

## **TigheM\_Assignment 4**

### **“The Moving Van”**

A Proposal for Improved Community Outreach to Prevent Falls In Seniors in Cumberland County and the Surrounding Areas Serviced by Cape Fear Valley Health System

#### **Statement Of Need**

Falls in the elderly <sup>(1)</sup> are more common than strokes. Three in ten elderly persons fall each year, and 1 in 10 will suffer serious resulting injury, including fracture. Falls are the direct cause of 90% of all broken hips suffered by the elderly. 16% of all emergency department visits and 7% of all hospitalizations are for fall related injuries. <sup>(3)</sup> Falls have been identified in studies as the most preventable cause of nursing home placement in the elderly. <sup>(4)</sup>

Nationally, the “baby boom” generation is now moving into retirement age, becoming one of the fastest growing segments of the United States population. The geriatric population <sup>(1)</sup> of Cumberland County, NC, is 44,037, or 13.8% of the county’s population. <sup>(2)</sup> If we apply the above-noted numbers to Cumberland County seniors, as many as 13,200 each year are at risk for falls. And of those, 4,400 face major injuries that may require emergency room care, hospitalization, or surgical interventions.

Many falls are directly related to impairments in our body’s 3 key balance systems: visual, vestibular (inner ear), and somatosensory (our ability to feel the ground and know where our joints are in space). As we age, these systems work less efficiently. Medical conditions such as Meneire’s disease, diabetes, and glaucoma can further impair how they function, and strokes can affect the brain’s ability to synthesize and coordinate the input from these systems.

These individual balance systems can be tested in a variety of ways; and based on the exam results, clinical predictions can be made as to an individual’s risk for loss of balance and/or falls. Physical therapy has developed increasingly accurate and sophisticated methods to test patients for balance problems and potential for falls (fall risk stratification). Once identified, physical therapists can then provide interventions to address these issues before they lead to a devastating fall injury.

One of the initiatives in the recently-passed Affordable Care Act was a renewed emphasis on preventive measures to reduce health care costs. <sup>(6)</sup> Screening patients and providing early interventions, can drastically improve the length and quality of their lives, and reduce the long-term health care costs incurred treating preventable medical issues.

Cape Fear Valley Health System (CFVHS), the primary hospital system for Cumberland County, is a community-owned, not for profit health system. Medicare/Medicaid patients and

the uninsured make up the vast majority of the health system's patients.<sup>(5)</sup> The financial impact of the limited to absent ability of these patients to pay for their health care is reflected in the facts that 63% of the health system's revenue comes from Medicare and Medicaid, and that for every dollar the health system charges, it receives 39 cents in re-imbusement.<sup>(5)</sup>

The financial hardship on patients, particularly elderly patients with fixed incomes and limited ability to pay healthcare expenses, and who suffer major injury is even greater.<sup>(13)</sup>

Wellness programs, proactive programs to reduce controllable risk factors, have been statistically shown to reduce overall financial and manpower costs to health systems and hospitals, third-party payers, and most importantly, to patients and their families.<sup>(9)</sup>

At CFVHS, visible screening services such as free blood pressure and heart check-ups are being offered at "The Vessel", a mobile testing lab that can be brought to community events, including "Fourth Friday" events downtown, the Dogwood Festival, Swamp Dogs baseball and Fire Ants hockey games, as well as to senior living centers and social gathering places. Because of the mobility of these services, individuals in Cumberland County have improved access to receive these screens.

The development of a mobile balance screening unit, similar to "The Vessel", is needed to address balance for seniors in Cumberland County. It will be staffed by licensed physical therapists, to provide not only hands-on manual tests such as a Berg Balance test, but to use a Balance Master, a phone booth-sized device that uses computer programs, mobile foot platforms, and other features to identify problems related to balance systems. Therapists will use the data collected from these tests to recommend preventative measures to reduce the fall risk in screening participants.

## **Background**

Studies of cardiovascular patients and cardiovascular health have identified modifiable and non-modifiable risk factors. Among these are high blood pressure, tobacco use, high caloric/high fat diets, obesity or abnormal fat storage, lack of exercise, heart arrhythmias, concomitant lung disease, physical and emotional stress, and prior familial histories.<sup>(10), (11)</sup> A key to the prevention of long-term cardiovascular health impairments, or "catastrophic" cardiovascular injuries such as heart attack (MI) or stroke (CVA), is early identification of these risk factors.<sup>(11)</sup> This allows patients optimal opportunities to modify reducible risk factors (for example, smoking cessation programs, health eating choices), and be referred to appropriate medical professions for interventions (cardiologists for medications –Beta blockers, anti-hypertensive meds—and exercise physiologists for monitored exercise regimens).

"The Vessel" offers a variety of screening tests for risk factor stratification for controllable risk factors for heart disease (blood pressure checks, auscultation of heart and lungs, pulse oximetry, health index questionnaires). From there, the staff are able to make

recommendations to patients on easy things they can do to reduce their risk of vascular, cardiovascular, and pulmonary disease, including lifestyle modification, and can give financially dis-advantaged patients an opportunity for exposure to preventive health care measures.

Can this same type of early recognition and management strategy work with patients with balance system impairments, to reduce their risk of catastrophic injury from falls? Current studies of this are ongoing, but initial results indicate a promising potential. <sup>(14), (15), (18)</sup>

Older adults show larger postural sway, slower gait velocity, and increased stride-to-stride variability compared to younger adults during dynamic activities. <sup>(14)</sup> These age-related changes in balance recovery mechanisms are significant contributors to falls, and inefficient balance strategies make older adults more prone to falling versus younger adults. Slips and trips account for 30-50% of falls in community-dwelling older adults. <sup>(16)</sup> Given, too, that falls in the elderly most often occur during ambulation <sup>(17)</sup>, research indicates that fall risk assessment should be carried out under dynamic, steady state conditions (ie; gait analysis) and reactive balance challenges (example: testing a patient's balance reactions to changes in ground consistency) to identify fall risk in older adults. <sup>(15)</sup>

A recent study published in the Journal of the American Medical Association (JAMA) confirmed that the most consistent predictors of future falls in the elderly are clinically-detected abnormalities of gait, or of balance. <sup>(18)</sup> These were found more consistent predictors than traditionally-mentioned items including visual impairment, medication variables, decreased performance of activity of daily living tasks, and cognitive changes. Screening was identified as the first step in preventing future falls. The *JAMA* authors further contended that by performing multi-factorial fall assessments on patients who screen in at increased fall risk, and then treating these same issues, falls can be reduced by 30-40%! <sup>(19)</sup>

To take these studies to their logical conclusion: if we are able to screen an as-yet-undetermined threshold of Cumberland County seniors, and refer them to appropriate care providers for fall risk reduction, then we should see a measurable reduction in fall-related hospital admissions for our county's elderly population.

## **Project Proposal**

Currently, there is not an organized, mobile screening service within Cape Fear Valley Health System that looks at balance system impairments and fall risk stratification out in the community. <sup>(12)</sup>

We will use "The Moving Van", a mobile "balance clinic on wheels", to provide opportunities in the community to screen patients for balance system impairments and fall risk stratification. Patients found with impairments will be "triaged" with referrals to the appropriate health system medical professionals (physicians for meclizine for vertigo and/or nerve

conduction issues, outpatient physical therapy for balance training and/or otolith recanalization), and receive patient/family education in ways to prevent falls.

We propose a three-tiered project to assess the efficacy of the mobile balance screening team.

First phase: Perform balance screens and tests at a community event, at a senior activity center, and a senior living center. Register these patients or “tag them” with a patient identifier for the CFVHS computer system if they meet certain criteria (for example, Berg Balance Test score of 45/56 or less).<sup>(8)</sup> The full list of tests we will use, and the diagnostic results indicating fall risks, are listed and described below.

Second Phase: With the use of this tag identifier (this is similar to our current identifier for patients who have been treated with MRSA, VRE, or C Diff in the past year, and should be able to be used while still protecting the patients right to privacy), track these patients on any hospital admissions for falls, or fall- or balance-related diagnoses.

Third Phase: Track these statistics over a period of 1 year to look for hospital admission trends in the local data collected. Compare these statistics to nationwide compilations of data on emergency room and hospital admissions for falls, or fall- or balance-related diagnoses.

## **Outcome Measures:**

### FIRST PHASE

The American Physical Therapy Association (APTA) has developed and recommended many formal testing measures to identify balance impairments and increased fall risks in all patient populations,<sup>(8)</sup> but especially in the elderly. Among them are the following, which we would include in our balance screening; listed with most are easily identified test results associated with balance impairments/fall risks:

Berg Balance Test : A series of 14 tasks, rated on a scale from 0 to 4. The higher the score, the more stable balance is during the task. Begins with simple tasks (sit unsupported or stand unsupported for 1 minute) and progresses in complexity (retrieve object from floor, assume heel-to-toe stance).

**Increased Fall Risk:** scores below 45/56.

Timed Up-and-Go (TUG): The patient starts in a seated position in a chair. The patient stands up, walks 3 meters (~10 feet) away from the chair, turns, walks back, and returns to the initial sitting position.

**Increased Fall Risk:** greater than 15 seconds to complete and/or a loss-of-balance.

Four-Quadrant/Four-Square Test: Four canes or dowels are placed on the floor to form four squares or quadrants. The patient stands in the lower left hand quadrant (assume overhead view). When cued, he steps forward into the upper quadrant, sidesteps to his right, then backwards into the lower right quadrant. Patient then reverses direction, stepping forward, left sidestep, then backwards, to return to the original starting position.

**Increased Fall Risk:** greater than 15 seconds to complete and/or a loss-of-balance.

Senior Chair Stand Test: Patient sits at the edge of a standard-height chair, arms crossed. When cued, the patient stands up and sits back down as many times as possible for 30 seconds.

**Increased Fall Risk:** completing 12 stands or less (9-12 reps = moderate fall risk, 8 or less indicating high fall risk).

Dynamic Gait Index (DGI): A series of 8 walking tasks, over a 20 foot long distance, including head turns, obstacle avoidance, and changes in direction, rated on a scale of 0 to 3. The higher the score, the more stable the patient's gait.

**Increased Fall Risk:** scores below 19/24.

Sensory Organization Test (SOT): Compares patient's performance during standing tests to age-related norms. These can single out individual components of the balance system (visual, vestibular, proprioceptive) and test how these systems compensate for an environmental loss of one or more of the normal inputs from those systems.

**Increased Fall Risk:** a composite score (of all 6 component tests) below an age-adjusted norm, and/or 2 or more falls on 1 or more components.

The first five of these measures can be applied with a minimum of expense and material. All that is needed is a stopwatch, one or two standard chairs (one with arms), an eight-inch stool or step block, a household item (a cup or similar item to be retrieved from the floor), and a ruler to measure forward reaching (in the case of the Berg) or a 10-foot distance (in the TUG). The SOT is a testing measure that requires a specialized machine called a Balance Master.

The Balance Master is a phone booth-sized construct that has an attached computer system and a support harness (similar to a safety harness seen on many medical treadmills). The machine has a computer monitor, mobile walls, and mobile foot plates. The computer program can manipulate one or more of these "inputs", and assess what strategy a patient uses to compensate for balance challenges (ankle, hip, stepping), if the patient is over-relying on one or more of his balance systems (visual, vestibular, proprioceptive), or if the patient has difficulty processing the inputs from these systems. In the clinic, the Balance Master has individualized treatment modes and exercises that can be used to train any impairments identified by the SOT.

These six tests represent data that is normally collected during balance screenings or evaluations within our outpatient clinics and the main hospital. In our proposal, they will be used to identify any balance system impairments, to determine fall risk stratification for the assessed patients, and for evidence to support referral to additional health care services as denoted above. Any increased fall risk identification score will be the “trigger” to tag their medical record number to track any admissions to CFVHS during the course of the proposal study, whether the patient participates in one, or any combination of two or more, of these examinations.

## SECOND PHASE

To track participating patient’s hospital or emergency room admissions for fall- or balance-related issues, we will use the following diagnosis list: <sup>(20)</sup>

- Mechanical Fall
- Fall with Upper or Lower Extremity Fracture <sup>(21)</sup>
- Syncope
- Vertigo
- “Dizziness”
- Vestibular Labyrinthitis
- Meniere’s Disease
- Benign Paroxysmal Positional Vertigo (BPPV)
- Unilateral Vestibular Hypofunction (UVH)

When senior patients tagged by their participation in mobile balance screening clinics are admitted to CFVHS, their admission diagnosis will be compared to the above list; if it meets one or more of these diagnoses, the team will receive computer notification. Alternatively, the team may be notified if tagged patients are admitted regardless of diagnosis. The team will then review the chart and determine whether their admission should be counted as part of our collected data.

## THIRD PHASE

For the first year after the establishment of “The Moving Van” and the mobile balance assessment team, we will track the number of balance and fall-related hospital admissions for all patients over the age of 60 years of age, as well as those patients who participate in screenings done by the balance team. This data will then be compared to regional and national data on similar admitting diagnoses for the same age group <sup>(22)</sup>, as well as data collected at our hospital from the previous calendar year. As stated above, our expectation is that the patients who

participated in balance screenings and were referred for follow-up interventions or instructed in fall prevention techniques, will demonstrate a lower rate of fall-related hospital admissions.

A tertiary phase may need to be considered, as well, in the absence of a control group. In this phase, the patients who were initially “tagged” after undergoing a screening could be re-assessed with the same balance measures after 1 year. Their scores would be compared to their initial screening results, to see if there had been any appreciable change in their balance measures, especially if these patients followed through on recommended referrals (example: outpatient PT referrals to address displaced otoconia).

## **Evaluation**

The outcome goals of this proposal include the following:

- (1) There will be a 30% reduction in hospital admissions for falls, or fall- or balance-related diagnoses, in our cohort group <sup>(23)</sup> versus the local (CFVMC) average for a cohort of the same ages <sup>(24)</sup>, in 1 year.
- (2) There will be a 30% reduction in hospital admissions for falls, or fall- or balance-related diagnoses, in our cohort group <sup>(23)</sup> versus the national average for a cohort of the same ages <sup>(25)</sup>, in 1 year.
- (3) 50% of the patients that participate in a “Moving Van” assessment, screen in for increased fall risk, and receive referral(s) for management, will demonstrate improvement in their indicated test score(s) by the APTA-recommended Minimal Clinically Important Difference (MCID), in 1 year.

The first two goals are a reflection of the JAMA article cited above, in which the authors contend that a regular screening process can reduce falls in the elderly by 30-40%. <sup>(19)</sup> The tests and measures in our study closely reflect those used in the JAMA and British Medical Journal articles on preventive medicine, <sup>(18), (19)</sup> so this is a reasonably attainable goal.

Our ultimate aim is to see a drop in fall-related hospital admissions for 30% of ALL Cumberland County seniors. However, we must consider the sample size in our proposal. First phase calls for balance screens and tests to be done at a community event, a senior activity center, and a senior living center. Statistically, it is unlikely that we can screen a majority of the county’s 44,000 senior residents unless we expand this phase to multiple community events (example: Fourth Friday events, all 30 home-dates for Swamp Dogs games) versus a single event (example: the Dogwood Festival), as well as to multiple activity and living centers. If statistics on fall reduction bear out as we expect, then expansion of the program as noted above is a logical outcome expectation.

The outcome measures for the third goal are, by necessity, less clearly defined. There is not a way to predict which one or more of the proposed testing measures will be the most effective at capturing the largest number of patients for increased fall risk. Additionally, none of these tests are equally effective for all possible causes or diagnoses associated with increased fall risks. For example, the Four Step/Quadrant Test has been shown to be effective in identifying increased fall risk due to vestibular dysfunction,<sup>(26)</sup> where the Senior Chair Stand Test is effective at looking at loss of Type 2 muscle fiber strength (loss of rapid power generation) in the lower extremities as a risk factor for increased falls.<sup>(14)</sup>

In addition, one of the difficulties in establishing a clinically-significant improvement score is there is not always a body of statistically valid evidence that supports what is an overall normal score, versus what is an age-related or age-adjusted normal score, versus a score that is attained with a physiological impairment. An example of this is the Timed Up-and-Go (TUG) test. Studies have identified age-related norms (Age 60-69: 9.0 seconds, age 70-79: 10.2 seconds, age 80-99: 12.7 seconds),<sup>(29)</sup> but have also determined two tiers of fall risk: a time of greater than 14 seconds,<sup>(27)</sup> and a time of greater than 10 seconds for “active” adults.<sup>(28)</sup> Similarly, the MCID of 2.9 seconds, while appearing a reasonable expectation of improvement following physical therapy intervention, is from a study looking at improvements in patients with post-stroke hemi-paresis.<sup>(29)</sup>

Still, reasonable and measurable outcome improvements for the cited balance tests to quantify our third goal would include:<sup>(8), (30)</sup>

- Berg Balance Test: 6 point improvement.
- Timed Up-and-Go (TUG): 2.9-3.2 second improvement.
- Four Quadrant/Square Test: Complete the test in less than 15 seconds with no loss of balance.
- Senior Chair Stand Test: 4 repetition improvement.
- Dynamic Gait Index (DGI): 3.2 point improvement.
- Sensory Organization Test (SOT): Attain age-related norm for composite score, reduce falls to 1 or 0 for each test condition.

Ultimately, the success of the program will not rest on improvement in scores on formalized tests, but on a real reduction in hospital admissions for fall, and fall- or balance-related diagnoses. The Moving Van will provide us the mobile, proactive tool we need to accomplish these goals for Cape Fear Valley Health System, and for the senior residents of Cumberland County.

## References and Footnotes

- (1) For purposes of this project request, “geriatric”, “senior”, and “elderly” are defined as adults 60 years of age or older.
- (2) [www.ncdhhs.gov/aging/cprofile/cumberland.pdf](http://www.ncdhhs.gov/aging/cprofile/cumberland.pdf)
- (3) [www.fallprevention.org/pages/fallfacts.htm](http://www.fallprevention.org/pages/fallfacts.htm)
- (4) New England Journal of Medicine. 337(18); 1279-84, 1997, Oct 30.
- (5) Cape Fear Valley Health System Annual Budget Report, 2010.
- (6) [www.whitehouse.gov/healthreform/](http://www.whitehouse.gov/healthreform/)
- (7) Healthgrades article
- (8) APTA Guide to Physical Therapy Practice, 2003 edition.
- (9) Phillips, JF “Using An Ounce of Prevention: Does It Reduce Health Care Expenditures and Reap Pounds of Profit? A Study of the Financial Impact of Wellness and Health Risk Screening Programs” *J Health Care Finance* 2009 Winter; 36(2):1-12.
- (10) [www.heart.org/HEARTORG/Getting/Healthy/](http://www.heart.org/HEARTORG/Getting/Healthy/)
- (11) Kannell, William, MD “Sixty Years of Preventive Cardiology: A Framingham Perspective” *Clinical Cardiology* Volume 34, Issue 6 pages 342-343, June 2011.
- (12) [www.capefearvalley.com/services/index.html](http://www.capefearvalley.com/services/index.html)
- (13) Englander, F et al; “Economic Dimensions of Slip and Fall Injuries” *J Forensic Sci* 1996; 41: 733-746
- (14) Granacher,U et al; “A Qualitative Review of Balance and Strength Performance in Healthy Older Adults: Impact For Testing and Training” *J Aging Res* 2012; 2012:708905 Epub 2012 Jan 23.
- (15) Schwesig, R et al; “Can Falls Be Predicted With Gait Analytical and Postulographic Measurement Systems?” *Clin Rehabil* 2012 July 27.
- (16) Gabell, A, et al; “Falls In The Healthy Elderly: Predisposing Causes” *Ergonomics* 1985; 28(7) : 965 – 975.
- (17) Kressig, et al; “Guidelines for Clinical Applications of Spatio-Temporal Gait Analysis in Older Adults” *Aging Clinical and Experimental Research* 2006 ; 18(2) : 174- 176.
- (18) Ganz, MD, et al; “Will My Patient Fall?” *JAMA* 2007; 297(1): 77-86.
- (19) Chang, et al; “Interventions for the Prevention of Falls In Older Adults: Systematic Review and Meta-Analysis of Randomised Clinical Trials” *BMJ* 2004:328680
- (20) “ICD-9 Codes” APTA Guide to Physical Therapy Practice, 2003 edition.
- (21) This needs to be distinguished from cases where a pathological fracture of the femur or vertebral body is the cause of the fall; these cases would not be amenable to fall risk stratification as proposed above; one would need to consider blood tests to look for hyper- or hypo-calcemia, osteoporosis, bone density studies, etc;
- (22) [www.CDC.gov](http://www.CDC.gov)
- (23) In this case, the cohort is Cumberland County residents over 60 years of age, who participate in screening by one or more of the special tests performed at The Moving Van, regardless of whether or not they screened in for an increased fall risk.

- (24) This cohort is the total number of admissions for falls, or fall- or balance-related diagnoses at Cape Fear Valley Medical Center (CFVMC) for all patients age 60 or over.
- (25) This cohort is the total number of hospital admissions for falls, or fall- or balance-related diagnoses for all patients age 60 or over.
- (26) Whitney, et al; "The Reliability and Validity of the Four Square Step Test for People With Balance Deficits Secondary to a Vestibular Disorder" *Arch of Phys Med & Rehabil.* Volume 88, Issue 1, January, 2007, pages 99-104.
- (27) Shumway-Cook, et al; "Predicting The Probability For Falls In Community-Dwelling Older Adults Using they Timed Up-and-Go Test" *Phys Ther* 2000; 80(9):896-903.
- (28) Boulgarides, et al; "Use of Clinical and Impairment Based Tests to Predict Falls By Community-Dwelling Older Adults" *Phys Ther* 2003; 83(4):328-339.
- (29) Flansbjer, et al; "Reliability of Gait Performance Tests In Men and Women With Hemiparesis After Stroke" *J Rehabil Med* 2005; 37(2):75-82.
- (30) <http://web.missouri.edu/~proste/tool/indexnorm.htm>

*I have neither given nor received unauthorized aid on this assignment.*