when using fireplaces or unvented space heaters. We also can educate on the need to evacuate immediately if they smell natural gas in the home. They should not operate anything that could cause a spark including lights, cell phones, flashlights, and appliances.

Space heaters can start fires if placed too close to furniture, bedding, or other combustible household items. If a space heater is being used, it needs to be placed on a level, hard surface and kept at least 3 feet away from things such as paper, clothing, bedding, curtains, or rugs. As physical therapists, we are often involved in environmental modifications in the home. Setting up a safe area for space heater and fireplace use is one example. We can also have our clients practice turning off space heaters before leaving the room or going to bed.

The next item is having an evacuation plan. The recommendation is to have at least two ways out of the home in case your main evacuation route is blocked by smoke or flames. Again, do we merely interview the client and ask them if they have an escape plan, or do we practice evacuations as part of our treatment (ie, fire drill)? We need to adequately assess gait speed and ability to vary cadence in case the client needs to evacuate emergently. If they are unable to perform this, it is clear what the goals are and the direction of the treatment plan.

WEATHER CAN MAKE A DIFFERENCE
In the colder, winter months, we may experience sub-zero weather. Many of our clients have inadequate heating sources in their homes, so they resort to leaving an oven door open, boiling water on a stove for hours at a time, using an outdoor grill, or plugging in too many space heaters into poorly functioning extension cords. We must provide written and verbal instruction to our clients and their families about providing adequate ventilation to prevent the risk of carbon monoxide poisoning when using fireplaces or unvented space heaters. We can also educate on the need to evacuate immediately if they smell natural gas in the home. They should not operate anything that could cause a spark including lights, cell phones, flashlights, and appliances.

As physical therapists, we can reduce space heater and fireplace use is one example. We can also have our clients practice turning off space heaters before leaving the room or going to bed.

A SAFETY ASSESSMENT RESOURCE
A very comprehensive home safety assessment is the Cougar Home Safety Assessment-Version 4.0.2 It is an invaluable resource to assess (not just interview) the client and the home. This assessment includes questions regarding smoke detectors, carbon monoxide

Rachel Botkin is a 2000 graduate of MCP Hahnemann University. She has been a Neurological Clinical Specialist since 2005. Rachel has focused on the needs of the geriatric community both as a skilled nursing facility rehab department manager and as a home health PT. She started her own therapy company, Botkin Rehab Services, LLC in 2012 to provide PT, OT, and ST services to home health clients.
OSTEOPOROSIS AND ITS MANAGEMENT IN THE ELDERLY
Kashmira R. Badiyani, MHS; Jennifer Bottomley, PT, MS, PhD

Osteoporosis is a complex disease of the bone characterized by low bone mineral density (BMD) and weakening of bone structure that can lead to increased risk of fracture, and increased cost of treatment.\(^8\) Osteoporotic bone looks different than regular bone with the matrix having much more open spaces.\(^9\)

According to the World Health Organization (WHO) criteria, osteoporosis is defined as a BMD that lies 2.5 standard deviations (SD) or more below the average value for young healthy women (a T-score of <-2.5 SD).\(^4\) The annual cost of osteoporosis and fractures in the elderly was estimated to be $16 billion, using a 2002 based population sample. The cost estimate of osteoporosis for 2008, as projected from 2002 data, was $22 billion up from $16 billion in 2002.\(^5\) There are about 1.5 million fractures from osteoporosis that result in emergency room admissions, hospitalizations, and taking treatment from doctors and skilled nursing facilities.\(^6\) This shows that osteoporosis has a great impact on health care costs.

SEX DEMOGRAPHICS

Although osteoporosis is commonly thought to affect women, data has shown that elderly men are at risk for osteoporosis and it is a common disorder found in elderly women.\(^7\) Men over 50 years of age are at risk for osteoporosis. However, in men, secondary causes of osteoporosis such as steroid therapy, androgen deprivation therapy, and previous fractures are the most important factors causing osteoporosis.\(^5\)

RACIAL DEMOGRAPHICS

Evidence suggests that African-Americans have higher BMD as compared to Caucasians whereas Hispanic-Americans may have similar or slightly higher BMD as compared to Caucasians. Asians also have lower BMD as compared to Caucasians and other groups.\(^8\)

CAUSES

Osteoporosis is not a part of normal ageing. However, certain changes in ageing may lead to osteoporosis. The leading causes of osteoporosis are as follows:

**Estrogen Deficiency**

A lack of estrogen is a common cause of osteoporosis in elderly women. Postmenopausal women have reduced estrogen levels. Studies have shown that low levels of estradiol cause increase in bone turnover markers, reduced bone mineral density, and hence an increased risk for osteoporosis.\(^10\) Hypogonadism causing deficiency of estrogen leading to osteoporosis is a common factor affecting female athletes.\(^11\) Estrogen deficiency may also occur as a result of surgeries such as oophorectomy, radiation and chemotherapy for ovaries, or autoimmune diseases.\(^12\)

**Testosterone Deficiency**

Studies have shown testosterone deficiency in men is an important cause of osteoporosis in elderly men above 65 years of age.\(^10,13\) Androgens have their effect on the skeletal tissues through estrogen receptors since they are converted into estrogens by aromatization.\(^14\)

**Vitamin Deficiency**

Vitamin D deficiency causes osteopenia and osteoporosis.\(^12\) Vitamin D deficiency results in increased osteoclastic activity through increasing synthesis of parathyroid hormone, decreasing BMD, and increasing the risk of osteoporosis related fractures. This results in a decrease in bone matrix and hence osteoporosis.\(^15\)

One study has also shown that deficiency of Vitamin B12 was associated with low BMD in men as well as women.\(^16\)

**Excessive Vitamin Intake**

Some studies have shown that excessive intake of Vitamin A in the form of supplements is associated with increased risk of fractures due to low BMD and osteoporosis.\(^17,18\) However, there are inconsistent results, hence, the exact effects of Vitamin A on bone health are not clear.

**Smoking and Alcohol Consumption**

Evidence has shown that smoking and alcohol usage adversely affect bone mineral density.\(^19\) Smoking may also affect efficacy of estradiol in individuals who are undergoing treatment for osteoporosis and bone loss is accelerated in untreated women who smoke.\(^20\)

**Immobilization**

Studies say that immobilization leads to decrease in the BMD of the part which is immobilized. There is an increase in the osteoclastic activity in the immobilized part which leads to an increase in the resorption of bone leading to osteoporosis.\(^11\) Immobilization or reduced mobility may be as a result of fractures, spinal cord injuries, stroke, Parkinson disease, or multiple sclerosis to name a few.

**Genetics**

Certain studies have shown that genetics play a role in development of osteoporosis. The study by Kobyliansky et al, shows that there is a genetic influence on the bone mass with black women having more bone mass than Caucasian or Asian women.\(^22\)

**Other Pertinent Causes**

Certain diseases are important causative factors for osteoporosis. Celiac disease is associated with malabsorption of nutrients such as calcium and Vitamin D which has been shown to lead to osteoporosis.\(^23\) Certain childhood disorders such as epilepsy and cerebral palsy may affect BMD which may predispose individuals to osteoporosis in later life.\(^24\) Inflammatory bowel disease is another disease that may cause malabsorption of calcium and Vitamin D. Gastrectomy or gastric bypass surgery may also affect absorption of essential nutrients and may lead to diminished BMD and osteoporosis.\(^25\)
Hypo- and hyperthyroidism are both implicated in osteoporotic fractures. Hyperthyroid patients have a lower bone mineral content as compared to controls. In hypothyroidism, even though the bone density is more, the bone quality is poor which leads to increased risk of fracture. However, once treatment is started and as the person returns to euthyroid state, BMD has been shown to return to normal levels.

Hyperparathyroidism is also an important cause of loss of calcium from bones. Overactivity of parathyroid glands leads to removal of calcium from the bones thus causing reduced bone mineral density thereby leading to fractures.

Type 1, as well as type 2, diabetes have been shown to be an important cause of osteoporosis. However, there is mixed data for type 2 diabetes on BMD. Possible pathogenesis is effect of insulin, insulin like growth factor, advanced glycation end products, changes in calcium metabolism, and effect of cytokines. All of these affect bone quality.

Drug induced osteoporosis

Drugs may induce osteoporosis at any age. However, in elderly individuals their effect may be amplified due to already present age-related changes. Anti-epileptic drugs cause increased metabolism of Vitamin D reducing vitamin D levels. This in turn leads to secondary hyperparathyroidism causing reduction in bone mineral density.

Corticosteroids are highly implicated in secondary osteoporosis. Corticosteroids are commonly used in different conditions such as chronic obstructive pulmonary disorders, dermatological conditions, rheumatoid arthritis, and post organ transplantation surgeries. Long term treatment with corticosteroids results in lowering of BMD in the lumbar spine. However, a study has shown that there is no particular dose-dependent effect of corticosteroids on BMD.

Aromatase inhibitors are frequently used for the treatment of estrogen receptor positive breast cancer. Long term use of aromatase inhibitors (AI) has been shown to affect BMD. In elderly individuals who are already at a risk for increased bone loss, AI may lead to severe deterioration of BMD leading to osteoporosis and an increased risk for fracture.

Androgen deprivation therapy (ADT) is the basis of treatment in prostate cancer. Androgen deprivation therapy results in reduction of levels of testosterone that can affect BMD and cause osteoporosis.

Proton pump inhibitors are prescribed for the treatment of gastric or duodenal ulcers, gastro-esophageal reflux disease. They have been associated with increased risk of fractures. They suppress the production of acid in the stomach. This may lead to impaired calcium absorption from food and hence bone loss. However, there are no robust randomized control trials to support this. Hence, the exact cause of increased prevalence of hip fractures in these individuals is not known.

Loop diuretics increase excretion of calcium through the urine. Studies have shown conflicting evidence regarding loop diuretics being a cause for osteoporosis or low BMD. One study shows that loop diuretics have a dose dependent effect on BMD and hip fracture. However, another study shows that renal losses of calcium are compensated by increase in the production of 1, 25-dihydroxy-Vitamin D levels, thus having a neutral effect on BMD.

Polypharmacy is a major contributor to falls seen in geriatric patients. A study by Kojimo et al showed that polypharmacy is the main cause of falls rather than comorbidities in the elderly.

**COMPLICATIONS**

The main clinical complication of osteoporosis is fracture. Vertebral fractures, femoral neck fracture, and Colles’ fracture are the most common presentations. Risk of fracture is more in the geriatric population due to increased risk of falls caused by lack of activity, fear of fall, medications, sleep disturbance, confusion, and cognitive impairment.

**DIAGNOSIS**

**Histomorphometry**

Bone histomorphometry involves taking a section of bone frequently from the iliac crest. The amount of bone is calculated from that and the cellular activity can also be measured. This technique may not be able to detect early bone loss but it may provide insight in the cause of bone loss.

**Dual Energy X-ray Absorptiometry**

Dual energy x-ray absorptiometry (DEXA) is an easy and affordable method of diagnosis of osteoporosis. It is a non-invasive technique. The study by Humadi et al shows that there is no difference in T-scores for different regions of the body with DEXA. Hence, DEXA of one region of the body can determine the status of the other body regions. This is of significance as it will help in reducing exposure to harmful x-rays and also reduce time taken for the procedure. It is a method of choice for diagnosis of osteoporosis.

**Ultrasound Densitometry**

Ultrasound densitometry is another tool available for identifying individuals with low BMD. Densitometry is usually used to measure BMD of the forearm and heel.

**Quantitative Ultrasound**

Quantitative ultrasound is a cheaper method of assessing BMD for detecting osteoporosis. However, the authors comment that it is not widely used because of the discrepancy in the measurement sites, a large variety of instruments, and lack of standard threshold of risks.

**Biochemical Markers**

Studies by Lofman et al showed that common inexpensive biochemical markers such as serum alkaline phosphatase, osteocalcin, urinary hydroxyproline, and calcium determined current bone mass and were also useful in determining future bone mass loss.

**Radiographs**

Spine radiographs have been shown to identify women with clinical signs of osteoporosis but BMD T-score of greater than or equal to -2.5 who are at increased risk of bone fracture. Radiographs are readily available and can be incorporated in the screening of individuals for fracture risk due to osteoporosis. Radiographic absorptiometry measures the density of bone and compares it with that of aluminum which has a known density. Although, it is not as effective as DEXA, it is a cheaper method to screen individuals.

A study by Johari Khatoonabad et al showed that panoramic radiographs of the mandible may be an effective screening tool for identifying patients.
with osteoporosis. His study showed that radiomorphometric indices of the mandible may provide information regarding bone density.47

**MEDICAL TREATMENT**

Medical treatment of osteoporosis is mainly with drugs. There are different varieties of drugs that are currently being used for the treatment of osteoporosis. The drugs should be selected depending on the individual and their co-morbid conditions. The commonly used drugs for the treatment of osteoporosis are as follows:

1. **Bisphosphonates:** They are considered to be the first line of drugs for prevention and treatment of osteoporosis.48 A study conducted to test the efficacy of alendronate in reducing fractures has shown that alendronate not only reduces risk of fracture in existing vertebral fractures but also in the individuals with low BMD.49 Risedronate has also been shown to have beneficial effect on BMD in men even after 4 years of taking the drug.50 Daily or intermittent ibandronate has also been shown to improve not only BMD but also bone quality, ie, bone trabecular structure.51 Bisphosphonates have to be taken with 6-8 oz of water and the patient should remain upright for at least 30 minutes after taking the tablet until having the first meal of the day. Adverse drug reactions that may occur are gastrointestinal intolerance which may lead to esophagitis or ulceration.52 Hence bisphosanates should not be used in elderly who are bed ridden or who cannot remain upright due to any medical condition. Osteonecrosis of the jaw53 is another risk factor of long term use of bisphosphonates which commonly occurs after tooth removal procedures.

2. **Hormone replacement therapy:** Low dose hormone replacement therapy has been shown to have beneficial effects on the BMD of the lumbar spine as well as the whole body.54 Another study has shown that HRT results in improvement of BMD with no effect on the breast or endometrial tissue in the short term.55

3. **Calcitonin:** Evidence has shown that nasal calcitonin is effective in improving BMD. However, according to the study, nasal calcitonin has a few adverse effects such as nasal irritation, rhinitis, and even epistaxis.58 However, there were no serious side effects identified. The possible mechanism of calcitonin is by inhibition of the inflammatory cytokines which cause bone resorption.59 Another study has shown that oral calcitonin has a positive effect on the BMD of the spine as well as trochanteric and total femoral BMD.60 Thus, oral calcitonin may be used in individuals with nasal problems.

4. **SERMs:** Selective estrogen receptor modulators (SERMs) have a selective estrogen agonist action and antagonist action. This helps it to be an effective drug not only for osteoporosis where agonist action is necessary but also in breast cancer treatment where antagonist action is desirable.61 Tamoxifen and raloxifene are two SERMs which are being currently used for the treatment of osteoporosis and related fractures. Raloxifene has been associated with an increased risk of thromboembolism.62

**ALTERNATIVE THERAPY**

A study by Banu et al53 mentioned using alternative dietary therapies which may have a valuable outcome in the treatment of osteoporosis. In their study, they compiled a list of plant and animal products that may have an effect on BMD. These are ginger, garlic, onion, tea, and ginseng, to name a few. Definite studies to see their effect in human beings are not currently present. However, according to the authors, these alternative therapies may be useful as they may have lesser side-effects, may reduce cost of care due to medications, and be easily available.

**SURGICAL TREATMENT**

There is no direct surgical treatment for osteoporosis. Surgeries are performed for vertebral, wrist, and hip fractures, the most common sites affected by osteoporosis. For vertebral fractures, vertebroplasty and kyphoplasty are the two options. Open reduction and internal fixations for vertebral fractures are generally not performed in geriatric patients because of increased morbidity and mortality.64 Vertebroplasty and kyphoplasty are minimally invasive techniques and are used if there is excessive pain as a result of compression fracture of vertebrae or there is kyphosis and loss of height due to vertebral fractures. Kyphoplasty is effective in restoring height.65

For wrist fractures, open reduction and internal fixation may be performed or it may be conservatively managed. For hip fractures, open reduction/internal fixation may be performed. Hemiarthroplasty and total hip arthroplasty are another two options for hip fractures.

**PT EVALUATION**

The morbidity of osteoporosis is caused by fractures, leading to pain, decrease in physical and social functioning, and loss of quality of life.10 Physical therapists may come across patients with osteoporosis in outpatient clinics, skilled nursing facilities, or home health care. It is important for physical therapists to identify possible risk groups for osteoporosis and refer them to the primary care physician accordingly.

In cases diagnosed with osteoporosis, the following testing should be performed: History forms are an important part of the entire evaluation process. Past history of falls should be asked in detail. Also, medical history of any illnesses, as well as current and previous drugs which may affect BMD, should be ascertained. Also, current medications that may cause drowsiness or affect patient’s arousal should be ascertained as this may cause increased risk of fall. Also, the patient should be asked if there is any pain in any region. The intensity of pain may be recorded with a visual analogue scale.
Observation findings: PTs should look for the following:

Posture
Individuals with osteoporosis may have a forward bent posture that could be due to ageing and may lead to vertebral wedging and subluxation. Or it may be due to vertebral wedging and subluxation. There may be presence of Dowager’s hump which is commonly associated with advanced age and vertebral compression. It is excessive curvature of the thoracic spine that may lead to stooped posture and reduced physical functioning and quality of life.

Deformity
An obvious deformity such as the Dowager’s hump or scoliosis may be seen. Deformities such as dinner-fork deformity may be seen in Colles’ fracture.

Swelling
Swelling may be present due to injury or bone fracture. Swelling in the groin may be present due to hip fracture.

Palpation
Palpation should mainly be done to check for any tenderness that could be due to underlying bony fracture which may have gone unnoticed. Also, palpate for warmth or swelling that could indicate possible injury.

Examination and Evaluation
1. It is important to evaluate for the strength of the muscles. Osteoporosis may be caused by lack of activity due to immobilization caused by fracture, prolonged illness, or sedentary lifestyle. Another reason could be fear of falling causing inactivity in the individual. All these factors may lead to deconditioning of the muscles. Hence, gross muscle testing for the extremities should be performed. Also, core muscle testing should be done.

2. Testing for balance and coordination is another important step in the examination. Studies have shown that fear of fall may lead to adverse outcomes such as falls and reducing physical function. In addition, lack of activity due to fear of falling may further exacerbate the problem of balance and coordination due to muscle weakness. Hence, it is important to examine the balance of these individuals so as to determine the level of assistance they may require with their activities as well as to improve their levels of activity and reduce falls and fear of falls.

3. Respiratory function: Respiratory function may be affected due to alteration in posture caused by ageing as well as due to fracture of bone. Chest expansion should be checked and breathing pattern should also be evaluated to determine any abnormalities.

4. Activity tolerance: Individuals with osteoporosis may not be able to tolerate activities. Reduced activity tolerance may be attributed to age, changes in posture and respiratory function, and reduced endurance due to muscle weakness and easy fatigability due to sedentary lifestyle.

Outcome Measures
It is important for physical therapists to determine individuals with risk of fall; as falls are the most important risk factors for morbidity and mortality in the elderly population. Thus, different outcome measures have been developed to screen for such patients who may show an increased risk of falls. These outcome measures can be used to identify at risk patients as well as to measure their progress with intervention.

Fall Efficacy Scale (FES)
The Short FES-I has been shown to be a reliable and valid measure in elderly individuals with or without cognitive deficit. It is also sensitive to changes caused by interventions to reduce falls. Hence, this is a good scale that can be used by therapists to evaluate patients with osteoporosis to screen them for fall prevention interventions.

Activity Specific Balance Confidence (ABC) Scale
It is another scale which can be used to measure confidence of individuals to maintain balance while performing various activities. Elderly individuals with osteoporosis may lose confidence in their daily activities which may in turn affect their bone quality due to lack of mobility. The ABC scale is strongly associated with physical function. Thus, it may be useful outcome measure during rehabilitation of individuals with osteoporosis with physical training.

Berg Balance Scale
A score below 45 is considered to be associated with increased risk of falls. However, a study by Muir et al has shown that this scale should not be used to determine fall risk since it is a measure of balance and it fails to identify such individuals.

Quality of Life
Evidence has shown that quality of life is affected in individuals with osteoporosis. A study conducted in Sao Paulo demonstrated that vertebral fractures have a negative effect on the quality of life in women with osteoporosis. It has an effect on social as well as mental functioning.

Hence, it is important for PTs to assess quality of life in people with osteoporosis in addition to determining the physical limitation of function. The Quality of Life Questionnaire of the European Foundation for Osteoporosis has been validated for use in individuals with vertebral fractures. It consists of 5 parts: pain, activities of daily living, jobs around the house, mobility, leisure and social activities, health perception, and mood. Since vertebral fractures are common in individuals with osteoporosis, this outcome measure can be used to assess the effect of vertebral fractures on the physical, social, and mental functioning of these individuals.

Also, depression and bone loss are associated. A study has shown that individuals with vertebral fractures may show signs of depression as measured by geriatric depression scale (GDS). Hence, it is important to assess individuals with osteoporosis or low BMD for depressive symptoms as they can be linked. The GDS can be used to assess depressive symptoms in this population. The same study also mentions that if depression and osteoporosis are present together, it would lead to worsening of health problems.

Physical Therapy Treatment
Exercise Training
Physical activity helps to provide better somato-sensory inputs thus reducing the risk of fall and hence reducing the co-morbidities associated
with increased number of falls. Improving independence helps to improve social participation which in turn improves quality of life. A study by Ekstrom showed that individuals with improved timed up and go and higher walking speed have a better social participation and quality of life.

1. Strength training using resistance, such as weights and therabands, are effective strategies in the management of individuals with osteoporosis. Studies have shown that back muscle strengthening exercises are very beneficial in osteoporosis, vertebral fracture, or kyphosis. The training program not only helps to improve strength but also improvement in posture and improved respiratory function. Strength training also has a positive effect on BMD. Back extension exercises are better than flexion exercises in osteoporosis as flexion may exacerbate vertebral compression.

2. Multi-disciplinary training, such as balance and endurance, along with strength training have shown to have a beneficial effect on improving the status of individuals with osteoporosis. Strength, endurance and balance training along with nutritional supplementation for calcium/Vitamin D have shown to have reduced risk of falls in individuals with osteoporosis or osteopenia. High impact weight bearing exercises, strength, and balance training have some effect on BMD. But the greatest benefit that was seen was on the quality of life of postmenopausal women. Another study, which examined the effect of land and water based strength and endurance training resulted in improvement of bone health and muscle strength. Exercises performed in water may be more effective and safe for individuals with osteoporosis due to buoyancy effect.

3. Fall prevention programs: Fall prevention programs comprised of strength training, walking exercises, obstacle and gait training, and training in fall techniques reduced the rate of falls in individuals with osteoporosis. However, another study that included an individualized strength, balance, and vestibular rehabilitation did not result in significant benefit in terms of reducing number of falls or injuries caused by falls. However, since the population groups in both of these studies are from different settings (hospital and community respectively), the results cannot be compared.

4. Aerobic training: A study has shown that aerobic exercise training for 4 weeks resulted in improvement in balance in individuals with osteoporosis and also helped to reduce risk of falls. This can also be used as a preventive program for high risk populations such as postmenopausal women.

5. Core stabilization: Core stabilization training in elderly has shown to improve core muscle strength and dynamic balance. Hence, core muscle training can be a very good form of exercise to reduce the risk of falls in elderly individuals. Sit-ups or crunches should be avoided. Plank exercises, bird-dog, dying bug, and core training on Swiss ball may be performed as they keep the spine in neutral.

All the studies mentioned above have different frequency and durations of exercise. Thus, there is no specific time, frequency, or duration for which these exercises can be performed. The intensity, duration, and frequency of exercise should be customized to individual needs and preferences.

Thus, osteoporosis is a multifactorial disorder. It cannot be attributed to a specific causative factor. It is important to consider the variety of causes that could lead to the condition and plan the treatment accordingly.

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OSTEOPOROSIS

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INTRODUCTION

Osteoporosis is considered the most common type of systemic skeletal disorder characterized by decreased bone mass and fragmentation of microarchitectural bone tissue, leading to increased risk of bone fracture due to an increased fragility of the bones.1 Osteoporosis is considered a major health issue due to its high morbidity and mortality rates with huge economic burden. In the United States, almost 12 million people over the age of 50 years (24% of women and 7.5% of men) suffer with osteoporosis. Every year, an average of 1.5 million fractures occur due to osteoporosis in the United States. Out of these, spine fractures are most common (700,000), followed by hip (300,000) and wrist (200,000).2 It is also estimated that more than 18 million people are osteopenic who are prone to osteoporosis or its related fractures and one of every two women of more than 50 years old will have an episode of osteoporotic fracture in their lifetime.3

On average, 1.5 million fractures occur each year due to osteoporosis.4 As per the records of 2002 the direct medical cost for treatment of osteoporosis ranged from $12 billion to $18 billion per year.5 Out of 200 million people who are suffering with osteoporosis worldwide, 30% of them are postmenopausal women who reside in the United States and Europe.6 Among these osteoporotic patients, 40% of women7 and 15% to 30% of men8 will incur with one or more fractures. Globally, every one out of 3 women and one out of 5 men is considered to be at risk of fracture due to osteoporosis. It is estimated that every 3 seconds an osteoporotic fracture occurs. The most common sites of fractures associated with osteoporosis are at the hip, spine, and wrist. Regardless of gender, with an increase in age the likelihood ratio of these fractures increases.9

ETIOPATHOPHYSIOLOGY

In normal skeletal systems, the tubular shaped long bones have a strong outer shell called a cortical bone that surrounds a soft and mash kind of bone cells called trabecular bone.9 These two types of cells makes these bones stronger and lighter in weight but also flexible enough to take all types of tensile, torsional shear, and compressive stresses from withstanding high impact forces and not sustaining fracture. Bone remodeling plays an important role in skeletal growth that allows the bone to grow continuously and heal after injury. But this process gets altered due to aging where bone, instead of getting remodeled, gets restructured gradually. There is relentless loss of trabecular bone and widening of bone cavity due to resorption of the minerals with in the bone cavity itself along with the inner layers of cortical bone. This loss of trabecular bone mass is slightly compensated by the gradual deposition of extra layers of minerals on the outer layers of the cortical bone.10 Thus the bone gets less denser and thicker which are brittle in older people due to declined bone mass.11

The activities of two important primary type of bone cells called osteoclasts and osteoblasts of different origin determine the balance between bone resorption and bone deposition. Osteoclasts, which are rich in active ion channels in their cell membranes, pump protons into the extracellular space, decreases the pH, and thus play a major role in causing minerals of the bone to dissolve.12 Osteoblasts, on other hand, play an important role in depositing layers of bone minerals. Depending on the activity and balance between these two types of cells, the minerals of the bone are either deposited or eroded. But generally, it is common that the osteoclasts are more active than osteoblasts in the cycle of bone remodeling, leading to bone resorption and formation of "pits." Later a reversal phase begins in which precursors of osteoclasts occupy the "pits" followed by deposition of osteoblast layers forming a new bone matrix.13

The time taken for the bone formation phase generally takes more time than the resorption phase. Therefore, there is net loss of bone density if there is an increase in remodeling activity. During this physiological process of bone formation and depletion, various “signaling” molecules are released in the bone environment through which the precursors, osteoclasts, and osteoblasts communicate with each other. In current research, many studies are being conducted to find how these signaling molecules and endogenous hormones, like estrogen, parathyroid hormone, and testosterone or external factors like diet and exercise are involved and influence the cells of bone physiology.12,13

In the formation of bone, the most primary modulators are hormones like estrogen,14 parathyroid hormone,15 and testosterone16 and are considered to play an important role in the structural development of bone cells and maintenance of mineral levels in the bone.17 Out of these hormones, studies suggest estrogen has an important role and its direct effect on bone cells causes some specific proteins and receptors interact with each other, on the outer surface of osteoblasts and osteoclasts. This interaction of proteins and receptors not only leads to a series of complex events within the bone cells and increases the activity of osteoclastic cells, but also shunts the communication between osteoblast and osteoclast cells. It is interesting to find that the factors that release the osteoblastic cells also stimulate osteoclast cells that cause the resorption of bone.18

Depletion of bone mineral density by the effect of estrogen hormone is mediated by estrogen receptor alpha (ERα) which is a special type of cell surface receptor. The ERα binds estrogen hormone and transports it to the nucleus of the cell where complex of receptor-hormone acts as a switch to turn on specific genes. Apart from ERα, other receptors like estrogen receptor-related receptor alpha are also found on the outer layers of osteoblast which also believed has an influence on the bone cell regulation.19

In this remodeling phase, entry of hormones especially estrogen into the bone...
cells is activated by sex hormone binding globulin.  

Apart from the hormones and receptors, there are few signaling molecules which are produced locally and also influence the physiology of bone density. Bone resorption and formation is influenced and stimulated by few lipid compound molecules like prostaglandins, particularly prostaglandin E2 (PGE2) which is formed by a polyunsaturated omega-6 fatty acid and a precursor called Arachidonic acid. As a response to mechanical stresses within the body, the synthesis of PGE2 is initially mediated by an enzyme called cyclooxygenase 2 (COX2) and its inhibitors prevents the formation of bone. Additionally, in remodeling phase of bone, PGE2 has an important role to play and is required for exercise-induced bone formation. 

Current evidence shows that intake of non-steroidal anti-inflammatory drugs that inhibit COX2 increases the risk of fracture. Other lipid molecules like leukotriene which are also derived from Arachidonic acid also seem to regulate bone remodeling phase and has been found to reduce bone density.

Bone morphogenetic proteins (BMP) that are present on the surface of osteoblasts precursor cells are the receptor proteins, considered as potent inducers of bone formation. These BMPs are the specific cell surface receptors that help in conducting signals from outside cells of bone into their nucleus, where various types of genes which regulate the activity of the bone cells can be turned on or off. Low density lipoprotein-related protein 5 receptor (LRP5) is also a type of cell surface receptor which is considered to be important for bone formation. Many studies have been conducted and proved that loss of LRP5 decreases the bone mineral density and causes severe osteoporosis. It has been discovered that osteoclasts precursor cells are produced by RANK (receptor activator of NFκB) which are later differentiated fully into osteoclasts. RANK is also a cell surface receptor which is activated by their cognate partner RANK ligand (RANKL).

The RANKL is a signaling molecule which is produced by osteoblast cells and helps in bone remodeling coordination by establishing a communication between the osteoblasts and osteoclasts. To prevent the binding between RANK and RANKL, specific proteins like osteoprotegerin are released by osteoblastic cells which acts as a decoy. Studies conducted on these proteins suggest that the balance between RANKL and osteoprotegerin is important. These studies showed decreased cellular production of osteoprotegerin protein causes osteoporosis and increases the risk of fractures, whereas an increase in cellular production of osteoprotegerin protein leads to an increased bone mass.

The deposition and depletion of osteoclasts is also based on a complementary cell signaling system which was disclosed in recent researches. These studies proved that intracellular calcium levels are increased if there is an interaction of cell surface receptors like DNAX-activating protein 12 and Fc Receptor common γ chain (FcRγ) with proteins like ITAM (immunoreceptor tyrosine-based activation motif) adaptor proteins. An increase in these two types of cell surface receptors causes increased bone mineral density (BMD) and their depletion or absence causes severe osteoporosis. The researchers of this study also suggested that the RANK/RANKL and the ITAM-mediated pathways influence the activity of osteoclast cells. A protein called the nuclear factor of activated T cells (NFAT) c1 is activated when RANK/RANKL and the ITAM-mediated pathways gets converged. This NFAT c1 protein acts as a main switch and activates specific genes causing the osteoclasts precursor cells to get differentiated into active osteoclast cells that eventually cause severe bone resorption.

**RISK FACTORS**

Age, gender (female), family history of osteoporosis, previous fracture, ethnicity, menopause or hysterectomy in women, long term glucocorticoid therapy, rheumatoid arthritis, primary or secondary hypogonadism in men are considered as fixed risk factors of osteoporosis. Alcohol, poor nutrition, low dietary calcium intake, eating disorders, low body mass index, smoking, Vitamin D deficiency, frequent falls, and insufficient exercise are considered as most common modifiable risk factors.

In research based on a survey of home care clients, researchers tried to find the risk profile and prevalence of fractures in older osteoporotic patients. Inclusion criteria included, patients of 65 years of age, residing in their own home, not receiving any other care services and not having dementia. About 1500 home care clients were selected randomly and a survey questionnaire was sent to gather information like demographic data, height and weight, risk factors, history of fracture, and treatments taken. After the data was analyzed, the results showed that older patients of 80 years were more prone to fractures than younger patients (P = 0.002) mostly with wrist fractures (P = 0.004). The results of risk profile showed that women had more risk factors than men (P < 0.001). Out of these older patients of 80 years old had more risk factors (P = 0.001). Only 34.5% of the respondents had undergone a complete osteoporosis assessment and out of those, few were referred to their general physician (44%), few referred to a medical specialist (39%) and the remaining to an osteoporosis specialist (31%). Only 54.6% of fractured cases had received treatment to reduce the further risk of more fractures.

Thus the authors concluded that only few home care clients get appropriate assessment and treatment for osteoporosis. Therefore they are at high risk. The authors recommended the home care providers to create awareness among these patients and help them from preventing risk of fractures. Therefore, it is very essential for home care providers to educate patients regarding the do’s and don’ts. Supportive care along with treatment is very essential in this patient population.

**DIAGNOSIS**

According to WHO, osteoporosis is defined based on the scores of BMD. Peak bone mass and bone loss of patient is measured using BMD score (T-score) which is compared to the BMD score (Z-scores) of control subjects of matched age and sex. Thus based on these scores osteoporosis is diagnosed if a patient’s BMD is equal to or more than 2.5 standard deviations below the threshold value and osteopenia is diagnosed when the measurement lies between 1 and 2.5 standard deviations below the young adult threshold value.

To detect the bone loss, dual-energy x-ray absorptiometry (DEXA) is generally used, which is a low radiation x-ray used to measure bone density of spine and hip. In 2008, a few researchers

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made a hypothesis that if an appropriate screening is done it would result in receiving an effective treatment by making the relevant decisions by patients and physicians. In this study a follow-up questionnaire was taken from these patients regarding their visit to a specialty doctor. The questionnaire also included blood tests reports, exercises prescribed, diet changes, questions on patient’s perception of care, their participation, and knowledge of their own health. Out of 239 patients who were screened for osteoporosis, only 215 people answered the questionnaire. Based on BMD out of these 239 patients, 87 were diagnosed as osteoporotic, 99 as osteopenic, and the remaining 99 were normal. From the group of 87 osteoporotic patients, 76 consulted the doctor and received specific treatments like bisphosphonates, riloxifene, and teriparatide, while the remaining 40 were not treated. Sixty-one patients of the osteoporotic group and 40 of the osteopenic group had taken medications regularly.

Based on the results, 90% of the osteoporotic group with low mineral density consulted doctor and had taken effective treatment. Only 38% of patients with normal BMD had taken appropriate treatment. Thus the authors concluded that the more severe the osteoporotic condition, the stronger was the patient’s urging to receive effective treatment indicating a higher degree of compliance. Based on these conclusions the authors made interpretations that screening helps in identifying the patients with low mineral density for which effective medical treatment can be given. So if DEXA is used as a diagnostic tool for identifying patients with low BMD, then effective treatment can be given, as identifying patients with osteoporosis based on initial symptoms is difficult.

According to Whittingham, men with chronic heart failure have decreased BMD which leads to increased risk of osteoporotic fractures. In women aged between 50 and 81 years who were hypertensive, the calcium metabolism is altered causing fragility of bones due to which they are highly prone to osteoporotic fractures. According to these authors, medications used for heart failure like thiazide diuretics, angiotensin-converting enzyme inhibitors and beta-blockers causes hypotension increasing the risk of fall in these patients. The authors suggested the specialist nurses use the Fracture Risk assessment tool on patients with comorbidities like heart failure, diabetes, and renal failure for a further detailed assessment should be performed on them. The authors concluded by recommending few indicators like fall assessment tools, New York Heart Association functional classification scores for frailty, life style factors that should be considered seriously. Based on these indicators, if patient is identified at risk, the BMD screening should be performed immediately.

In 2009, Ito et al. conducted a cohort study. The main aim of this hypothetical cohort study was using Osteoporosis Self-Assessment Tool (OST) and performing bone densitometry only for high-risk patients thereby comparing the health benefits and costs associated. Subjects were 70-year-old U.S. white patients having no history of osteoporotic fractures. Using decision analytical model, 3 strategies like no bone densitometry, selective bone densitometry using the OST, and universal bone densitometry were compared following 5 years of alendronate therapy for the patients diagnosed with osteoporosis. Incremental cost effectiveness and quality-adjusted life years gained were the outcome measures. Based on the results of the study, it was evident that using the OST by selective bone densitometry cost $100,700 per additional life year when compared to no bone densitometry strategy. Universal bone densitometry costs $483,500 for additional life year when compared to selective bone densitometry. For patients more than 84 years old, selective bone densitometry was not only more cost saving (≤$110 per year) but also reduced the risk of non-vertebral fracture (≥82%). Thus the authors concluded that using OST is cost effective to stratify the risk patients. They recommended to perform bone densitometry only for high-risk patients and to provide alendronate therapy only to those who were assessed and diagnosed with osteoporosis.

### TREATMENT

#### Pharmacological Treatment

Bisphosphonates like Alendronate, Risedronate, Ibandronate, and Ibandronate act as osteoclastic inhibitors and thus prevents the bone resorption. Research studies show that in women with established osteoporosis, Alendronate treatment helps to decreases bone resorption by increasing the BMD and reduces the incidence of fractures by 30% to 50%. It also decreases the bone loss in osteoporotic men, who receive androgen deprivation therapy for prostate cancer along with glucocorticoid-induced osteoporosis. In osteoporotic women of age 70 to 79 years, treatment with Risedronate, it is proved that the incidence of hip fracture has decreased by 40%. By daily administration of Ibandronate orally of 2.5 mg or intermittently with a dosage of 20 mg every other day for 12 doses every 3 months in postmenopausal osteoporotic women, it helps them to increase their BMD and reduces bone turnover and incidence of vertebral fractures by at least 50%. Zoledronic acid (ZOL), when given intravenously 5 mg once in a year to postmenopausal women with osteoporosis, helps in decreasing the incidence of vertebral fractures by at least 50%.

### RANGE

<table>
<thead>
<tr>
<th>RANGE</th>
<th>BMD VALUES</th>
<th>T-Score</th>
</tr>
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<tbody>
<tr>
<td>Normal</td>
<td>BMD within 1 SD of the mean bone density for young adult women</td>
<td>T-score ≥ –1</td>
</tr>
<tr>
<td>Osteopenia</td>
<td>BMD 1–2.5 SD below the mean for young-adult women</td>
<td>T-score between –1 and –2.5</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>BMD ≥±2.5 SD below the normal mean for young-adult women</td>
<td>T-score ≤ –2.5</td>
</tr>
<tr>
<td>Severe</td>
<td>BMD ≥±2.5 SD below the normal mean for young-adult women in a patient who has already experienced ≥1 fractures</td>
<td>T-score ≤ –2.5 (with fragility fracture[s])</td>
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of vertebral fractures by 70% and in the incidence of non-vertebral fractures by 25%.52

A study was conducted to check the efficacy of intravenous ZOL 5 mg in reducing the fracture risk in postmenopausal women with osteoporosis if given once yearly. The subjects were randomized to either the intervention group (n=1,961) who received an intravenous infusion of ZOL 5mg or the placebo group (n=1,926). New vertebral and hip fractures or any kind of clinical vertebral and nonvertebral fractures and changes in bone turnover markers levels and BMD were considered endpoints. The results showed that at 3 years the subjects of the intervention group showed lesser incidence of any clinical fracture (10.8% vs. 16.6%), clinical vertebral fracture (1.1% vs. 3.7%), and nonvertebral fracture (9.9% vs. 13.7%) when compared to placebo group. Thus, the researchers concluded that by administering intravenous ZOL 5mg once-yearly, postmenopausal elderly women with osteoporosis decreased the risk of vertebral and non-vertebral fractures.53

Calcitonin, which is available commercially as Salmon calcitonin nasal spray, is a 32-amino-acid peptide secreted by the C-cells of the thyroid gland. In osteoporotic old women with prevalent vertebral fractures, this spray increases the bone mineral density BMD by inhibiting the osteoclastic cells in a very mild range and decreases the incidence of vertebral fractures by 33%.54 Recombinant 1-34 fragment of human parathyroid hormone [rhPTH (1-34), teriparatide] and recombinant human intact parathyroid hormone [PTH (1-84)] are believed to decreases the incidence of new vertebral fractures (65%) and of non-vertebral fractures (53%) in women with osteoporosis.55

In 2007, the researchers conducted a RCT to study the changes of BMD in patients with secondary hyperparathyroidism (HPTH) when treated with Alendronate (ALN) or ALN plus calcitriol (1,25D3). The results of the study showed that patients of ALN plus 1,25D3 showed a significantly higher increase in lumbar spine BMD than those patients receiving ALN alone (mean percentage ± standard deviation 6.8 ± 4.6 vs. 3.7 ± 3.2, p<.001). Also, the serum levels of PTH decreased significantly in the ALN plus 1,25D3 group (-32.1 ± 22.1, p<.001). Based on the response of ALN on the levels of PTH of patients, the authors concluded that before starting any treatment protocols, it is better to measure the PTH levels that are at high risk of HPTH.56 But this study has threat to external validity, as the results of the study cannot be generalized to all kinds of geriatric patients.

**Fall Prevention Program**

Smulders et al57 conducted a RCT with an objective to understand the mechanism of Nijmegen Falls Prevention Program (NFPP) in patients with osteoporosis. The important aspects of the NFPP are to walk over an obstacle course which consists of environmental obstacles that are usually encountered in activities of daily living. It also includes educating the osteoporosis condition to patient and teaching safety issues while walking in the house or in crowded places, during weight-bearing exercises, correction of gait abnormalities, and the correct practice of fall techniques. In this study, the obstacle avoidance performance was compared between the NFPP group (n=50) and the control that received no treatment (n=46). The results of the study showed that the NFPP group showed significant improvement in obstacle avoidance success rates than the control group. Thus, this program helped the patients of osteoporosis to avoid obstacles, prevent falls, and lead to “improved skills of dual tasking and decreased fear of falling.”57 This kind of prevention programs should be applied in clinical settings of all nursing home departments.

**Awareness Programs**

Susanne Dalsgaard Reventlow58 conducted a qualitative interview study on 60-year-old elderly women with an aim to understand their physical activity and perception of the risk of osteoporosis. In-depth interviews were conducted on 16 elderly women (purposeful selection) to gather data regarding their perceptions and experiences. The results of the study showed that most women had perceived osteoporosis as an immediate risk. Most of the women were scared of fractures, so they had completely restricted their physical activities. Only the women whose bone scan was normal believed that their bones were strong enough to lead a normal life. Most of them expressed a feeling of “bodily fragility” and stopped participating in many leisure activities like walking, cycling, and playing sports and games. Thus the results proved that the women had overestimated the risk and limited most of their physical activities, mainly weight bearing. Therefore, authors concluded that awareness programs regarding osteoporosis and definite advice to weight bearing activities are very essential for the well-being of the patients.58

**Tai Chi**

In a prospective pilot study, the researchers hypothesized that in osteoporotic elderly female patients, taking 12 weeks of 5-Form, Yang Style Tai C (TC) instruction would help to improve mobility of the joints, strength of muscles, confidence, performance of balance, along with decreased incidence of falls. The intervention of TC classes when given twice a week for 12 weeks, balance performance of both legs showed significant improvement (p<0.05). Functional strength and mobility of the joints also showed improvements (p<0.05) which were evident even in long term follow up. Thus the authors concluded that TC as a safe practice and low cost intervention that helps the patients of osteoporotic female patients.59

**Physical Therapy**

Bennell et al,60 in the year 2010, conducted a RCT to study and quantify the efficacy of a physiotherapy program that helps in improving quality of life with increased physical function in patients with osteoporotic vertebral fracture. This was achieved by implementing manual techniques and pain reducing exercises, increasing the strength of back and lower extremity muscles, and increasing postural control, trunk stability, and mobility. This program consists of postural taping for a week followed by postural and range of motion exercises daily, along with strengthening and trunk control exercises 3 times per week. Based on outcome measures assessed at base line and 11 months after intervention, it was found that there was significant pain reduction in the intervention group during movement [mean difference -1.8 (-3.5 to -0.1)] and also at rest [-2.0 (-3.8 to -0.2)]. Improvements in Quallefo physical function [-4.8 (-9.2 to -0.5)] and the Timed Loaded Standing test [46.7 (16.1 to 77.3) secs] were also evident in the study. Thus the
study results supported the hypothesis that physical therapy program helps in improving quality of life with increased physical function in patients with osteoporotic vertebral fracture.60

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59. Murphy L, Singh B. Effects of 5-Form, Yang Style Tai Chi on older females who have or are at risk for developing osteoporosis. Physiother Theory Pract. 2008;24(5):311-320.


Sakshi Jamwal is a student at the University of Indianapolis currently pursuing a Masters in Health Sciences, majoring in musculoskeletal sciences. She completed her bachelors in physical therapy from Jammu College of Physiotherapy, in Jammu, India. While working as a supervising physical therapist at GEM Nursing Home in India, she was awarded “Young Scientist” from the National Science Congress, conducted by Regional Institute of Education at Mysore, India. She is going to start her career as a physical therapist at a skilled nursing facility in New York very soon and is looking forward to working with the geriatric population.

Jennifer M. Bottomley is an independent consultant in geriatric rehabilitation, an educator, and has authored numerous articles, chapters, and texts. She currently serves on an Interdisciplinary Medicare Advisory Board for the White House, assisting in recommendations towards Health Care Reform.
A student currently enrolled in second-year studies in the Somerset Community College Physical Therapist Assistant Program has been named the recipient of the American Physical Therapy Association (APTA) Section on Geriatrics’ Outstanding Student Award for 2014. Briana Allen, of Monticello, received the award at the APTA Combined Sections Meeting in Las Vegas, Nevada.

Allen is the second SCC student to win the award. Debora Lasure of Stanford was the 2013 recipient.

Allen attended Monticello High School in Kentucky where she was a student athlete. She has been active in a number of community service projects, including assisting with free health screens at the Kentucky Special Olympics. On campus, she served as president of SCC’s Physical Therapy Student Organization and Martial Arts Club and was a Representative of the Student Government Association. She is a Student Ambassador and represented the college at the 2013 Kentucky Mountain Laurel Festival Pageant. She has participated in many student recruitment initiatives, including the Governor’s Minority Scholarship Preparation Program, Camp Jump Start and the Rogers Scholars Programs.

Active within the APTA, Allen has attended the past two APTA National Student Conclaves and participated in the PTA program’s fundraising efforts in the Pittsburgh-Marquette Challenge, for which the program was named the “Outstanding PTA Program” by the Foundation for Physical Therapy. She has co-authored educational brochures related to elderly populations and coordinated free self-defense and tai chi courses.

Allen was nominated for the award by Program Director Ron Meade, who described Allen as “compassionate, caring, and extremely humble.” The nomination was supported by program faculty members Dr. Steve Hammons, PT, and Claudette Prather, PTA, and by program students Christine Sooriya-Arachchi and Katie Linville.

Allen is the daughter of Robert and Michelle Allen of Monticello and has a brother, Andre. She is presently employed by the physical therapy department at Wayne County Hospital.

For more information about the SCC PTA Program, contact the program’s director at ron.meade@kctcs.edu.
When people think about a 90-year-old woman, what do they see? Most of the population today would not picture a basketball championship team, or a woman dribbling a ball up-and-down a court, or even a woman who spends her Saturday nights doing anything but watching television, let alone playing in the San Diego Basketball Tournament for seniors. That is exactly what an 87-year-old woman was doing on May 19, 2013. She and her fellow ladies call themselves the “Old Beaches.” The Old Beaches get together at least once a week at a local San Marcos gym to practice for the big games. Sitting on the sidelines running the scoreboard for the many games that were held that day, my whole outlook on aging turned 180°. I spent the entire afternoon in awe of the women before me. Their agility, speed, competitiveness, and spirits overwhelmed me and made me rethink everything I had stereotyped about the geriatric population.

The North County Senior Games were held at the San Marcos community gym. There were more than 80 female participants who ranged in age from 40 to 87. The games were set up according to age groups. The 40s, 50s, 60s, 70s, and 80s were all represented with pride. The women had been training for months to compete in this tournament, and they were not here to mess around. The women played multiple games, some back-to-back all day in hopes of taking home the trophy. The teams varied by skill level and even within each team the skill level of each woman varied greatly. It was hard to imagine testing any one of these fit and healthy women for a TUG test, or a Functional Reach Test. When we learned these exams in gerontology class, it was assumed that individuals in their 80s would have decreased time results in these tests. These ladies would have no such deficits. These women were clearly healthier than many younger patients being examined in these ways in the clinic. It was almost comical to imagine player number 13, a personal favorite, with her white hair pulled back into a pony tail and her frail looking legs speeding her down the court faster than most 23 year olds could run, performing any geriatric functional tests at all. It took number 13 exactly 5 seconds to dribble a ball the 22 feet length of the court. Needless to say she passed the impromptu 10-meter walk test with flying colors.

It was clear from the beginning that these women may be at the very top of the healthy scale for their ages. The agility, coordination, speed, balance, and reaction time needed to compete in this tournament was not understated. As the games went on and the ladies became more fatigued, it became slightly more obvious that the skill levels varied greatly. Many of them began to pull out their knee braces, ankle braces, or wrist support. It took considerable restraint not to approach the knee brace-wearers and educate them on the misnomers of these non-prescribed braces that were in the wrong size for these athletes. A recent lecture on the “On Track” brace made by Kate Grace and the benefits of realigning the patella instead of throwing on a Buttress Brace flooded every physical therapy student’s mind as these women struggled to pull up their too big braces. It became evident how important proper fit of aid devices are and that education alone can be critical for the geriatric population, even the most active of the group.

Even though throughout the day fatigue did set in for most of the ladies, their spirits did not show it. These women were running and jumping for over 8 hours. The National Osteoporosis Foundation states that one of the best ways to prevent osteoporosis is to exercise including high impact activities. These women have that covered. Between their bounds down the court and their layups at the basket these ladies are most certainly building bone with the high impact nature of their sport and preventing osteoporosis on a daily basis. When comparing these women to other 80-year-olds I have met, it is obvious that their lifestyle has directly affected their quality of life keeping them fit, strong, agile, and sharp.

Looking back on the experience, I also realize what a benefit “living big” can be. After a lecture on BIG Therapy it is clear to me that geriatrics that are active in sports may also see the benefits of this theory. The theory focuses on big movements, big voices, and big thoughts to particularly help patients who have Parkinson disease amplify their day-today activities. Parkinson disease can cause the patient to have muffled voices and movements to the point that they are not heard or take too long to ambulate from place to place. As far as I could tell none of these ladies had Parkinson disease but what a fantastic sport to encourage large scale movements and big voices. There are not many sports that have you so low to the ground and then an explosive jump with your arms overhead in one swift movement. It dawned on me that the idea behind BIG therapy could benefit all geriatrics, and not just individuals who have Parkinson disease.
Although I volunteered at the basketball tournament in North County San Diego, this is not the only opportunity seniors have to compete in this event. The San Diego Senior Games is an Association that was founded in 1992. Their mission is to, “Encourage senior adults, aged 50 or older, to carry on vigorous lives by developing and maintaining high levels of physical activity and mental fitness through regular participation in sports, fitness, and health education activities.” In 2012, it was estimated that over 2,000 seniors competed in the games and more than 1,000 individuals will participate as coaches, spectators, and volunteers. This association is a prime example of community activities that help keep our seniors healthy and active. As a future physical therapist, I cherish being involved in activities such as this, to be apart of an event that is making a difference in so many lives. It is easy to say how important it is to stay active into later years, it is another to actually do it. Programs like the Senior Games are exactly what our society needs to keep citizens as healthy as possible for as long as possible. I am honored to have been a part of this event and will continue to cheer the Old Beaches on for many seasons to come.

RESOURCES

WHEN LEARNING CAME BEFORE A FALL
My Experience at the San Marcos Senior Center: A Reflection Paper

Grace Bhalla, SPT, DPT Graduate Student

There she sat at a table in the corner of the room. Her frail, weak body masked by her bright-eyed banter with her friend. The wrinkles on her skin commanded a type of respect that only years of experience could warrant. I mustered the courage to strike up a conversation and quickly realized that unfamiliar company was of little interest to her. All she wanted was to be left alone; to float in her bubble of familiarity. As I walked away disappointed by her rejection, yet contented with my attempt; I realized that it was her demeanor, not so much her words, that taught me more than I would ever learn from books.

Anti-aging products do not even begin to describe the stigma that we, as a society, associate with the aging process. Yet here I was, at the San Marcos Senior Centre, volunteering to screen the elderly, my clouded view unwilling to change. I refuse to simply brush off my experience as an eye-opener, which in all regards, it was. The real value of my volunteering, however, lays in my acceptance of aging as a process that must be skilfully dealt with. While 4 hours of volunteering cannot undo years of unpleasantness felt towards aging, I think that I gained a reformed perspective. Three key thoughts summarize my take home message from this activity and I believe that in some unforeseen manner these lessons will make me a better clinician.

1. You CANNOT ignore them, even if you tried!

I always questioned the point of reviewing random statistics in lectures. How did the 15.3% increase in elderly population affect me? What does an 18.8 year increase in life expectancy mean to my PT career? Theoretically speaking, these were just numbers that predicted a rise in a population I never intended to treat. Then again as I watched the crowd of elderly people trickle into the Senior Centre; those very statistics became more than just predicted numbers. The need for geriatric PT, be it from a specialization perspective or otherwise, is critical to defining the future of health care. The predicted population increase coupled with the high life expectancy makes it very plausible that a significant percentage of my patients will comprise the elderly. To think that I would never have to clinically use any aspect of what I learn in gerontology is unreasonably audacious.

Furthermore, the screen results of some patients younger than 65 years indicated that they were potentially headed toward being a fall risk. This early onset of symptoms shows that physiological decline in balance, coordination, somatosensation, and other body functions is anything but a sudden development at 65 years of age. Aging is an on-going process and what we, as PTs, do at any stage in this process (before, at, or after 65) eventually affects the functional quality of an elderly life.

2. They’re experiencing it WITH you not BEFORE you!

Having taken several courses on aging at various levels in my academic career, I deduced that the bottom line was this: Aging meant weak bones, decreased muscle mass, increased co-morbidities, decreased skin elasticity, incontinence, and decreased independence. Three terms in PT school did not teach me any different. Anatomy and biomechanics stressed on the decrease in bone growth, connective tissue elasticity, and nerve conduction velocity. Neuromus-
Falling is a natural fear. This fear is especially of concern in the elderly population. As people get older, the number of falls and the severity of injury increase.\(^1\)

Falls are the leading cause for hospitalization and death for adults 65 years or older. It also is the most common reason for non-fatal injuries such as hip fractures, lacerations, and head injuries.\(^1\)

Falls by older adults are attributed to many reasons including: decreased mobility from inactivity, impaired vision and hearing, slower physical reactions, poor balance and coordination, osteoporosis, and decreased physical stamina. Sometimes, the same treatments (ie, restraints, assistive device, and medications) used to prevent many of these adverse health conditions actually increase the risk of falls.\(^1\) Seniors who become

**COMMUNITY REFLECTION PAPER: MY DAY AT THE SAN MARCOS SENIOR CENTER**

Karen Tong, SPT, DPT Graduate Student

Falls are the leading cause for hospitalization and death for adults 65 years or older. It also is the most common reason for non-fatal injuries such as hip fractures, lacerations, and head injuries.\(^1\)

Falls by older adults are attributed to many reasons including: decreased mobility from inactivity, impaired vision and hearing, slower physical reactions, poor balance and coordination, osteoporosis, and decreased physical stamina. Sometimes, the same treatments (ie, restraints, assistive device, and medications) used to prevent many of these adverse health conditions actually increase the risk of falls.\(^1\) Seniors who become
sedentary and avoid physical activity due to fear of falling will also be more likely to have an accident. For these reasons, it is important for health practitioners to assess older adults' risk for falls and spot safety problems early on.

Falls are scary, but the reality is they are preventable at any age. Physical therapists and occupational therapists can prevent injuries associated with falls by identifying individuals who are at risk. Once the individual is identified, we must educate patients about medical and environmental factors that contribute to their risk. We must then implement balance training and exercises to minimize or prevent future falls. These interventions should be individualized and functional so each patient has the opportunity to address specific conditions that predisposes them to falling. However, a fall risk assessment must be done before we can implement any type of interventions.

I participated in my first fall risk assessment at the San Marcos Senior Center with Dr. Childers and 9 other classmates this past June. This was a wonderful experience because I was able to integrate concepts and skills learned from the first 3 terms of PT school. When I first walked into the senior center, I found the facility to be a very warm and inviting place. This was a stark contrast to the image I had in my mind of senior centers being depressing and somber. One of the first things I noticed when I walked in was an activity board announcing an event for speed dating. I could not help but laugh when I saw that sign. This announcement took me back to one of the first lectures of Gerontology class, when Dr. Childers debunked a myth that seniors have no interest in dating and engaging in sexual relationships. Here in front of me was evidence that seniors are still interested in dating. As Dr. Childers stated in her lecture, "sexuality in this group is non-reproductive recreational activity related to emotional health and life satisfaction." There are significantly less stigmas associated with seniors dating than before. An AARP survey conducted in 1999 and 2005 showed older adults have greater acceptance of sexuality outside marriage, increased availability of drugs for erectile dysfunction, and a high percentage of baby boomers engaging in online dating. Coupled this with the Viagra revolution 15 years ago, and we see more people able to enjoy the pleasures of sex at any age. Speed dating at this senior center was enough evidence for me to prove old age does not signify the end of sexual activity and start of new relationships.

As I continued to pass through the lobby of the senior center, I was directed into the activities room by a friendly, elderly woman aged 70 or so, who worked at the informational front desk. She was hustling and bustling, taking phone calls, answering questions, and directing people to their place of interest within the center. I observed her in action for a moment and took notice of her ability to multi-task and perform activities that require a high level of cognition. This brief observation helped demystify yet another myth about aging: older workers are less productive than younger workers because their declining brain functions do not allow them to succeed in the workplace. As we learned in class, this is simply not true. Older workers are highly motivated and they often draw on experiences to solve problems, making them important assets to any work force. Many older adults have intact cognition, allowing them to be as productive, if not more, than their younger counterparts. Observing this particular woman, it was clear that age was not slowing her down. I thought to myself, she could be on a beach somewhere or at home enjoying retirement, but instead she was here at San Marcos Senior Center working and serving others. She represents 19% of Americans, age 65 and older, who are choosing to withhold retirement and continue to work. Perhaps this woman was wise and understood the concepts of neural plasticity. As we learned in class, the brain continues to change and reorganize in response to new knowledge and motor skills acquired throughout a person's life span. This woman knew by engaging in stimulating activities such as volunteer work, she is more likely to maintain memory and important neural connections than her sedentary and inactive friends. Not only that, she gets to interact with people all day and improve her social health. Through her service at the center, she is continuing to stay physically and mentally active, and she is living a healthier post-retirement life than most.

In the activity room, my classmates and I prepared a safe area for the fall risk assessments. We set up 6 stations: interview and history taking, Romberg test, single leg stance, time up and go, four square step test, and 30 seconds sit to stand test. As learned in class, these tests assess a person's ability to use compensatory postural strategies and postural control during stance. By having participants perform functional activities such as standing with their eyes closed, balancing on one leg, and getting up from a chair, we challenge both their anticipatory (proactive) and adaptive (reactive) postural strategies. This is important to assess because many seniors develop poor balance overtime due to muscle atrophy, delayed activation of postural synergies, and difficulty scaling the amplitude of appropriate size postural synergy responses. Some may also display sensory impairments such as problems with vision, somatosensory, and vestibular inputs. As we learned throughout our studies at the University of Saint Augustine (USA), in order to effectively restore stability and execute postural strategies, the CNS must know where the body is in space and whether the body is in motion. For most neurologically intact patients, somatosensory inputs provide the greatest and most reliable information. When this is compromised, visual input must compensate and step in. If that is compromised as well, the vestibular system is the last resort. When two or more systems are compromised, we will likely see balance and coordination deficits. The 5 specific tests used for our fall risk assessment will help identify individuals who may have these deficits.

For the assessment, I was placed in charge of the sit to stand station. In this particular test, patients are asked to perform as many sit to stands from a chair as possible in 30 seconds without use of their arms for support. This test evaluates a person's dynamic balance, functional mobility, and served as a way to objectively document changes over time. Since most people perform sit to stand numerous times a day, this is an assessment of overall transfer ability. In the span of 4 hours at the senior center, I administered this test for over 25 individuals and was able to compare the performances among this group. One person I distinctly recalled displaying poor performance on this test was Paul, who was 68 years old. From an initial observation, he presented with slight kyphotic posture and looked a bit thin for...
his age, but otherwise appeared healthy. I introduced myself and informed him the purpose of the test. Although I reassured him the safety of this test, I could tell Paul was a bit apprehensive. Perhaps he was discouraged by the results of the last station, the Romberg test, where he nearly fell over doing the tandem stance with his eyes closed. Aware of this, I guarded him closely. Paul prepared himself for the sit to stand task by doing what so many others mistakenly do: he sat towards the back of the chair. He thought this would give him extra stability, but he unknowingly placed his back under the chair, his pelvis rotated posteriorly and his center of mass was placed far behind his legs. He would have to lean over with an anterior trunk weight shift and rely on his weak abdominals and back muscles to get him over his center of gravity. Since this was a true functional assessment, I waited to correct him after the exam. I watched and carefully monitored Paul as he performed several reps, with each successive rep more difficult and clumsier than the last. He was able to perform 7 reps before he fatigued and was unable to do anymore. According to this test’s standards, a person his age should be able to do 12 reps. Unfortunately, Paul fell short of the mark and was identified as a fall risk. At the end of the test, I instructed a tired Paul to perform one more rep but this time with his bottom scooted to the front of his chair and his legs placed under him. Paul tried this method and was surprised the difference these simple adjustments made. Not only did he feel safer performing the task, he moved with greater ease and efficiency. Paul later told me he felt fortunate to have performed the fall risk assessment that day because he realized he had been getting up from his chair incorrectly all along. He expressed his gratitude and even vowed to teach his friends what he learned. I was thrilled to have heard those words from Paul. I was pleasantly surprised by the impact I was able to make by just showing people how to correctly get up from a chair.

During my time at the San Marcos Senior Center, I was reminded of the reasons why I pursued the field of physical therapy. When I first arrived in the United States, I had the purpose in mind to help people just like Paul. Admittedly though, during my first two terms, I briefly lost sight of that purpose. Consumed with my studies, I found myself learning not for the reason of one day educating information to others, but in hopes of just getting good grades. Volunteering at the senior center brought me back to experiences I had working as an aide in the clinic, when I knew physical therapy was much more than seeing patients every half hour from 9 to 5, and receiving a paycheck every two weeks. I realized learning to be a great physical therapist in school is similarly much more than memorizing words on a paper, selecting correct answers from a list of multiple choices, and getting As on a transcript. The experience at the senior center reminded me what a good health care practitioner needs to be: one who truly cares and is willing to spend time with their patients. Paul and the other patients helped me remember my purpose at USA and reaffirmed my goal to be a caring, compassionate PT.

RESOURCES

SENIO S BEHIND THE WHEEL: A REFLECTION PAPER

Morgan Romans, SPT, DPT Graduate Student

Many older adults are fully capable and entitled to have a lifetime of safe and enjoyable driving experiences, thereby maintaining their independence and responsibility into the older years. While decisions about an individual’s ability to safely operate a vehicle should never be based solely on age, there are many factors that may contribute to an older adult’s inability to drive safely on the roadways. Whether it is due to a current medical condition, physical fitness, vision, hearing, cognitive changes or altered reflexes, an individual’s lack of safety and proactive disposition may be grounds for revocation of their license due to safety concerns. Family members, social support groups, and clinicians are all key players in accurately assessing an elderly individual’s ability to drive a vehicle, and ultimately play a role in the decision for an older adult to continue driving safely on the roadways, or potentially have their license revoked and choose an alternate mode of transportation.1

While assessing an elderly individual’s ability to drive safely and navigate the roadways is critical for keeping the community free from unnecessary motor vehicle accidents, there are a limited number of resources and tools to implement an assessment and promote safe elderly driving. One of the main programs that offer older adults the opportunity to assess how well their vehicle promotes safety is through the organization known as CarFit. An educational program located nationwide, CarFit offers elderly individuals information and even adaptive equipment for their vehicle in order to promote safety for drivers and their community, as well as increase mobility and access to resources within the area. While elderly drivers typically wear their seatbelts more often and are less likely to speed or drive intoxicated as compared to younger drivers, there is a greater risk for them to suffer from serious injuries or even death related to a motor vehicle accident due to the fragility and vulnerability of their aging bodies.2 Therefore, it is critical for older adults to assess and
understand the importance of how well their vehicle adapts to them as a driver as well as on the roadways, in order to keep them, their family, and the surrounding community safeguarded from preventable accidents.

Since the assessment of older adult driving is critical for the safety of the community and preventable accidents, CarFit events are held nationwide and consist of trained technicians and health professionals who work directly with each participant to determine how adaptable their car is in order to ensure maximum comfort and safety. In only 20 minutes, a driver at a CarFit event can have their mirrors adjusted to minimize blind spots, be advised on proper foot positioning on the gas and brake pedals in order to prevent muscle weakness and slow reaction times, have the height of the steering wheel adjusted to a proper setting, and even be recommended adaptive equipment such as pedal extensions, key holders, leg lifters, or a seat belt easy reach handle for increased efficiency. While CarFit creates an open environment for conversation about safe driving, it can be guaranteed that the event coordinators and health professionals maintain all information about the driver and the most appropriate equipment adaptations confidential. Contrary to common belief, CarFit is not considered an evaluation for revocation of a license, a pass or fail examination, nor does it provide any personal information to law enforcement or any other parties on the roadway. It will not be critical to assess and evaluate the range of motion, muscle strength, reaction time, reflexes, and also to educate the patient on medication effects as well as impaired vision and hearing that may risk their safety and the safety of others on the roadway. It will not only be necessary to educate the older driver on the importance of having an appropriately fitted vehicle, but also to educate their family and loved ones on warning signs that warrant an intervention in order to keep the older adult safe. Potential warning signs that may be grounds for a conversation and further evaluation to be made for the adult driver include disobeying traffic signals or stop signs, driving too slow, becoming lost in a familiar place, swerving or drifting between lanes, a recent driving accident or a moving violation.

Driving is important to not only older individuals, but all legal and able individuals due to the contribution driving makes to the quality of life, autonomy, role fulfillment, and ability to access valuable activities. As a practicing Physical Therapist working with older adults who want to continue driving, it will be critical to assess and evaluate their range of motion, muscle strength, reaction time, reflexes, and also to educate the patient on medication effects as well as impaired vision and hearing that may risk their safety and the safety of others on the roadway. It will not only be necessary to educate the older driver on the importance of having an appropriately fitted vehicle, but also to educate their family and loved ones on warning signs that warrant an intervention in order to keep the older adult safe. Potential warning signs that may be grounds for a conversation and further evaluation to be made for the adult driver include disobeying traffic signals or stop signs, driving too slow, becoming lost in a familiar place, swerving or drifting between lanes, a recent driving accident or a moving violation.

Educated on the importance of safety for elderly drivers, the potential impairments that may contribute to unsafe driving, and the warning signs that warrant further evaluation is not only critical for the practicing physical therapist, but also as a proponent for individual and community safety.

For nearly every individual, the opportunity to drive represents a value of freedom and independence within society, whether to visit family and friends, go to the store, or take a road trip. However, convincing an elderly driver that it may be time to refrain from driving due to the safety of themselves and those in their community can be a very difficult and challenging task to do. For many elderly individuals, losing the ability and freedom to drive at their own convenience can be quite personal and emotional, even though it is in their best interest and for the safety of other drivers and pedestrians. With resources such as CarFit, the driver rehabilitation program, as well as being educated as a person, student, and health care provider about the skills and requirements for safe driving, it is imperative to increase awareness in the community about the resources to improve older adult driving and maintain the community of both young and older individuals safe on the roadways.

RESOURCES

RESEARCH TO PRACTICE CORNER

Jill Heitzman, PT, DPT, GCS, NCS, CWS, CEEAA, FACWCS

INTRODUCTION
To encourage more use of evidence-based practice, GeriNotes is starting a “Research to Practice Corner.” Submissions of articles related to research and the impacts on practice are encouraged. To begin this addition to GeriNotes, the initial article will discuss terminology. This article will discuss some basic terms used in research and provide some application to assist in understanding and applying research. In future issues, articles will discuss what makes a good measurement tool and the various forms of research. Additionally, future articles will focus on the process for development of clinical prediction rules. Any therapist interested is encouraged to submit questions and/or specific articles related to the impact that research has on practice.

THE BASIC TERMS
An understanding of validity, reliability, standard error of measurement, and minimal detectable change are all important when choosing and using any measurement tool. The tool must be appropriate for the specific condition and the amount needed to demonstrate true change in the individual are important considerations. But what do these terms actually mean? How are they determined? Rothstein and Echternach wrote a book in 1993 that is still relevant today as it provides readers with a basic understanding of measurement issues. This is a book that should be in every physical therapist’s library and is the primary reference for this article.

Validity
Validity by definition is whether the measurement(s) can be used for the purpose(s) for which they were intended. The validity then is in regards to the uses the measurements are put. Using the components of validity as put forth by Rothstein and Echternach, a review of how gait speed evolved as valid criteria for measurement will be presented.

Initially, a study by Ann Shumway-Cook looked at how fast a person walked in the home and community to perform tasks. This study assessed environmental demands of community aging adults; both with and without mobility difficulties. These results then were used to support the construct validity. A decline in the speed would theoretically affect their ability to perform tasks in the community and home. The content validity was next determined in regards to how the change in speed reflected the functional decline and ultimate fall risk. This was then compared to other criterion tools for fall risk (Berg Balance Scale and TUG). The concurrent validity was determined in relation to history of falls and living arrangements. Utilizing this information, gait speed was analyzed in regards to the ability to predict a fall and decline in function. These steps were used to determine the validity of a score cut off to predict falls and to develop minimal clinical detectable change that would indicate improvement across settings.

Reliability
By definition, reliability refers to the reproducibility or repeatability of a specific measure. There is intertester reliability (between two or more different testers), intratester reliability (within the same tester), and test-retest reliability. These are all referring to the amount of error between the results that is within an acceptable range. Therefore, the test is not what is considered, but the outcomes found within an acceptable (reliable) range. A study by Roberta Newton was done with inner city people of minority ethnicity and the comparison of 3 balance tools: Berg Balance Scale, Forward Functional Reach, and TUG. The population she utilized included community dwellers in the inner city and senior centers. She had a small sample size (n=250) and found that with the TUG, the older adults in this study were mostly able to complete the TUG with an average of 15 seconds which was higher than what was determined from the community dwellers in the original study, which was 10 seconds or less. The author hypothesized that the older adults who are comfortable performing tasks remain physically active in their environment longer than those who are uncomfortable performing tasks. The frequency also tended to correlate with physical function. The author also hypothesized that those who live in the inner city may not have the opportunity to frequently interact with their community which may be limited by safety, finances, and availability of activities. Therefore, walking tasks such as TUG and gait speed may not be the same depending on geographic location and opportunity to interact with the environment. This would make the reliability of the outcome measures difficult to generalize to all populations without more studies.

Standard Error of Measurement
Standard error of measurement (SEM) is the estimate of reliability and is based on the standard deviation expressed as: SEM= standard deviation times the square root of 1-reliability. Standard deviation is based on the distance from the mean. The variability of sample size and characteristics can affect the SEM. In a normally distributed scale, there will be a larger sample size in the middle range resulting in a smaller SEM within this portion of the distribution. As the population is smaller at the upper and lower end of the distribution, the SEM will be larger. Therefore, where the individual is on the distribution would affect their individual SEM. The SEM is based on the group not the individual and thus is dependent on the population being tested. This will affect the test/retest changes based on the sampling error.
Minimal Detectible Change

The minimal detectable change (MDC) is the amount of change that is more than would be expected by error. This is determined by using the SEM and determining a value that is 90% or 95% confident that the change is beyond the SEM. Since the SEM is sample dependent, the MDC is calculated for that population as well and cannot be taken to other populations or settings that use the specific tool of measurement. As previously stated, the SEM is based on the deviation from the mean. The closer the distribution is to a normal curve, the larger the population is to the mean. This would give a smaller SEM, indicating a potentially higher reliability of the outcome measure. However, the further away from this cluster of results, the higher the SEM would be, indicating a lower reliability of the outcome measure. This is important because the MDC would be different for individual participants based on where their score result placed them in the overall distribution curve. Someone who scored low on a scale would have greater error and would need a greater change in score than someone in the middle score range/distribution. At the higher ends, there may be a ceiling effect so a different scale may need to be considered to capture the change on reassessment. Overall, when an MDC is reported for an outcome measure, this may not be the MDC for the individual tested with that specific measurement tool. The therapist needs to look further into the testing outcome results and research studies to determine the MDC for that individual in that specific setting and with that specific diagnosis.

SUGGESTED REFERENCE

A good place to begin looking for a compilation of outcome measurement tools based on diagnosis and setting is www.rehabmeasures.org. Using these definitions of the various terminology should assist the clinician in understanding these tools as listed on this website.

REFERENCES


CELEBRATING FIVE YEARS OF CEEAA

Anne Coffman, PT, MS, GCS

The Certified Exercise Expert for Aging Adults (CEEAA) course has been offered for 5 years and now has more than 700 PTs certified as experts. Many members may not realize that this excellent course series grew out of a member motion from a Members’ Meeting at CSM in 2004. The members asked initially for the Section to investigate the development of a regional continuing education course and certification on geriatric exercise for strength and conditioning. The Board created a task force, called the Task Force on Promoting Physical Therapists as Exercise Experts for the Aging Population, and asked Marilyn Moffat, PT, DPT, PhD, FAPTA, CSCS, CEEAA, and Dale Avers, PT, DPT, PhD, to be co-chairs. Other members of the task force were Carole Lewis, PT, DPT, PhD, FAPTA, Rita Wong, PT, EdD, FAPTA, Karen Keminis, PT, DPT, MS, CDE, CEEAA, Marybeth Brown, PT, PhD, FAPTA, Mark Richards, PT, MS, CEEAA, Katie Klime-Mangione, PT, PhD, and Steve Wolf, PT, PhD, FAPTA, with Anne Coffman, PT, MS, GCS, serving as the Board liaison. The purpose of this task force was to promote the “power” and effectiveness of exercise to positively influence the health and well-being of America’s older adults through promotion of the physical therapist’s role in promoting exercise for older adults. The task force was to address professional education needs, patient/client education, research, reimbursement issues, exercise programs highlighting the physical therapist’s role, and public awareness. To that end, the following areas also formed part of the purpose of this task force:

1. Establish methods to gather information on current exercise practices related to physical activity assessment, counseling, and follow-up with older adults.

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2. Incorporate “best practices” on exercise and other physical activity into education programs for all physical therapist professional programs.

3. Develop an evidence-based approach and practice guidelines to deliver exercise and physical activity programs for older adults.

4. Increase physical therapists professional training on exercise and physical activity for older adults. Such training should be available through physical therapist entry-level professional education and through continuing education programs.

The task force members met 2 to 3 times annually for almost 5 years and in addition to the CEEAA course, they also contributed the following documents/products:

- Two power point presentations, one titled “From Frail to Fun” and the other titled “So You Want to Begin Exercising,” both geared toward consumers. These are available to Section members on the Section website through the Members Only Page. These presentations are to be used for local consumer groups to expand their awareness of the importance of physical therapists in exercise prescription for the aging population and to begin to get sedentary aging individuals into an exercise program.

- The Task Force created 3 consumer brochures in the following areas: Guidelines for Physical Activity and Exercise for Aging Adults; Osteoporosis – Guidelines for Safe and Effective Physical Activity and Exercise for the Older Adult; and Diabetes - Guidelines for Safe and Effective Physical Activity and Exercise for the Older Adult. These consumer brochures are available on the Members Only section of the website.

- The Task Force also recommended to the Section Board a number of motions for presentation to the 2007 APTA House of Delegates. These were approved by the Section Board and were introduced in 2007. The motions included the concept of consumers visiting a PT annually and a charge to APTA to promote this concept, a resolution that PTs should be role models for their patients/clients by exercising 5 days per week for a minimum of 30 minutes per day, a charge to APTA to explore the inclusion of a PT screen in the Welcome to Medicare visit, and a charge to APTA to conduct a marketing campaign to promote PTs as exercise experts to other health care providers including nurse practitioners and physician assistants. Only the first motion passed but the entire group of motions began to raise awareness of the role of PTs as exercise experts.

- The Task Force created “Physical Therapists as Exercise Experts with Aging Adults Curriculum Guidelines” - a sample curriculum for professional education programs. A copy of this was distributed to all PT programs in 2009.

Be sure to look through the Section website to access these valuable resources: www.geriatricspt.org. The Section on Geriatrics won the Exceptional/Inspirational Communication award in 2010 from APTA for all the work products created by the Exercise Task Force.

This same group worked cooperatively to create the CEEAA course with task force members contributing their pre-existing presentations as well as adding to those to comprehensively provide the most recent literature on exercise testing/application with older adults. Initially it was offered as a two-day regional continuing education course but gradually grew to a series of 3 two day courses complete with practical lab exams and a written exam for a certification award upon completion. Now offered in 3 locations annually, it has become a highly sought after course and certification for physical therapists working with older adults.

As we head into 2014, the Section extends our deepest appreciation to two of the task force members who served as Administrators of the CEEAA program for the past 5 years, Marilyn Moffat and Karen Kemmis. Both worked diligently to develop the instructor pool, update the presentation with input from all instructors, grade exams, and connect with vendors to provide necessary equipment for each course. We also thank Danille Parker, PT, DPT, GCS, CEEAA, Myles Quiben, DPT, PhD, GCS, NCS, CEEAA, Mark Richards, PT, MS, CDE, CEEAA, William Staples, PT, DPT, DHS, GCS, CEEAA; Ellen Strunk, PT, MS, GCS, CEEAA; Mike Studer, PT, MHS, NCS, CEEAA; and Kerry Walsh, PT, DPT, GCS, CEEAA.

Please visit http://www.geriatricspt.org/events/experts.cfm for more information on the Section’s CEEAA course series.
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Manual Physical Therapy for the Geriatric Patient

-15 Contact Hours-

May 31 - June 1, 2014
Truman Medical Center - Kansas City, MO

Presented by Carleen Lindsey, PT, MScAH, GCS, CEEAA

Description: This course is designed to give experienced PTs a practical approach to manual therapy interventions for the geriatric patient. Lab sessions and demonstrations will feature flexible curve kypholordosis measurement, muscle energy techniques for spinal, rib, and SIJ dysfunctions, joint mobilization for shoulder, hip, foot and ankle, myofascial and tender point releases, PNF with deep tissue mobilization, manual therapy with contract-relax and passive physiological intervertebral mobilization. This clinically comprehensive, hands-on workshop is designed for the PT to immediately apply the information in the clinical setting to geriatric patients.

Who Should Attend?

• Physical Therapists
• Physical Therapist Assistants
• Students in their final year of school in these fields

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