Decreasing Fall Risk in Older Adults: Understanding Health Care Providers Balance Assessment Practices in Urban and Rural Settings in Saskatchewan

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By

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ABSTRACT

There has been limited research on how physical therapists assess balance in older adults however; it is unknown how other health practitioners, such as nurses and other rehabilitation specialists, administer balance assessment in their clinical practice. Additionally, it is unclear if there are differences in choices, facilitators and barriers to balance assessment in rural verses urban communities. The purpose of this study was to determine the factors influencing health care providers' clinical choices, decisions and enablers, and challenges to conducting balance assessment in Saskatchewan. A secondary purpose was to compare practices between different professions and location of practice. Findings could contribute to inform future practice and opportunities for education and support to health care providers who are engaged in the assessment and management of fall risk in urban and rural locations in Saskatchewan.

This study used an explanatory sequential mixed methods design. An electronic survey to determine balance assessment practices was merged into a larger study focussed on fall risk screening and assessment practices of health care providers in Saskatchewan. Data was collected from rehabilitation therapists (n=30), nurses (n=156) and other health professionals (n=10); with a comparison of assessment practices limited to rehabilitation therapists and nurses. Balance assessment practices from work locations (n=112), urban and (n=67) rural participants data were also compared. Follow-up interviews included physical therapists (*n*=6) and nurses (*n*=3) purposefully sampled from the survey who completed a 60-90-minute audio-recorded, semi-structured interview over the phone.

From the survey, rehabilitation therapists were two times more likely to assess limits of stability (OR = 2.4; 95% CI 1.1-5.5) and three times more likely to assess dynamic stability (OR=3.0; 95% CI 1.0- 9.1) than nurses. Rehabilitation therapists are less likely (OR= .384; 95% CI .165-.894) to assess confidence than nurses. There was no significant association in the assessment of balance components amongst practice location in Saskatchewan. Interview results showed physical therapists tended to use balance specific tools whereas nurses would utilize general assessments of functional activity. In both professions, challenges identified included team staff shortages, patient status, and time needed to complete a thorough assessment. Tools and methods used for assessment of balance factors varied across professions but enablers and barriers were similar.

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I may have missed someone and if so, I do apologize as I have tried to create an inclusive list of acknowledgments.

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GLOSSARY OF TERMS

Fall: An unexpected or unintentional event where a person comes to rest on the ground, floor or lower level (World Health Organization, 2018).

Multifactorial Risk Assessment: An assessment with multiple components that aims to identify a person's risk factors for falling. This assessment should include: identification of falls history, assessment of gait and balance, osteoporosis risk, fracture risk, perceived functional ability, fear of falling, visual impairment, cognitive impairment and neurological examination, urinary incontinence, home hazards, cardiovascular examination and medication review (National Collaborating Centre for Chronic Conditions [Great Britain], 2006).

Functional Mobility Assessments: An assessment that focuses on the physiological and functional domains of postural stability including strength, balance gait, and reaction times (Scott et al., 2007).

Motor synergy: A group of muscles acting as a functional unit (Shummway-Cook & Woollacott, 2017).

Interdisciplinary team: Other colleagues health care providers from different disciplines that the health professional works with or refers their client to when assessing balance.

Disconnect: A lack of or a break in connection, consistency or agreement (Merriam-Webster, n.d.)

Institutional Care Setting: Work setting where health care providers provide care in an acute or long-term care setting.

Acute Care setting: An institution where health care providers provide or are concerned with short-term usually immediate medical care as for serious illness or traumatic injury (Merriam-Webster, n.d.)

Long term care setting: An institution where health care providers provide care in a facility such as a nursing home (National Institute on Aging, 2017)

Outpatient Care Setting: Work setting providing care in a clinic or at the patient's home.

Transfer Lifting and Repositioning Program (TLR): The TLR program and resource which consists of education on anatomy, injuries, body mechanics, personal health, lifting and patient handling procedures, standardized patient handling needs assessment, and patient handling algorithms (a decision-making tree that standardized the criteria for selecting which patient handling method is required for each patient) (Black, Shah, Busch, Metcalfe, & Lim, 2011).

Chapter 1: Introduction

Falls are one of the most common causes of injury in Canada among older adults (Chief of Public Health's Officer Report, 2010). Specifically, 4 out of 5 injury hospitalizations involving older adults are due to falls (Canadian Institute for health information, 2019). Additionally, **falls have a significant impact on morbidity and mortality among seniors in Canada**. Falls are a direct cause of 95% of all hip fractures in older adults and can lead to death in 20% of cases (Public Health Agency of Canada, 2014).

Most falls in older adults are the result of a combination of physiological, behavioral, environmental and sociodemographic risk factors (Rubenstein, 2006). Multifactorial fall risk assessments are often used by health care providers to determine the factors contributing to an older adult's fall risk; thus, can guide the development of interventions to reduce the risk of a fall. Assessment processes have some differences in approach based on the setting where they are used (i.e., community, acute and long-term care) (Public Health Agency of Canada, 2014).

One of the most modifiable and primary risk factors leading to falls in older adults is balance (Ambrose, Paul, & Hausdorff, 2013). Balance, or postural control, is defined as the ability to keep the centre of mass within the limits of the base of support (Gervais et al., 2014). Early theoretical models, such as the reflex model, described the maintenance of postural control by activation of reflexes based on visual, vestibular and somatosensory triggers (Horak, 2006; Magnus, 1926; Roberts, 1973; Weisz, 1938 & Roberts, 1978). However, more recent research has rejected aspects of the reflex model and led to the development of the systems framework for postural control described by Horak (Horak, Shupert &Mirka, 1989; Horak 2006). The systems framework of postural control identifies the components of balance influenced by the interaction of the individual, the task, and the environment. When correcting a state of imbalance, the central nervous system (CNS) will organize its response by activating an appropriate motor synergy. Activation occurs based on sensory information, environmental context, the task being performed, prior experiences of that person, and the body's individual characteristics (Horak, Shupert & Mirka, 1989).

Based on the systems model, four types of balance control are used during activities of daily living which include static, dynamic, anticipatory and reactive postural control (refer to **2.2**

Postural Control). Additionally, there are different types of individual systems for postural control that are required to maintain each type of balance which include: motor, sensory and cognitive systems. Different environmental demands such as changes in support surfaces affect the organization of muscles and forces needed for balance. Sensory information used for balance control can be affected by different visual and surface conditions. Additionally, different tasks affect the cognitive attention used to control balance (Shumway-Cook & Woollacott, 2017).

Components first described in the systems framework of postural control included (1) biomechanical constraints, (2) movement strategies, (3) sensory strategies, (4) orientation in space, (5) control of dynamics and (6) cognitive processing (Horak, 2006) Based on a scoping review by Sibley et al. (2015), an updated version on the original six components described by Horak (2006) was developed. These balance components described in the updated version of the systems framework of postural control include: (1) static stability, (2) orientation in space, (3) limits of stability, (4) dynamic stability, (5) underlying motor systems, (6) reactive postural control, (7) anticipatory postural control, (8) sensory strategies, and (9) cognitive processing (Sibley et al., 2015).

Both intrinsic (characteristics or factors associated with the individual) and extrinsic (environmental factors) can influence balance. The primary purpose of a clinical balance assessment of an older adult is to; 1) determine if there are any difficulties in balance related to these factors; and, 2) to identify the underlying cause (Mancini & Horak, 2010). By identifying intrinsic balance deficits and extrinsic balance factors; this system-specific theoretical approach is helpful to predict risk of falling and develop appropriate intervention.

Balance assessment is within the scope of practice for physical therapists; however, other health care professionals such as occupational therapists, nurses, and physicians also conduct balance assessment within their scope of practice (American Geriatrics Society and British Geriatrics Society, 2011; Scott et al., 2007; Transferring Lifting and Repositioning Resource Manual, 3rd edition). For example, during a multifactorial risk assessment, nurses may use a checklist comprised of questions to screen the level and nature of risk for factors that may contribute to a fall (Scott et al., 2007). In addition to these questions that rely on self report, the tools may or may not include physical assessments of health status, balance, or mobility (Scott et al., 2007). Research has suggested that a routine of quick balance tests by nurses could improve fall risk assessment and potentially reduce the number of falls of older adults (McMichael et al.,

2008). However, current guidelines do not recommend any specific tests to use over others when a multifactorial risk assessment is being administered (American Geriatrics Society and British Geriatrics Society, 2011; Public Health Agency of Canada, 2014; Reducing Falls and Injuries of Falls, 2015). This might result in a health care provider missing a significant factor contributing to fall risk.

Different types of balance assessment tools direct the type of intervention for more effective management or treatment of the balance impairment. Ideally, to assess postural control, health care professionals should include measures that are: 1) reflective of both the functional capabilities and quality of postural strategies; 2) sensitive and selective for postural control abnormalities; 3) reliable and valid; and, 4) easy to use and inexpensive (Horak, 1987). Multiple tests have been developed to assess each component of balance based on the systems framework of postural control either independently or grouped together in one assessment (Avin, 2015). However, there is no recommendation by governing bodies of which tests or procedures are ideal or recommended to assess each balance factor (Duncan et al., 2013).

There has been some research reporting physical therapists' use of balance assessment measures of older adults. A recent study of Saskatchewan physical therapists found they regularly used tests such as: Berg Balance Scale, single leg stance test, tandem standing/walking, functional reach, and timed up-and-go test (Oates et al., 2017). Additionally, physical therapists in Saskatchewan did not equally assess all of the factors of balance during a patient encounter. Only 6% of therapists assess all of factors included in the systems framework of postural control, and 93% reported assessing at least five or less of the balance factors during a patient encounter (Oates et al., 2017). Additionally, reactive postural control is one of the most important factors of balance in determining whether an individual will fall (refer to **2.2.1.4. Reactive Postural Control and Underlying Motor Systems** for more detail) (Gervais et al., 2014). This important fall risk component was found to be minimally assessed by physical therapists when conducting balance assessments (Gervais et al., 2014; Oates et al., 2017; Sibley et al., 2011). This might result in health care providers missing significant factors contributing to fall risk and developing an ineffective balance intervention for older adults. Previous research has reported on the decision process of physical therapists' selection and use of balance assessments in the U.S. (McGinnis, Hack, Nixon-Cave & Michlovitz, 2009). However, the decision processes of balance

assessment choice of physical therapists in Canada are unknown. Research is also scarce regarding the types of balance assessment choices and follow-up by other health care providers. It has been found that nearly one-quarter of those requiring specialist care reported challenges for accessing that care in rural areas in Canada (Karunanayake et al., 2015). The risk of encountering difficulty in accessing medical specialist care services increased with greater distances. Reduced access to health care services in more remote and rural locations may be due to difficulty recruiting health professionals to work in rural areas (Wielandt & Taylor, 2010). It has also been reported that nurses are sometimes the only health care providers in rural and remote areas (Macleod et al., 2017). Minimized diverse mix of health care providers in rural areas may result in reduced access to different types of care; health care providers practice is limited to their scope of their profession.

Understanding of the current practice of balance assessment, enablers and barriers of assessing components of balance could inform future practice. This understanding could provide opportunities for education and support to health care providers. Specifically, those who are engaged in the assessment and management of fall risk in urban and rural locations in Saskatchewan.

1.1. Purpose:

The overall purpose of this Master's thesis was to determine the current practice of balance assessment based on the systems framework for postural control and the factors impacting health care providers' clinical choices, decisions, enablers, and barriers to conducting balance assessment in Saskatchewan.

1.2. Research Questions:

1.2.1. Research Question Phase 1:

What was the frequency of assessing each component of balance within a health care providers' assessment of postural control for older adults?

1.2.2. Sub Research Question Phase 1:

Were there differences in the assessment of balance components amongst different health care professions and their practice locations (rural vs. urban) in Saskatchewan?

1.2.3. Research Question Phase 2:

In urban and rural settings, what were the decisions, enablers, and barriers to conducting balance assessment of older adults in Saskatchewan amongst physical therapists and nurses.

1.3. Hypothesis:

I did not generate hypotheses because there has been no literature to direct hypotheses for a broad scope of health care providers, or for different practice locations based on the systems framework of postural control.

Chapter 2: Literature Review

This chapter provides a review of the literature on falls in older adults, the risk factors associated with a fall, theories and research of postural control, and assessment of fall risk and balance across different practice settings.

2.1. Falls:

A fall is defined as an unexpected or unintentional event where a person comes to rest on the ground, floor or lower level (World Health Organization, 2018). Falls are divided into two categories, a nonfatal fall that results in unintentional injury and a fatal fall resulting in unintentional death (Stevens, 2005). Falls can occur across the lifespan, however the risk of falling increases after the age of 65 years (Peel, 2011; Public Health Agency of Canada, 2014). Between 20-30% of Canadian seniors fall each year (Public Health Agency of Canada, 2014). With an aging population, the impact of falls on individuals and the health care system is likely to worsen; since the frequency of falls and fall-related injuries increases with age and frailty level (Peel, 2011; Public Health Agency of Canada, 2014; World Health Organization, 2008). Falls are one of the most common causes of injury in Canada among older adults (Chief of Public Health's Officer Report, 2010). Four out of 5 injury hospitalizations involving older adults are due to falls (Canadian Institute for health information, 2019).

Fall-related direct health-care costs in Canada were estimated at $2 billion annually (Canadian Patient Safety Institute, 2014). Additionally, **falls have a significant impact on morbidity and mortality among seniors in Canada**. Falls are a direct cause of 95% of all hip fractures in older adults and can lead to death in 20% of cases (Ioannidis et al., 2009; Jian et al., 2005; Public Health Agency of Canada, 2014; Wolinsky et al., 2009). In addition to physical injuries, falls in older adults can also lead to loss of independence and fear of falling (Kelsey et al, 2010; Peel, 2011).

2.1.2. Risk Factors:

Most falls in older adults are the result of a combination of biological, behavioral, environmental and sociodemographic factors (Rubenstein, 2006). These risk factors are complex

and interactive and do not exist in isolation (Public Health Agency of Canada, 2014). This section will discuss the different categories of risk factors that contribute to a fall.

2.1.2.1. Biological Risk Factors:

Biological or intrinsic risk factors include those pertaining to the natural aging process of the human body, and as well as the effects of chronic or acute health conditions (Public Health Agency of Canada, 2014). These include acute and chronic illness, balance deficits, and cognitive impairments. Symptoms of acute illness such as, weakness, pain, fever, nausea and dizziness can increase the risk of falling (Public Health Agency of Canada, 2014; Tinetti, Doucette, & Claus, 1995). One of many important intrinsic risk factors is balance or postural control (refer to section **2.2. Postural Control** for more detailed description) (American Geriatrics Society and British Geriatrics Society, 2011). Balance impairments occur when there are changes to the normal functioning of the systems underlying postural control. This can involve biomechanical, sensory, and cognitive changes resulting in context-specific instabilities that may lead to falls (Public Health Agency of Canada, 2014). A wide range of chronic conditions can increase an individual's risk of falls affecting one's mobility, gait and balance. The following examples are not an exhaustive list, but highlight some of the common conditions that affect an older adult's risk of falls. Neurological disorders such as Parkinson's disease, cardiovascular disease, end-stage renal disease, chronic obstructive pulmonary disorder, cerebral vascular accident or stroke, and diabetes can all negatively impact balance (Public Health Agency of Canada, 2014). Furthermore, complications related to conditions as for example, diabetes, can include neuropathy, retinopathy, and hypoglycemia, all known to contribute to an increased risk of falls (Berlie & Garwood, 2010). Bowel or bladder incontinence and urgency can lead to rushing and frequent trips to the bathroom, whereas foot disorders such as corns, bunions, toe deformities, ulcers and general pain can impair balance (Public Health Agency of Canada, 2014).

Older adults with osteoporosis, characterized by low bone mass and deterioration of bone tissue or low bone density, are at increased risk of fractures from a fall (Public Health Agency of Canada, 2014; Tinetti, Doucette, & Claus, 1995). Cognitive impairment, which involves different disturbances of memory, thinking, and problem solving, are caused by various underlying disorders. These include dementia or delirium, and can affect one's ability to anticipate and adapt

to environmental stimuli to maintain or restore balance (Härlein, Halfens, Dassen, & Lahmann, 2011; Haur et al., 2003).

Low vision can interfere with one's ability to walk safely as one cannot detect hazards in the environment (Public Health Agency of Canada, 2014). Changes to vision, such as reduced ability to detect low-contrast hazards, spatial relationships, poor judgement of distances, and difficulty of processing moving visual information all seem to be the major visual risk factors for falls (Lord, Smith, & Menant, 2010). Low vision can also affect the ability to maintain balance while walking. For example, when encountering obstacles or changes in terrain, sighted individuals adjust their gait pattern to accommodate these changes (Ray & Wolf, 2008). In contrast, individuals with visual impairments cannot benefit from visual information due to poor sight. Poor sight may impact one's ability with visual impairments to negotiate obstacles as they are encountered (Ray & Wolf, 2008). Additionally, upper and lower extremity weakness can lead to a slip, trip, or stumble resulting in a fall (Moreland, Richardson, Goldsmith, & Clase, 2004).

2.1.2.2. Behavioral Risk Factors:

Behavioural risk factors for falling include actions, emotions or choices of the individual (Public Health Agency of Canada, 2014). Examples of these include confidence in ability to balance and prevent a fall, risk taking behaviours, using assistive devices, clothing, shoes, history of falls, diet, nutrition, and medications. Canes and walkers can improve balance and mobility in older adults if properly used and maintained. However, some mobility aid users have difficulty using their devices due to lack of maintenance, malfunction, inappropriate fit or overreliance on the device. This can result in an assistive device being a fall hazard (Bateni & Maki, 2005; Public Health Agency of Canada, 2014). Clothing that is difficult to put on may cause a person with reduced mobility to lose their balance and fall while dressing (Public Health Agency of Canada, 2014). Additionally, walking barefoot and in socks indoors are associated with a greater risk of falling (Menant, Steele, Menz, Munro, & Lord, 2008).

Fall history is associated with an increased risk of future falls (Dionyssiotis, 2012). History of falling is considered a behavioural risk factor when one chooses not to take action and seek information on ways to reduce the risk of a fall (Public Health Agency of Canada, 2014). Fear of falling is an important risk factor for future falls, as fear of falling may lead to reduced physical and functional activity (Dionyssiotis, 2012). This may lead to muscle weakness and poor

balance (Dionyssiotis, 2012). An inadequate diet from dehydration or malnutrition could lead to physical weakness, fatigue and frailty increasing an older adult's risk of a fall. A vitamin D deficiency may also lead to impaired gait patterns, muscle weakness, osteomalacia and osteoporosis (Dionyssiotis, 2012). The risk of falls increases when more than four medications and drugs such as psychotropic, antiarrhythmic drugs, digoxin diuretics and sedatives are taken (Dionyssiotis, 2012).

2.1.2.3. Social and Economic Risk Factors:

Social and psychosocial factors that decrease the risk of a hip fracture due to a fall include: being married, living in present residence for five years or more, using proactive coping strategies in response to stress, having a higher level of life satisfaction, and engagement in social activities in older age (Peel, Bartlett & Mclure, 2007). There is also an increased risk for falls in older adults who have a low socio-economic status (World Health Organization, 2008). Factors that may put an older adult at risk for a fall with a low socioeconomic status may include poor environment, poor diet, and barriers to accessing health care services (World Health Organization, 2008).

2.1.2.4. Environmental Risk Factors:

Environmental risk factors include the physical environment, such as the design of a building, building entrances, indoor spaces and outdoor spaces. Indoor environmental hazards include: inadequate or no lighting, rugs, no aids or poorly installed aids such as hand rails, cluttered floors, slippery tubs, difficulty entering or exiting home, and stairs (Fletcher & Hirdes, 2002).

Outdoor environmental hazards include uneven and poorly maintained sidewalks, weather, and slippery conditions (Chippendale & Boltz, 2015). In Saskatchewan, both temperature and precipitation are factors that can lead to wet or icy surfaces which increases the risk of falling (Gao & Abeysekera, 2004). Additionally, wet or icy surfaces can lead to ineffective use of assistive devices such as canes and walkers (Public Health Agency of Canada, 2014).

2.2. Fall Assessment:

The first step in fall prevention is to screen for a history of falls and fall risk. Older adults who answer positive to any of the screening questions warrants further evaluation using a multifactorial fall risk assessment (American Geriatrics Society and British Geriatrics Society, 2011; Public Health Agency of Canada, 2014). A multifactorial fall risk assessment can determine the risk of falls, identify the risk factors, and assist in identifying an appropriate intervention (Public Health Agency of Canada, 2014). Postural control is a main component in a fall risk assessment. A multi-factorial fall risk assessment also includes the assessment of psychological status, mobility dysfunction, acute and chronic illnesses, sensory deficits, medication use, history of falling, evaluation of the safety of the physical environment, and nutritional status (American Geriatrics Society and British Geriatrics Society, 2011; Reducing Falls and Injuries of Falls, 2015; Scott et al., 2007). Additionally, multifactorial assessments may or may not include physical assessments of health status or mobility (Scott et al., 2007). Health care providers who work in community, acute and long-term care settings differ in the approach to a multifactorial fall risk assessment of an older adult. Assessment of older adult fall risk in community, acute and long-term care settings is discussed in the following sections.

2.2.1. Community Setting:

According to the American Geriatrics Society and British Geriatrics Society (2011) (AGS/BGS) practice guidelines, all adults over the age of 65 years of age should be screened for fall risk at least once a year. Screening should include questions about the number and frequency of falls in the past year, and any difficulties in balance and/or gait (American Geriatrics Society and British Geriatrics Society, 2011) (AGS/BGS). These guidelines identify older adults who are considered at a high risk for falling as having: 1) fallen two or more times in the past 12 months, 2) been to the emergency because of a fall 3) report having difficulties with walking and/or balance. Older adults identified as having a higher risk of falling should undergo a multifactorial risk assessment. Low risk is defined as not fallen or fallen once without any other recurrent falls in the past 12 months and therefore, a multifactorial risk assessment is not required.

The 2011 AGS/BGS guidelines recommend that a multifactorial risk assessment should include: obtaining relevant medical history, physical examination, cognitive assessment, functional assessment, history of falls, medications, assessment of gait and balance, vision,

muscle strength, neurological impairments, heart rate, postural hypotension, feet and footwear, and identification of environmental hazards. A multifactorial risk assessment can be carried out by a single or several health care providers who may complete the components most relevant to their expertise. Health care providers who may conduct all or part of a multifactorial fall risk assessment include: general health practitioners, nurse practitioners, physical therapists, occupational therapists or pharmacists (Public Health Agency of Canada, 2014).

2.2.2. Acute and Long-Term Care Settings:

Falls among older adults are common in acute and long-term care settings (Norris, Walton, Patterson, Feightner & Canadian Task Force on Preventative Health Care, 2005; Reducing Falls and Injuries of Falls, 2015). By screening residents, health care providers can develop interventions to prevent falls from occurring or to minimize injury if they occur (Reducing Falls and Injuries of Falls, 2015). Guidelines encourage health care providers to assess older adults in acute and long-term care for fall risk at the following time points: 1) on admission, 2) on a regularly scheduled basis, 3) following any change of status, and 4) following a fall or near fall (Reducing Falls and Injuries of Falls, 2015). The frequency of subsequent fall risk assessments will be dependent on the setting and the patient's risk. In long-term care the frequency of a fall risk assessment will often be an established part of standard care practices (Reducing Falls and Injuries of Falls, 2015). In acute care the need for regular reassessments is determined by: the older adult's length of stay, level of acuity, and level of acute illness effect on physical and cognitive function (Reducing Falls and Injuries of Falls, 2015). Some of the most commonly used fall risk assessment scales used in acute and long-term settings include Hendrich II Fall Risk Model, Morse Fall Scale, Scott fall risk screen for residential Long-Term Care, and Stratify Risk Assessment (Reducing Falls and Injuries of Falls, 2015).

2.3. Postural Control:

One primary modifiable risk factor to reduce the risk of falls in older adults is balance (Ambrose, Paul, & Hausdorff, 2013). Balance, or postural control, is defined as the ability to keep the centre of mass within the limits of the base of support (Gervais et al., 2014). Center of mass is defined as the weighted average of each body segment, whereas the base of support is the area in contact with a support surface. The central nervous system (CNS) controls the body's

muscles which generates forces to control motion of the center of mass. The center of the distribution of the total force generated and applied to the support surface is called the center of pressure. The center of pressure moves to keep the center of mass within the base of support (Shumway-Cook & Woollacott, 2017). The base of support must increase or be modified if the center of mass moves outside the base of support. Moving feet quickly, or reaching for a support surface with the upper body, can catch the center of mass to prevent a fall. For example, when walking the center of mass does not stay within the base of support, and thus the body is in a continuous state of imbalance. To prevent a fall as the center of mass moves forward, the swinging foot is placed ahead of the stance foot thus ensuring control of the center of mass relative to a moving base of support (Shumway-Cook & Woollacott, 2017).

Original reflex theories of postural control described maintenance of balance controlled by activation of reflexes based on visual, vestibular and somatosensory triggers (Horak 2006; Magnus 1927; Roberts, 1973; Roberts, 1978; Weisz, 1938). In the reflex model, sensory stimulus alone shapes motor responses to disequilibrium, as information flow was thought to be unidirectional from sensory receptors to motor effectors (Horak, Shupert & Mirka, 1989). However, the reflex model does not account for how postural control requires one to predict, detect, and encode disturbances in posture. Additionally, the reflex model does not account for how the body selects the most reliable source of sensory information to develop a corrective or protective response.

Limitations to the reflex theory had led to the development of the systems framework of postural control by Horak (Horak, Shupert and Mirka, 1989; Horak 2006). The systems framework of postural control, like the reflex theory, identifies the use of sensory inputs in detecting a stimulus to trigger a postural response. However, unlike the reflex theory, this framework takes into account how the CNS maps the location of the body's center of mass based on: the body's biomechanical constraints, the available sensory information, the environmental context, and the prior experience of that person (Horak, Shupert & Mirka, 1989). Postural control is impacted by the body's biomechanical constraints because neural activity via the CNS implements movement of the musculoskeletal system. Interaction of components in the CNS such as the spinal cord, brainstem, cerebellum, and basil ganglia organize and interpret sensory information to select postural responses appropriate to the environmental context (Horak, Shupert & Mirka, 1989). Somatosensory information is transmitted via the spinal cord. The brainstem

controls postural tone; where as, adaptation of postural responses and muscle patterns is controlled by the cerebellum and basil ganglia (Shumway-Cook & Woollacott, 2017). Information about the position of center of mass must be derived from peripheral sensory information about 1) motion of the body with respect to the support surface, 2) motion of body segments with respect to each other from the somatosensory system, 3) motion of the body with respect to extra personal space from the visual system, and 4) linear and angular acceleration of the head from the vestibular system. Additionally, automatic responses to imbalance depend not only on sensory information but also prior experience of a task (Horak, Shupert & Mirka, 1989).

The Systems framework of postural control identifies components of balance that are influenced by interaction of the individual, task, and environment (Brody & Hall, 2011; Shumway-Cook & Woollacott; Horak, 2006). Daily living requires four main types of balance control used in a wide variety of functional tasks. These include static, dynamic, anticipatory, and reactive postural control (refer subsections below). Additionally, different environmental demands, such as changes in support surfaces, affect organization of muscles and forces needed for balance. Different visual and surface conditions affect sensory information used for balance control and different tasks can affect cognitive attention used to control balance (Shumway-Cook & Woollacott, 2017). The systems postural control framework also describes different systems or components affecting balance. Each of the following types of balance and components are described within each subsection below: Components first described in the systems framework of postural control included (1) biomechanical constraints, (2) movement strategies, (3) sensory strategies, (4) orientation in space, (5) control of dynamics and (6) cognitive processing (Horak, 2006) Based on a scoping review by Sibley et al. (2015), an updated version on the original six components described by Horak (2006) was developed. These balance components described in the updated version of the systems framework of postural control include: (1) static stability, (2) orientation in space, (3) limits of stability, (4) dynamic stability, (5) underlying motor systems, (6) reactive postural control, (7) anticipatory postural control, (8) sensory strategies, and (9) cognitive processing (Sibley et al., 2015).

Each of the following types of balance and components are described within each subsection below: (1) static stability, (2) orientation in space, (3) limits of stability, (4) dynamic stability, (5) underlying motor systems, (6) reactive postural control, (7) anticipatory postural control, (8) sensory strategies, and (9) cognitive processing. Additionally, confidence will also be

discussed as poor confidence in one's balance is associated with fall risk (Lajoie & Gallagher, 2004).

2.3.1. Static and Dynamic Stability:

Static stability is defined as the ability to maintain balance in an unsupported stance for a measured period of time when the base of support does not change (Horak 2006; Shumway-Cook & Woollacott, 2017). When a person is maintaining a static stance, postural sway, which is the constant small deviations in centre of mass position, will occur (Sturnieks, St George & Lord, 2008). Factors that contribute to one's ability to maintain static stability to ensure that postural sway remains within the base of support include **orientation in space**, biomechanical constraints, and **limits of stability**.

Orientation in space, known also as **postural alignment** or **verticality**, is the ability to orient the body parts via internal references with respect to gravity, the support surface, and visual surroundings (Horak, 2006). The vertical line of gravity falls in the midline between the mastoid process, a point in front of the shoulder joints, the hip joints, and a point in front of the center of the knee, and ankle joints. Some of the muscles responsible for proper alignment in respect to the line of gravity are the abdominals, quadricep femoris, and the tibialis anterior. These muscles help with correcting postural sway when the body sways in the backward direction. Muscles responsible for correcting postural sway when the body sways forwards include: erector spinae, bicep femoris, gastrocnemius, and the soleus (Shumway-Cook & Woollacott, 2017). If there is an inaccurate internal representation of postural alignment that is not aligned with gravity this will result in an unstable static stance (Horak, 2006). Biomechanical constraints are described as joint motion and quality of base of support (Horak, 2006; Sibley, 2015; Shumway-Cook & Woollacott, 2017). Common limitations to biomechanical constraints in the elderly can include limitations in size, control, strength, range, or pain in the feet (Tinetti, 1988). **Limits of stability** is described as the ability to move the center of mass in the anterior-posterior or medio-lateral direction as far as possible without changing the base of support (Horak, 2006). This can be measured by the center of pressure trajectory in relation to the base of support. The ability to move the center of mass without changing the base of support decreases with age which puts older adults more at risk for a fall (Sturnieks, St George & Lord, 2008). **Dynamic stability** is the ongoing control of balance as the base of support changes. This includes

postural transitions and gait. Characteristics of impaired gait in older adults include slow walking speed, reduced stride length, and mild widening of the base of support (Herman, Giladi, Gurevich, & Hausdorff, 2005).

2.3.2. Anticipatory Postural Control:

Anticipatory postural control is the ability to shift and control balance in anticipation of postural transition from one body position to another. This includes stepping, sitting to standing, and reaching or lifting objects. Postural adjustments are often used in a proactive manner to stabilize the body before making a voluntary movement (Kanekar & Aruin, 2014). For example, one must activate the muscles and shift their weight toward their left leg before stepping onto a curb with their right (Shumway-Cook & Woollacott, 2017). Individuals with impaired anticipatory postural control show postural instability during self-initiated movements (Horak, 2006). Inability to stabilize the body in association with voluntary movement contributes to the risk of falls in older adults. Adults over 60 years commonly activate postural and prime mover muscles simultaneously. The inability to activate postural muscles before the prime mover muscles can cause a loss of balance putting an older adult at risk for a fall (Shumway-Cook & Woollacott, 2017; Kanekar & Aruin, 2014).

2.3.3. Reactive Postural Control and Underlying Motor Systems:

Reactive postural control is the ability to regain balance in response to an unexpected perturbation. There are four types of strategies that are used when balance is disrupted in the anterior and posterior direction which include: in place ankle strategies, in place hip strategies, changing in support strategies by stepping, and reaching to grasp (Shumway-Cook & Woollacott, 2017). Additionally, **underlying motor systems** can impact the functional strength and coordination for ankle and hip strategies (Sibley, 2015).

The ankle strategy restores stability through body movement centered primarily about the ankle joints. This strategy is typically used in situations in which the perturbation is small and the support surface is firm (Shumway-Cook & Woollacott, 2017; Horak & Nashner, 1986). Any perturbation in the forward direction results in activation of the gastrocnemius, producing a plantarflexion torque, which slows and reverses the body's forward motion. Additionally, activation of the hamstrings and paraspinal muscles keeps the knees and hips in an extended

position. This allows the gastrocnemius to produce a plantarflexion torque without the forward motion of the upper extremities. In the backwards direction activation of the tibialis anterior, the quadriceps, and abdominal muscles, brings the body's backward motion forward (Shumway-Cook & Woollacott, 2017).

The hip strategy restores stability in response to larger and faster perturbations when standing on a support surface that is short in relation to one's foot length (Shumway-Cook & Woollacott, 2017; Horak & Nashner, 1986). Any disturbance in the forward direction will result in activation of the abdominal muscles followed by the quadriceps. If backward sway occurs due to a disturbance in balance, the paraspinal muscles and hamstrings are activated (Shumway-Cook & Woollacott, 2017; Horak & Nashner, 1986).

These strategies require range of motion and strength in the ankles and at the hips. Limited range of motion at the ankles due to shortening of the gastrocnemius and soleus muscles may limit an older adult's ability to generate forces against the surface to control the center of mass (Horak, Henry, Shumway-Cook, & Peterson, 1997). Also reduced hip, knee extension and ankle dorsiflexion strength are a major risk factor for falls in older adults (Sturnieks, St George & Lord, 2008).

The recovery of balance is also accomplished by using change in support strategies which involve rapidly moving the limbs to change the base of support. This is accomplished by either taking a step or by reaching and grasping an object (Shumway-Cook & Woollacott, 2017). It was originally believed that the change-in support strategies were mechanisms of last resort when fixed-support strategies had failed. However, research has found that change in support strategies is used when perturbations are small and stability could have been maintained without moving the arms or legs (Maki & McIlroy, 2006). Fixed support reactions may be important in providing an early defense against loss of balance. However, change in support reactions have the potential to make a larger contribution to stabilization. Change in support strategies increase the size of the base of support and the moment arm between the point of action of the foot or hand contact and the center of mass (Maki & McIlroy, 2006). Elderly individuals at risk of falling tend to use the stepping, reaching, and hip strategies more than an individual with a low risk of falling who tends to uses the ankle strategy to maintain postural stability (Horak, 2006).

2.3.4. Sensory Strategies

Sensory strategies are defined as the ability to re-weight visual, vestibular and somatosensory information when input is altered. Visual input provides the individual with information regarding the position and motion of the head with respect to surrounding objects. Vision is also used as a reference for verticality in static postural control (Shumway-Cook & Woollacott, 2017; Horak 2006). When subjected to limited visual cues, older adults' postural sway increases which subjects them to an increased risk for a fall (Alexander, 1994).

Somatosensory input provides the CNS with position and motion information about the body with reference to the support surface (Shumway-Cook & Woollacott, 2017). Impairment in peripheral sensory receptors in lower extremities can diminish one's capacity to detect information from the soles of the feet (Qiu et al., 2012). Diminished somatosensory function has also been identified as a significant age-related change, and contributor to postural instability and falls in older adults (Qiu et al., 2012).

Vestibular input provides the CNS with a gravitational frame of reference for postural control. The CNS will use information about the position and movement of the head with respect to gravity (Shumway-Cook & Woollacott, 2017). Older adults who have impaired vestibular input have minimal control their center of pressure within their base of support (Talebi, Karimi, Abtahi & Fereshtenejad, 2016). Older adults with impaired vestibular input move their center of pressure from anterior to posterior, and lateral to medial position more when compared to older adults without visual impairments. This is done simultaneously with high frequency. The high frequency movement of the center of pressure increases the risk for a fall in older adults (Talebi, Karimi, Abtahi & Fereshtenejad, 2016).

When an individual moves from one environmental context to another, the ability to distribute sensory information is important for maintaining postural control (Horak, 2006). In a well-lit environment with a firm base of support, healthy persons rely on somatosensory information (Peterka, 2002). However, somatosensory input decreases when standing on an unstable surface. This increases sensory weighting to vestibular and visual information (Peterka, 2002). Individuals with visual, vestibular, or somatosensory loss from neuropathy are limited in their ability to re-weight postural sensory dependence and, thus, are at risk of falling in particular sensory contexts (Horak, 2006).

2.3.5. Cognitive Processes and Confidence:

Cognitive processes are described as the ability to maintain stability when attending to additional tasks or responding to commands during a task. Performance of postural tasks can be impaired by a secondary cognitive task since the control of posture and other cognitive processes may share the same cognitive resources (Horak, 2006). Individuals who have neurological impairments may use more of their available cognitive processing to control posture. If an individual is occupied with a secondary cognitive task this may put an individual at risk for a fall if there is an insufficient amount of cognitive processing to control posture (Horak, 2006). Specific to balance, confidence pertains to the perceived ability to maintain balance during daily activities of living (Lajoie & Gallagher, 2004). In older adults, low confidence in one's balance has shown to be associated with falls (Lajoie & Gallagher, 2004).

2.3.6. Summary:

Based on the systems framework of postural control described by Horak (2006) the individual, task, and the environment interact to impact postural control. Static, dynamic, anticipatory and reactive balance control are required to maintain balance in different everyday tasks. Sensory systems such as vision, somatosensory, and vestibular impact balance depending on the task and environment. Additionally, attending to different tasks can put a demand on cognitive processes that can impact postural control and result in instability.

2.4. Types of Balance Assessment:

This section first discusses a study by Sibley et al. (2015) which reviewed components of postural control included in standardized balance measures. This section is followed by Table 2.1 listing common balance measures and tools used to assess standing balance (Sibley 2011). Additionally, examples to test cognitive processing and confidence were included.

2.4.1. Components of postural control included in standardized balance measures (Sibley et al., 2015):

The purpose of this article was to synthesize literature on standardized balance measures for adult populations and analyze the content of measures with respect to the systems framework

for postural control. Out of the 66 measures, underlying motor systems were evaluated in all 66 measures, anticipatory postural control in 47 measures, dynamic stability in 44 measures, static stability in 42 measures, sensory integration in 32 measures, functional stability limits in 18 measures, reactive postural control in 15 measures, cognitive influences in 11 measures, and verticality in five measures. Thirty-four measures evaluated three or fewer components of balance, 22 measures evaluated between four and six components of balance, nine measures evaluated seven or eight components of balance (Clinical Gait Balance Scale, Fullerton Advanced Balance Scale, Mini-BESTest, and Unified Balance Scale included 8 components of balance), and one measure evaluated all nine components of balance (the Balance Evaluation Systems Test).

Table 2.1. Common tools and measures to assess standing balance

Measure/Tool	Summary	Components Assessed	Resource of Measure/Tool
Balance Evaluation System Test (BESTest)	36 item test which identifies the disordered systems responsible for poor functional balance.	Biomechanical Constraints Limits of stability Orientation in Space Anticipatory Postural Control Reactive Postural Control Sensory Integration Underlying Motor Systems Cognitive Processing Static Stability Dynamic Stability	Horak, Wirsley and Frank (2009)
Berg Balance Scale	14 item list consisting of movements common in everyday life. Designed to assess balance in the elderly.	Bio-mechanical Constraints Limits of stability Anticipatory Postural Control Sensory Integration Static Stability	Berg, Wood-Dauphine, Williams and Gayton (1989)
Clinical Test of Sensory Integration in Balance	Changes in the patient's amount and direction of postural sway while standing for a maximum of 30 seconds is observed.	Sensory Integration	Shumway-Cook and Horak (1986)
Community Balance and Mobility Scale	Assesses balance deficits that may impact participation in the community and not fall risk for older adults.	Bio-mechanical Constraints Limits of stability Anticipatory Postural Control Reactive Postural Control Static Stability	Howe, Inness, Venturini, Williams and Verrier (2006)

		Dynamic Stability	
Performance-Orientated Mobility Assessment	Assesses gait, balance, fear of falling, and perception of balance in activities of daily living.	Anticipatory Postural Control Reactive Postural Control Sensory Integration Static Stability Dynamic	Tinetti (1986)
Push and release test	This test rates the postural response to a sudden release of a subject pressing backward on an examiner's hands placed on the subject's back.	Reactive Postural Control	Jacobs, Horak, Van Tran and Nutt (2006)
Single-leg stance test	The amount of time an individual can stand on one lower limb is tested.	Static Stability	Fregly and Graybiel (1968)
Timed "Up & Go" Test	Patient is starts in a seated position. Time begins when the patient stands up, walks three meters, turns around, walks back to the chair and sits down.	Anticipatory Postural Control	Podsiadlo and Richardson (1991)
Activities-Specific Balance Confidence Scale	A questionnaire that measures an individual's confidence in performing activities without losing balance.	Confidence	Hatch, Gill-body and Portney (2003)

2.5. Urban and Rural Setting:

When compared to Canadians living in urban centers; rural Canadians generally have poorer health, higher morality rates, shorter life expectancy, higher rates of disability, and greater risk of death from suicide (Shah, Milosavljevic & Bath, 2017; Wielandt & Taylor, 2010). One of the biggest contributing factors to health risks of rural Canadians is lack of adequate health care services (Shah, Bath, & Milosavlievic, 2015; Wielandt & Taylor, 2010). Additionally, shortage of health professionals in rural areas also contribute to health risks of rural Canadians (Shah, Bath, & Milosavlievic, 2015; Wielandt & Taylor, 2010). Specifically, in Saskatchewan, adults aged 65 years and older who live in rural areas face reduced access to different health services. In

Saskatchewan half of the residents living in rural communities have reduced access to health care providers such as nurse practitioners (Moran et al., 2015). About 10% of Saskatchewan's older adult population have reduced access to physicians and physical therapy services (Shah, Bath, & Milosavlievic, 2015). Family physicians are not evenly distributed throughout Canada (Karunanayake et al., 2015). For example, according to the Canadian Institute for Health Information, Saskatchewan has the lowest number of physicians per 100 000 population of any province in Canada (Wasko, 2014).

Where rural and remote residents make up approximately 30% of Saskatchewan's population, only 10% of Saskatchewan's physiotherapists practice in rural areas in the province (Bath et al., 2015). This results in reduced access to these services for residents living in rural areas in this province (Bath et al., 2015).

Research suggests there are several factors that affect retention of health care providers which include access to continuing professional development and education, financial factors including financial incentives, return of service contracts, or short employment contract, community factors such as children's education, leisure activities, and personal factors including rural background, spousal and family interest (Stewart et al., 2011; Wielandt & Taylor, 2010).

2.6. Summary of Balance Assessment Studies:

This section is a summary of studies that have evaluated balance assessment practices specifically linked to the systems framework of postural control. There are two Canadian studies that identified balance assessment practices and use of standardized balance measures based on the systems framework of postural control. Specifically, these studies focused on practices of physical therapists in the province of Ontario (Sibley et al., 2011) and Saskatchewan (Oates et al., 2017). Sibley et al. (2011) and Oates et al. (2017) concluded similar findings, reporting that respondents regularly assessed many components of balance that were important for daily functioning; however, reactive components of balance specifically related to fall avoidance were not regularly assessed by most physical therapists. A third study discussed below is a qualitative study identifying the clinical decision-making process of physical therapists in the United States (McGinnis et al., 2009).

2.6.1. Balance Assessment practices in Ontario (Sibley et al., 2011):

The purpose of this article was to examine current practices in balance assessment across different settings and practice areas based on examining components of the systems framework for postural control. Objectives of the study were to identify which components of balance were most commonly evaluated, identify which standardized balance measures were most commonly used, and to compare the balance components assessed and measured across physical therapist practice areas in Ontario. Regularly assessed balance components were postural alignment, static stability, dynamic stability, functional balance, and underlying motor systems. The least assessed balance components included underlying, sensory, and cognitive contributions to balance, and reactive balance control. In regards to balance measures most commonly used was the single leg stance test, Berg balance scale, and the timed up and go test.

2.6.2. Balance Assessment practices in Saskatchewan (Oates et al., 2017):

The purpose of this article was to determine the current balance assessment practices of physiotherapists who assess and treat adults with balance and mobility impairments in Saskatchewan. This included which measures therapists were using and which balance components were being assessed regularly. Oates et al. (2017) hypothesized that the most commonly used measure and balance components assessed would be similar to those reported by Sibley et al. 2011. Primary outcomes for this study included the percentages of the respondents who: (1) regularly used balance measures and (2) regularly assessed balance components.

Seventy-two participants completed the survey identifying the frequency of assessment of the nine distinct balance components identified in the systems framework as well as opportunities to add in other assessment practices used.

The most regularly used assessment approach was not balance measures that included theoretical systems framework components, but identified as movement observation. Out of the standardized balance measures used in practice, the five measures most regularly used were the: Berg balance scale, single leg stance test, tandem standing and walking, functional reach test, and the timed up and go test. The balance components most regularly assessed were static stability, underlying motor systems, and dynamic stability. Anticipatory postural control, verticality, and functional stability limits were also regularly assessed by respondents. The least regularly assessed components of balance were reactive postural control, cognitive influences and sensory

integration. Four respondents reported regularly assessing all nine balance components, 38 regularly assessed five to eight components, 20 regularly assessed one to four components, and one reported regularly assessing none of the components. No significant differences were found in the balance components assessed across practice areas.

2.6.3. Factors that Influence the Clinical Decision Making of Physical Therapists in Choosing a Balance Assessment Approach (McGinnis et al., 2009):

There were 3 main objectives to this study: (1) explore the clinical decision-making during examination of patients with balance deficits, (2) to understand the use of balance assessment methods from the clinician's perspective, and (3) to identify what therapists in the study knew about available options to assess balance explore why they selected the balance methods they chose. A grounded theory approach was chosen to permit an in-depth exploration of clinical decision-making during examination of balance. Seven themes emerged from the data which were presented in 4 different categories which included: (1) sources of information, (2) decision-making process, (3) decision-making reasons, and (4) professional role. In the sources of information category, the first theme that was developed included **the limited influence of the literature in guiding participants selection of a balance method**. The second theme generated was **practical knowledge**. Contributing factors to their **practical knowledge** was the primary role of experience in influencing their decisions, interacting with colleagues and influence from their academic education contributed to their balance assessment decisions.

In the decision-making process category, the third theme that emerged was **that therapists use patient factors to initiate decision making and to contribute to expected patient presentation based on their experience.** Patient factors contributing to examination decisions most commonly identified by participants were medical diagnosis, age and history. **The fourth theme that was generated was that physical therapists rely on movement observation to guide assessment decisions**. This is consistent with findings in the studies summarized above. Participants would use movement observation for: preliminary observation, screening, select specific tests, determine areas to include in the examination, as a diagnostic tool, and an outcome measure.

In the decision-making reasons category, the fifth theme that emerged was **therapists' perspective that the primary advantage of using standardized balance tests was to have quantitative data for documentation purposes.** Participants reported that balance assessment

approaches with numeric scoring was useful to assist with specific purposes such as goal setting or demonstrating patient progress. Some participants identified that psychometric properties of reliability or validity was a primary consideration in their selection of balance assessment approach. The six theme that was generated was **therapists' views of the perceived value of information gathered from a particular balance assessment approach mattered more than the testing time when selecting methods during examination of patients.** Participants would consider both aspects and select an approach that they valued, considered relevant or meaningful.

The fourth category developed was the professional role of the therapist. The seventh and final theme in this category was **difficulty with the concept of physical therapists as diagnosticians**. Participants reported they focused on the medical diagnosis or pathology-based diagnosis already given to the patient and did not view establishing a diagnosis as part of their role as the physical therapist. However further analysis of the participants responses led to researchers identifying that participants used balance assessment approaches to identify patient problems and to develop a plan of care. Therefore McGinnis et al., (2009) identified that participants did engage in a diagnostic process even though participants did not view it in this way.

2.7. Summary of Literature Review:

There are multiple factors that impact fall risk. In different care settings, different types of fall risk assessments are used to identify fall risk of an older adult. One of the modifiable fall risk factors is balance. Described in the systems framework of postural control (Horak 2006), balance is impacted by different factors such as the environment, task, and individual characteristics of a person. These individual characteristics, or components of balance, can be tested. Testing of these components can lead to development of an intervention to reduce fall risk. There are many common assessments and tools that can be used to identify balance deficits (Sibley et al., 2011). However, there is no recommendation by governing bodies of which assessments or tests are the best or gold standard to be used to assess each balance component (Duncan et al., 2013). Some literature has reported physical therapists' use of balance assessment practices in Ontario and Saskatchewan (Oates et al., 2017; Sibley et al., 2011). However, these studies identified not all components of balance are being assessed when assessing for balance deficits in older adults; with a tendency to rely on other methods such as movement observation. Specifically, we do not

know what other health care providers are doing in regards to assessing balance in urban and rural settings in the province of Saskatchewan.

Chapter 3: Methodology

3.1. Study Design: Sequential Explanatory Design

Sequential explanatory design (quantitative-QUALITATIVE) (Cresswell, Plano, & Vicki, 2010) was used in this research study. Sequential explanatory mixed methods design involves two phases. Phase one includes collection and analysis of quantitative data. Phase two includes collection and analysis of qualitative data to help explain or elaborate the quantitative results obtained in the first phase (Ivankova et al., 2006). Quantitative data collected in phase 1 helped answer how often within a health care providers' assessment of balance for older adults are all balance components assessed. Additionally, quantitative data were used to identify any differences in assessment of balance amongst professions or practice location (rural vs. urban) in Saskatchewan. Phase 2 results refined and explained the quantitative results from phase one by exploring participants' views in more depth through one-on-one semi-structured interviews. Development of the qualitative interviews were based on results from the quantitative data analysis. These interviews helped expand on current clinical practice of general health care providers identifying the decisions, enablers, and barriers to conducting balance assessment of older adults in urban and rural Saskatchewan (Ivankova et al., 2006). Results obtained from phase 2 were then used to explain phase 1 results [Figure 3.1].

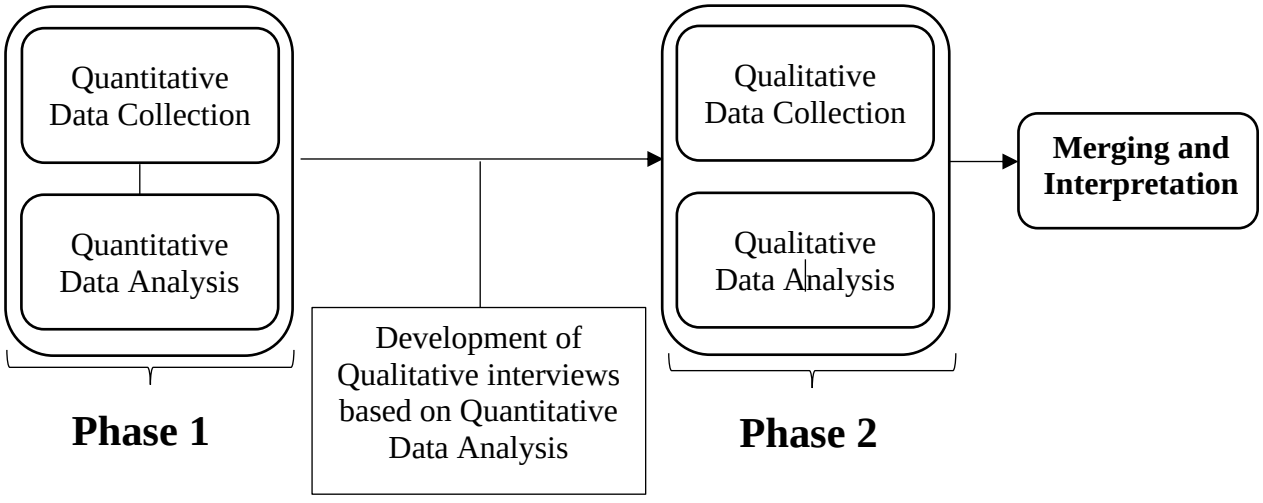

Figure 3.1. Sequential Explanatory Design

3.2. Phase 1: Quantitative Data Collection and Analysis

Described below is the method for the analysis of the survey data used in the quantitative phase. Data for the present study were collected as part of a larger survey study that assessed a wide range of information regarding fall risk assessment parameters. A sub-survey to determine balance assessment practices for those respondents who indicated they assessed balance and/or gait as part of the fall risk screening, was administered for this project (refer to section **3.2.5. Data Collection** for more details of development of the balance survey). The survey was administered by The Canadian Hub for Applied Social Research (CHASR) at the University of Saskatchewan. SSRL sent an anonymous link so no identifying information such as email address would be collected. The sampling technique used was convenience sampling (Lopez & Whitehead, 2013) as participants were accessed through obtaining lists of members in professional health organizations. For the purposes of this portion of the study, a survey link was administered by SSRL to Saskatchewan professional health organizations. These included: Saskatchewan Registered Nurses Association, Saskatchewan Occupational Therapy Association, Saskatchewan College of Physical Therapists, Saskatchewan College of Pharmacists, Canadian Society of Exercise Physiology, and the Saskatchewan Association of Social Workers. This sampling technique was used to include health care providers working in the province of Saskatchewan, who currently identified as providing care within their practice to adults over 65 years of age and older.

3.2.1. Participants:

Practice professions identified from the participants who met the criteria as described above and completed phase 1 survey included: kinesiologist (n =1), occupational therapist (n=6), pharmacist (n=6), physical therapist (n=23), social worker (n=3), registered nurse (n=10) and licensed practical nurses (n=147). Refer to **Table 3.1** for a working definition of each profession. Based upon these numbers, professions were then grouped into 3 categories: rehabilitation therapists (n=30) (kinesiologists, occupational therapists and physical therapists), nurses (n=156) (registered nurses and licensed practical nurses), and other (n= 10) (pharmacists and social workers).

Table 3.1: Working definition of Professions		
Profession	**Definition**	**Source**
Kinesiologist	University-educated health professional who applies exercise and movement science to promote health and wellbeing; prevent, manage and rehabilitate injuries; treat illness and chronic disease; restore function, and optimize human performance in the workplace, clinical settings, sport and fitness.	Canadian Kinesiology Alliance (n.d.) Retrieved Jan 9th, 2021 https://www.cka.ca/en/what-is-kinesiology
Physical Therapist	University-educated health professional who assists people to restore, maintain and maximize their strength, function, movement, and overall well-being. Physiotherapists have in-depth knowledge of how the body works and specialized hands-on clinical skills to assess, diagnose, and treat symptoms of illness, injury and disability.	Saskatchewan Physiotherapy Associatio (n.d.) Retrieved Jan 9th 2021 http://saskphysio.org/physiotherapy/what-is-physiotherapy
Occupational Therapist	University-educated health professional who specializes in the analysis, adaptation and therapeutic use of occupations, to achieve goals jointly determined by the therapist and the client, in the context of their own home and community. Additionally, promotes health, prevent disability, and develop or maintain abilities.	Saskatchewan Health Authority (n.d.) Occupational Therapists- Retrieved Jan 9th 2021 https://www.saskatoonhealthregion.ca/locations_services/Services/Occupational-Therapy
Pharmacist	University-educated health professional who provides services including medication reviews, chronic disease management, immunization and wellness programs.	Canadian Pharmacists Association (n.d.) Retrieved Jan 9th 2021 https://www.pharmacists.ca/pharmacy-in-canada/pharmacists-in-canada/
Social Worker	University-educated health profession concerned with helping individuals, families, groups and communities to enhance their individual and collective well-being. It aims to help people develop their skills and their ability to use their own resources and those of the community to resolve problems. Social work is concerned with individual and personal problems but also with broader social issues such as poverty, unemployment and domestic violence.	Canadian Association of Social Workers. (n.d.) Retrieved Jan 9th 2021 https://www.casw-acts.ca/en/what-social-work
Nurse	A care provider who is registered or licensed by a nursing regulatory body which includes	Staff Mix: Decision making framework for Quality

	registered nurses (RN), nurse practitioners (NP), licensed/registered practical nurses (LPN).	Nursing Care (2012). Retrieved on Jan 14th 2021: https://salpn.com/wp-content/uploads/Staff-Mix-Framework-2012.pdf
Registered Nurse (RN)	University Educated health professionals who may specialize in areas such as surgery, obstetrics, psychiatrics, pediatrics community health, occupational health, emergency, rehabilitation or oncology. RNs carry out activities based on an authorized health care providers orders and take a leadership role when the care requirements become more complex.	Interpretation of the RN Scope of Practice. Saskatchewan Registered Nurses Association. (2015). Retrieved on Jan 14th 2021: https://www.srna.org/wp-content/uploads/2017/09/Interpretation_of_the_RN_Scope_2015_04_24.pdf National Nursing Assessment Services. (n.d.) Retrieved on Jan 15th 2021: https://www.nnas.ca/nursing-requirements-in-canada/
Licensed Practical Nurse (LPN)	A health professional who requires a two-year college level practical nursing diploma. LPNs provide and coordinate care for individuals, families and groups in acute, long term, community or home care. Consulting and collaborating with other health care professionals are required.	Miller Brandon, 2021. Registered Nurse (RN) versus Licensed Practical Nurse (LPN)/ Registered Practical Nurse (RPN). Retrieved on Jan 14th 2021: https://www.monster.ca/career-advice/article/rn-versus-lpn-versus-rpn-canada National Nursing Assessment Services. (n.d.) Retrieved on Jan 15th 2021: https://www.nnas.ca/nursing-requirements-in-canada/
Nurse Practitioner (NP)	University Masters educated health professional that provides health care services such as health promotion, maintenance of wellness, illness and injury prevention, health condition, health care management of common acute and chronic illness, including ordering diagnostic investigations and prescribing treatments which include medications.	Interpretation of the RN Scope of Practice. Saskatchewan Registered Nurses Association. (2015). Retrieved on Jan 14th 2021: https://www.srna.org/wp-content/uploads/2017/09/Interpretation_of_the_RN_Scope_2015_04_24.pdf

3.2.2. Recruitment

Health care providers were contacted via their respective licensing body or professional associations. An invitation with a link to the electronic survey was emailed to members of each health care provider's organization. Prospective participants were sent a reminder two weeks after the initial invitation was sent. Participants were able to respond to the survey until April 30th 2019. It is difficult to determine the response rate because a third party disturbed the survey to their membership.

3.2.3. Ethical Considerations

Ethics approval was received from the Behavioral Ethics Review Board, University of Saskatchewan (Beh-REB 272) (Appendix A). By clicking to continue to answer the online survey about health care professionals' use of fall risk screening and assessment guidelines, via the email link, participants completed the consent portion of the application (Appendix B). All research procedures were completed in accordance with the REB guidelines.

3.2.4. Data Collection:

The larger survey was developed by a team of clinicians, researchers, patient and family advisors across the province. The survey was pilot tested by a sample of clinicians in the province and revised accordingly. The survey was hosted on a secure platform at the University of Saskatchewan. In the larger survey about health care professionals' use of fall risk screening and assessment guidelines, participants filled in their first 3 digits of their postal code of their work location. This identified if the participant worked in an urban or rural setting. Participants were identified as rural health care providers if the 3 digits of their work location's postal code obtained a zero (i.e., S0K). Participants were identified as an urban health care provider if the first 3 digits of their work location's postal code obtained any other number other than zero (i.e., S4K). Participants who identified they saw older adults in their practice and indicated that they assessed balance, and/or gait, were directed to the phase 1 balance survey for this study. In this survey, participants answered 11 questions focusing on how often each balance component was assessed for an older adult (Appendix C). The balance survey was adapted from previous studies (Oates et al., 2017; Sibley et al., 2011). The balance survey was also modified to include factors

in the systems framework of postural control (Horak, 2006; Shumway-Cook & Woollcott, 2017; Sibley et al., 2015). Balance survey instrument and survey administration procedures were pretested by three members of the project advisory team and modified based on feedback (refer to **2.2 Postural Control** section for explanation of systems framework of postural control and balance factors included in this model).

All 9 balance components from Sibley et al. (2015) updated systems framework of postural control were included in the survey. In addition, two components, confidence and verticality, were included based on previous literature (Horak 2006; Horak, Wirsley & Frank, 2009; Sibley et al., 2015). In result the balance components included in the survey were: (1) biomechanical constraints, (2) limits of stability, (3) static stability, (4) orientation in space, (5) underlying motor systems, (6) reactive postural control, (7) anticipatory postural control, (8) dynamic stability, (9) sensory strategies, (10) cognitive processing and (11) confidence. These balance components were defined and modified based on previous work, which was adapted the systems framework for postural control (Horak, Shupert & Mirka, 1989; Horak, 2006; Oates et al., 2017; Shumway-Cook & Woollcott,1990). Responses to the survey provided information to answer the research question: How often within a health care provider's assessment of balance for older adults are all balance components incorporated? Additionally, responses to the balance survey provided information to the sub-question: Are there differences in the assessment of balance amongst professions or practice location (rural vs. urban) in Saskatchewan?

3.2.5. Data Analysis:

Data from completed questionnaires were extracted and analyzed with SPSS 26 statistical software. Participant demographics and the frequency of assessment of balance components were summarized using descriptive and frequency statistics. The original ordinal scale was converted to a dichotomous scale. This was based on previous research where regular assessment of a balance component was defined as assessing 60% or more of the time in the participants' primary practice (Oates et al., 2017). Due to the data being treated as categorical, a chi-square analysis was chosen to answer the research question: "Are there differences in the assessment of balance amongst professions or practice location (rural vs. urban) in Saskatchewan?" Chi-square analysis provided information on exactly which categories account for any differences found between the different professions of rehabilitation therapists and nurses; and practice locations. Since there

was a sample size less than 20 in the "other" health care provider group, this sample was not included in the comparison of assessment of balance components professions. Additionally, 17 participants did not identify their work practice location and were not included in the chi-square analysis. When significant results were found ($p<0.05$), an odds ratio was calculated for the profession and practice location.

3.2.6. Validity:

Face validity and construct validity were achieved during the development of the survey. Face validity was achieved by asking the primary researchers advisory committee if the description of each balance components were understandable to health care providers who may not be familiar with clinical terms of each balance component. Additionally, face validity was achieved when feedback was given about the rating scale for the survey by the advisory committee. Construct validity was also achieved by the survey questions measuring only one construct: balance (Oates et., al 2017; Heale & Twycross 2015)

3.3. Phase 2: Qualitative Data Collection and Analysis:

3.3.1. Grounded Theory Approach:

The methodological approach used in the second phase was Straussian grounded theory. This approach is derived from the philosophical assumption of pragmatism and social interactionism (Corbin & Strauss, 1990). Pragmatism focuses on the outcomes of the research, actions, situations, and consequences of inquiry (Cresswell, 2013). Social interactionism describes how our thoughts and actions are influenced by our social interaction (Crooks, 2001). Derived from these two assumptions, Straussian Grounded theory aims to uncover a theory to explain a process, action or interaction (Corbin & Strauss, 1990). In this approach, the researcher is actively involved by completing memo writing as data is collected which actively helps to inform the development of a theory. In addition, the researcher will conduct a constant comparative analysis by interviewing participants, analyzing and creating themes from the data collected, then returning to the field to gather more data until re-occurring themes are developed to form the theory (Cresswell, 2013). Saturation was defined based on Straussian grounded theory which is defined as the point in category development at which no new properties,

dimensions, or relationships emerge during analysis (Strauss & Corbin, 1999: pg. 143). Straussian grounded theory was chosen to help develop a theory to explain the decision process of physical therapists and licenced practical nurses when assessing balance of older adults.

3.3.2. Participants:

Participants who responded to the phase 1 survey with interest in participating in the phase 2 one-on-one interviews included occupational therapists (n=1), physical therapists (n=10), kinesiologists (n=2), licensed practical nurses (n=19), registered nurses (n=2), and pharmacists (n=2). Participants were purposefully sampled from phase 1 respondents to ensure participants for phase 2 were selected with knowledge and experience of the phenomenon of interest (Palinkas, Green, Wisdom, Duan & Hoagwood, 2015). Given the decision to only include rehabilitation therapists and nurses in phase 1 analysis, phase two focused on these two professions. PTs represented the majority of respondents of rehabilitation therapists and LPNs for nurses.

3.3.3. Recruitment

Participants who completed the section of questions in the larger survey were prompted to a question at the end. This question asked participants to provide their name and email address for a further follow up interview on balance. Participants who responded “yes” to interest in participating in a one-on-one interview were contacted via email or phone. Once contacted, a time set up most convenient to the participant was scheduled to complete the one-on-one interview.

3.3.4. Sample Size:

Due to a higher response rate in phase 1 of licensed practical nurses (LPN) and physical therapists (PT), a focus of recruiting a maximum of 10 PTs and 10 LPNs to obtain a sample size of 20 participants was chosen which also provided the ability to explore potential differing perceptions of balance assessment between these two professions. It is suggested saturation should be obtained around recruitment of 20 participants (Cresswell 2013; Cleary et al., 2014). However, given a combination of a subset of interested respondents no longer available, as well as reaching a point where it appeared that saturation was reached or close to being met with re-

occurring data with no new properties, dimensions, or relationships emerging (Strauss & Corbin, 1999: pg. 143). The final sample included nine participants; 6 PTs and 3 LPNs. Three of the PTs worked in a rural work location where as the remaining 3 worked in an urban location. Two LPNs worked in a rural location while 1 worked in an urban setting.

3.3.5. Data Collection:

Ethics approval for phase 2 was obtained on August 15th 2019 (Beh-REB 272) (Appendix A). Since participants were not located at a single site, but dispersed across Saskatchewan, interviews were conducted over the phone at a time convenient to the participant. Before each interview, participants were sent a copy of the consent form via email. Participants were able to review the consent form so any questions could be answered prior starting the interview. At the start of the telephone interview, participants were first read the consent form and given the option to verbally consent to participate in the study (Appendix E). Participants were allowed to choose a pseudonym during the interview so their identification would remain anonymous. Each interview was audio recorded on a handheld recorder. Audio recordings of each interview allowed the researcher to listen and take field notes during each interview. Audio recordings of each interview also allowed playback of each interview so the researcher could transcribe the interview accordingly after the interview was conducted. Each semi-structured interview was conducted for 30 to 60 minutes with each participant. The semi-structured interview included questions about how the health care providers assessed balance in older adults in their practice. These questions included: (1) primary balance components assessed by the therapist, (2) the types of specific balance measures used during assessment, (3) identification of the profile of the clients that was considered by the therapist, and (4) the barriers and facilitators of administration of balance assessment (Appendix F). Questions in the semi-structured interview were developed and modified from a study which looked at understanding physical therapists' responses to balance assessment (McGinnis et al., 2009).

3.3.6. Data Analysis:

Constant comparative analysis was used to analyze the data collected after each interview by the primary researcher. Using this type of analysis ensured saturation of the data to occur (Glaser, 1965). Saturation was defined as the point in category development at which no new

properties, dimensions, or relationships emerge during analysis (Strauss & Corbin, 1999: pg. 143). Since there were no significant results of the chi square analysis based on urban and rural location, after transcription of each interview by the primary researcher, open ended codes based on profession were developed. The primary researcher first open coded each interview after each interview was completed. The primary researcher then open coded each interview in NVivo to provide another analysis source of information to generate open codes. This allowed the researcher to create tentative labels or categories that summarized responses to the semi-structured interview (Moghaddam, 2006). After open codes were developed, the primary researcher selected one category from the open codes that was extensively discussed by the participants. After selecting this one open coded category, or central phenomenon, the primary researcher positioned it as the central feature. The primary researcher then returned to the data base to understand how the other open coded categories generated related to the central phenomenon. Open codes were then grouped into categories of related concepts known as axial codes. This allowed the researcher to reduce the number of open codes and to collect them together to show a relationship among them (Moghadam, 2006). The primary researcher continued to interview participants and analyzed the data until common themes were identified from the axial codes. A second researcher also read all the transcripts and coded themes independently. Themes from both researchers were then discussed and modified to develop a theory of balance assessment. Additionally, field notes were analyzed to help fully saturate the data (refer to **3.4.1 Reflexivity**) (Cresswell, 2018).

3.4. Rigor

Rigor was be achieved in the study by ensuring reflexivity, transferability and completeness of the study.

3.4.1. Reflexivity:

Strauss and Corbin (1999) suggest researchers should be reflexive and sensitive to the data collected by being aware and acknowledging their own background. The primary researcher achieved this by actively writing in a reflective journal after each one-on-one interview (Appendix G). During data analysis, the primary researcher referred to each reflective entry when the open and axial codes were being developed. This process helped remind the primary

researcher that not all health professions understand the terminology of each component of balance; but still were conducting balance assessments within their work setting. Because of this, the primary researcher had to be aware of the participants' description of their assessment of balance. Participants would describe components of balance but not specifically identify them for the category in the systems framework of postural control. For example, a participant would describe how they would look at how a patient would walk but would not identify it as assessing dynamic balance.

3.4.2. Transferability

To ensure transferability, results must be transferable outside of the research setting (Chametzky, 2013). To ensure this, participants were given the opportunity to confirm the accuracy of the telephone interviews. The primary researcher emailed individual interviews to each participant for review of the conversation. Participants were asked to comment, add, or delete anything from their transcribed conversation. Participants had up to 2 weeks to clarify or provide edits to the transcript. If participants provided edits to the transcripts, they were modified accordingly and used in data analysis. However, no major changes were made by the participants to their interview transcriptions.

3.4.3. External Audit:

It is important to identify if the findings, interpretation and conclusions developed are supported by the data collected (Cresswell, 2013). To achieve this, one of the primary researcher's committee members completed an external audit to establish completeness of the study. After data collection, the external auditor additionally analyzed the transcripts and developed her own axial codes. Axial codes developed by the primary researcher and the external auditor were compared to determine if completeness had occurred.

Chapter 4: Results

4.1. Phase 1 Results:

4.1.1. Demographics:

In the larger study a total of 323 participants completed the questionnaire. One hundred and ninety-six participants from the larger survey completed the survey specific to this thesis, on balance assessment. Practice areas identified included kinesiologist (n =1), occupational therapist (n=6), pharmacist (n=6), physical therapist (n=23), social worker (n=3), registered nurse (n=10) and licensed practitioner nurse (n=147). Based upon these numbers, professions were then grouped into 3 categories: rehabilitation therapists (n=30) (kinesiologists, occupational therapists and physical therapists), nurses (n=156) (registered nurses and licensed practitioner nurses), and other n= (10) (pharmacists and social workers). The majority of respondents that did report their sex were female (n=83), whereas there were (n=10) male respondents. There were (n=103) respondents that did not report their sex. The majority (n=112) of the participants worked in urban settings where as the remaining participants identified as working in rural areas (n=67). There were twenty-two respondents who did not report their work location. Thirty-four respondents (17.3%) reported that they worked less than five years with clients of 65 years of age or older. Only (21.4%) respondents reported that they worked with clients of 65 years of age between 5-9 years, (20.9%) between 10-14 years, (17.3%) between 15-20 years, and (23.0%) greater than 20 years.

Table 4.1: Demographics		
Grouped Profession		
	Frequency	**Percentage (%)**
Rehabilitation Therapist	30	15.3
Nurses	156	79.6
Other	10	5.1
Total	196	100
Age		
18-30 years	9	9.6
31-40 years	32	34.0
41-50 years	23	24.5
51-60 years	23	24.5
>60 years	7	7.4
Missing Value	102	52.0
Sex		
Male	10	10.8
Female	83	89.2
Missing Value	103	52.5
Location of Work Setting		
Rural	67	34.2
Urban	112	57.1
Missing Value	17	8.6
Completion of professional training		
< 5years	34	17.3
5-9 years	42	21.4
10-14 years	41	20.9
15-20 years	34	17.3
> 20 years	45	23.0
Missing Value	0	0
Education in fall risk screening/assessment		
Yes	75	78.1
No	21	21.9
Missing Value	100	51.0

4.1.2. Frequency of Balance Components Assessed Within a Health Care Providers Assessment:

Regular assessment of each balance component was defined as assessing 60% or more of the time in the participant's primary practice (Oates et al., 2017). Each balance component as described within the systems of postural framework was questioned independently for frequency of assessment. Results of the percentage of the sample who did and did not assess regularly are summarized in **Table 4.2**. Greater than 60% of the sample reported regularly assessing (n =196) balance components such as biomechanical constraints (n = 121, 62.1%), static stability (n= 127, 65.1%), orientation in space (n= 123,63.1%), underlying motor systems (n= 124, 63.9%), anticipatory postural control (n= 135, 69.2%), and dynamic stability (n= 136, 69.7%). Balance components where less than 60% of the sample reported not regularly assessing included limits of stability (n= 104, 53.1%), reactive postural control (n=94, 48.5%), sensory strategies (n= 113, 57.9%), cognitive processing (n=79, 41.6%), and confidence (n= 86, 45.5%).

Table 4.2. Percentage of the sample who did and did not regularly assess balance components

	% of respondents who assessed (n=196)	% of respondents who did not (n=196)	Missing Values
Biomechanical Constraints	62.1 (121)	37.9 (74)	1
Limits of Stability	46.9 (92)	53.1 (104)	0
Static Stability	65.1 (127)	34.9 (68)	1
Orientation in Space	63.1 (123)	36.9 (72)	1
Underlying Motor Systems	63.9 (124)	36.1 (70)	2
Reactive Postural Control	51.5 (100)	48.5 (94)	2
Anticipatory Postural Control	69.2 (135)	30.8 (60)	1
Dynamic Stability	69.7 (136)	30.3 (59)	1
Sensory Strategies	42.1 (82)	57.9 (113)	1
Cognitive Processing	58.4 (111)	41.6 (79)	6
Confidence	54.5 (103)	45.5 (86)	7

4.1.3. Chi Square Analysis:

Out of the 186 respondents who were nurses or rehabilitation therapists, a significant association of regularly assessing limits of stability and dynamic stability was found. Results are summarized in **Table 4.3**. Rehabilitation therapists are two times more likely to assess limits of stability (OR = 2.4; 95% CI 1.1-5.5) and three times more likely (OR=3.0; 95% CI 1.0- 9.1) to regularly assess dynamic stability than nurses. Rehabilitation therapists are less likely (OR= .384; 95% CI .165-.894) to assess confidence than nurses. Out of (n=179) respondents there was no significant association in the assessment of balance components amongst practice location in Saskatchewan. Results are summarized in **Table 4.4**.

Table 4.3. Chi square analysis based on profession								
	Rehabilitation Therapist			Nurses			Asymp Sig (2-sided)	Odds Ratio (95% CI)
	% of respondents who assessed (n=30)	% of respondents who did not (n=30)	Missing Values	% of respondents who assessed (n=156)	% of respondents who did not (n=156)	Missing Values		
Biomechanical Constraints	76.7 (23)	23.3 (7)	-	60.6 (94)	39.4 (61)	1	.096	-
Limits of Stability	66.7 (20)	33.3 (10)	-	45.5 (71)	54.5 (85)	-	.034 (*)	2.4 (1.1-5.5)
Static Stability	80.0 (24)	20.0 (6)	-	64.5 (100)	35.5 (55)	1	.099	-
Orientation in Space	56.7 (17)	43.3 (13)	-	67.1 (104)	32.9 (51)	1	.272	-
Underlying Motor Systems	73.3 (22)	26.7 (8)	-	64.3 (99)	35.7 (55)	2	.339	-
Reactive Postural Control	43.3 (13)	56.7 (17)	-	55.2 (85)	44.8 (69)	2	.234	-
Anticipatory Postural Control	73.3 (22)	26.7 (8)	-	71.0 (110)	29.0 (45)	1	.793	-
Dynamic Stability	86.7 (26)	13.3 (4)	-	68.4 (106)	31.6 (49)	1	.043 (*)	3.0 (1.0-9.1)
Sensory Strategies	53.3 (16)	46.7 (14)	-	42.6 (66)	57.4 (89)	1	.278	-
Cognitive Processing	48.1 (13)	51.9 (14)	3	62.1 (95)	37.9 (58)	3	.173	-
Confidence	37.0 (10)	63.0 (17)	3	60.5 (92)	39.5 (60)	4	.023 (*)	.384 (.165-.894)
(*) Significant Difference found between profession								

Table 4.4. Chi Square Analysis Based on Work Location								
	Urban			Rural			Asymp Sig (2-sided)	Odds Ratio (95% CI)
	% of respondents who assessed (n=112)	% of respondents who did not (n=112)	Missing Values	% of respondents who assessed (n=67)	% of respondents who did not (n=67)	Missing Values		
Biomechanical Constraints	65.8 (73)	34.2 (38)	1	53.7 (36)	46.3 (31)	-	.110	-
Limits of Stability	48.2 (54)	51.8 (58)	-	40.3 (27)	59.7 (40)	-	.303	-
Static Stability	65.8 (73)	34.2 (38)	1	58.2 (39)	41.8 (28)	-	.312	-
Orientation in Space	66.7(74)	33.3 (37)	1	53.7 (36)	46.3 (31)	-	.085	-
Underlying Motor Systems	62.7 (69)	37.3 (41)	2	58.2 (39)	41.8 (28)	-	.550	-
Reactive Postural Control	50.9 (56)	49.1 (54)	2	44.8 (30)	55.2 (37)	-	.428	-
Anticipatory Postural Control	68.5 (76)	31.5 (35)	1	65.7 (44)	34.3 (23)	-	.700	-
Dynamic Stability	68.5 (76)	31.5 (35)	1	65.7 (44)	34.3 (23)	-	.700	-
Sensory Strategies	41.4 (46)	58.6 (65)	1	38.8 (26)	61.2 (41)	-	.729	-
Cognitive Processing	54.2 (58)	45.8 (49)	5	59.1 (39)	40.9 (27)	1	.529	-
Confidence	49.1 (52)	50.9 (54)	6	57.6 (38)	42.4 (28)	1	.277	-
(*) Significant Difference found between work location								

4.2. Phase 2 Results:

4.2.1. Demographics:

Three of the nine respondents were physical therapists working in a rural work location where as the remaining 3 physical therapists worked in an urban location. Three licenced practical nurses (LPN) consented and completed the telephone interview. Two LPNs worked in a rural location while one worked in an urban setting.

Table 4.5: Demographics Phase 2		
Profession		
	Frequency	**Percentage (%)**
Physical Therapist	6	66.7
LPN	3	33.3
Total	9	100.00
Years in Practice		
< 5years	3	33.3
5-9 years	2	22.2
10-14 years	0	0
15-20 years	1	11.1
> 20 years	3	33.3
Missing Value	0	0
Years worked with older adults		
< 5years	2	22.2
5-9 years	2	22.2
10-14 years	0	0
15-20 years	0	0
> 20 years	5	55.6
Missing Value	0	0

4.2.2. Open Codes:

To answer the research question "In urban and rural settings, what are the decisions and enablers and barriers to conducting balance assessment of older adults in Saskatchewan?", the open codes generated were balance assessment, procedure of assessment, balance components, interdisciplinary team, work location, balance resources, time, work environment, and patient status. **Figure 4.2.1.** provides a definition of each open code.

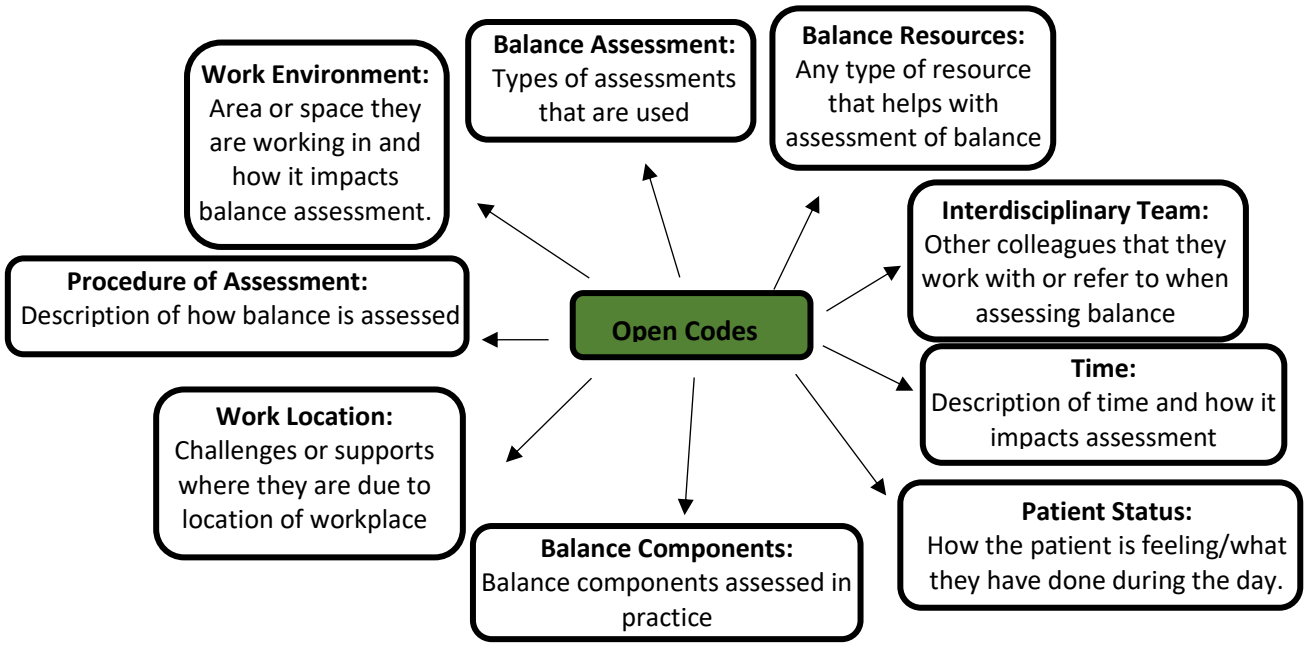

Figure 4.2.1. Open Codes

After collection of the first 3 interviews, a central phenomenon of interest was chosen from the open codes. Prior to open coding and development of the central phenomenon of the first three transcripts, the primary researcher referred to the reflection pieces written after each interview to engage in reflexivity. The central phenomenon of interest that was chosen was **Assessment of Balance. Assessment of Balance** was extensively discussed by the participants as this was the primary purpose of the interview questions asked (Cresswell, 2018). After the

central phenomenon was developed, more data was collected, transcribed and analyzed. Before open coding of the remaining transcripts the reflection journal entries were referred to. This helped the primary researcher be reminded how some participants were not familiar with some of the wording and terms used during the interview. The database was reviewed to develop specific coding categories that related to the assessment of balance. Before this process the journal entries were referred to one more time to ensure reflexivity. The specific coding categories, or axial codes, that were developed were: types of balance assessment used by health care providers, what health care providers are assessing during balance assessment (factors assessed), interdisciplinary team, time, work environment, patient status, and balance resources (**Figure 4.2.2**).

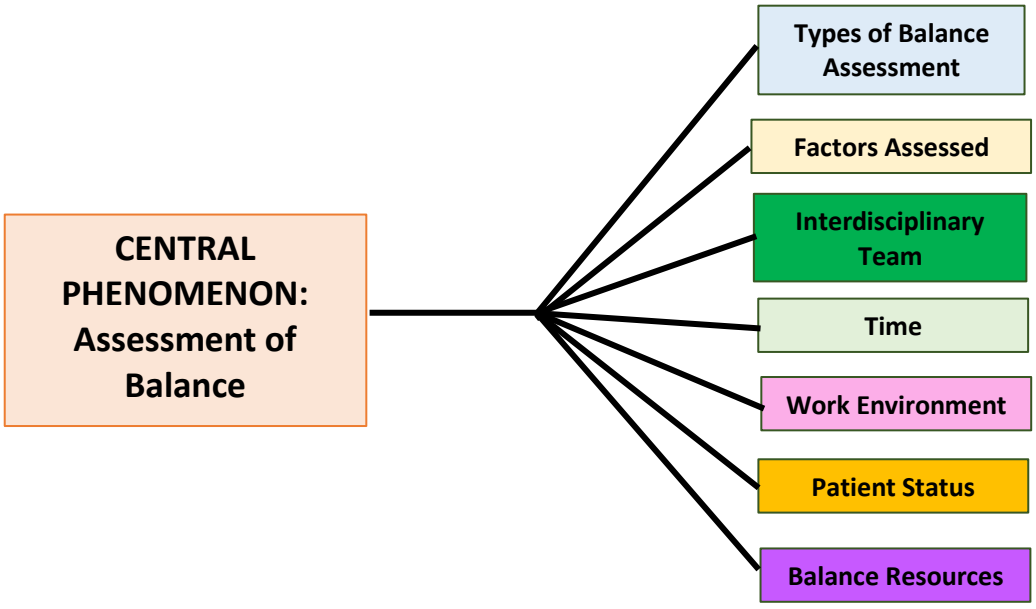

Figure 4.2.2. Axial Codes

4.2.3. Themes:

Common themes were identified from the axial codes. An overview of the themes created are discussed in this section. After an external audit of the axial codes, themes were modified and discussed to develop 5 final themes: 1) balance assessment approach "a functional paradigm", 2) supports and challenges with interdisciplinary teamwork 3) patient status 4) challenges: time and

environment dependent 5) resource disconnect. Each section is divided into similarities and differences found between nurses and physical therapists when assessing balance. Since there was no difference in the assessment of balance components identified in Phase 1 amongst the practice location of health care providers in Saskatchewan, rural and urban experiences will not be discussed. Direct quotes from study participants to support the themes are italicized. Throughout the data analysis process, the primary researcher referred to each reflective entry. Reflection entries were helpful to remind the primary researcher that not all health professions understand the terminology of each component of balance and interpretation of words used were important within the context of the health professional and their work setting. This reflection was used to help generate open, axial codes and themes throughout the data analysis process.

4.2.3.1. Balance Assessment Approach "A Functional Paradigm":

Types of balance assessment used and the participants' approach to an assessment of a client were discussed. Participants tended to use balance assessments that adhered to a functional approach. Physical therapists and nurses discussed using a functional assessment to commonly assess balance.

Steve, a physical therapist said, "*A lot of the times its just manual muscle testing, range of motion and functional testing."*

LPNs also use a functional assessment to assess balance.

Participant 1, an LPN said, *"… I don't know I guess like from assessing their balance is part of assessing how they are going to get around and how what mobility aides they need."*

LPNs mainly use the transfer, lift and repositioning (TLR) program to assess balance. Saskatchewan health region issues mandatory use of the TLR by nurses in Saskatchewan as a standard guide. PTs most commonly used the Berg balance scale, timed up and go, gait analysis, and the Tinetti. These tests have a graded score that can be used to help their client understand why they may need to improve their balance.

Moira, a PT said, "*… sometimes problem solving and convincing somebody they need to use a walking aid a cane, a walker of some kind, rests with being able to show through testing and numbers what a person's functional ability is."*

4.2.3.2. Supports and Challenges with Interdisciplinary Teamwork:

Participants discussed the positives and challenges with working in an interdisciplinary team. Participants who work in an interdisciplinary team find it helpful to collaborate with other colleagues when trying to understand why an older adult may be falling. Having colleagues who are able to help conduct balance assessments can help ensure thorough assessment of the client.

Danielle, a PT working in an interdisciplinary team said, " *…we are a really specialized team here. And a lot of the people working here have been working here for many many years. So, I have a really resourceful team of nurses, physicians, occupational therapists, social workers to kind of pull from. Nurse practitioners as well so that is really handy. And that has been really handy if for some reason my assessment doesn't give me what I'm looking for and I can't really figure out why they are falling I do have other people to kind of bounce ideas off of and pull information from so."*

Linda, an LPN, also described their experience working on an interdisciplinary team, *"well, I talk to the family and talk to the direct family caregivers like one-on-one CCA."*

Information regarding fall prevention and balance assessment from other colleagues can be useful in deciding which tests are best to use for a balance assessment.

Moira, a PT, noted *"what seems to impact it when I am speaking to my different colleagues is if they are part of a falls prevention team or if there is some sort of course that someone has gone to that has either shown itself to be interesting or useful. Those are the things that will kind of make a decision to use a different test."*

Emad, a PT, also discussed a culture of safety in the workplace when working with a team. *"The health region that I am working with is positive about safety, it is very positive. We have a safety management system, we talk every Tuesday in the morning and we pick, talk mainly about safety in the day."*

When working on an interdisciplinary team, shortage of different health professionals can pose as a challenge for assessing balance of older adults.

Emad, a PT said, "*maybe doctor or the pharmacists need to review the medication for the patient which contribute to dizziness. Another problem is shortage of occupational therapists. Currently, we do not have an OT which I might need to do home assessment for client with falls at home".*

Participant 1, an LPN, also mentioned the shortage of health professionals on their team. One LPN noted, *"We have a physio team that comes and does their assessment as well. They are not there every other day of the week either."*

Those who work in outpatient settings don't have people to bounce ideas off of so they have to rely on their own knowledge.

Melanie, a PT, said *"I don't have anyone to bounce ideas off of or any really support to talk things through…it is rare that I get to try and bounce ideas off people or talk things through with other therapists."*

4.2.3.3. Patient Status:

Patient status was identified as a theme impacting test results and what a health care provider can assess for balance. This includes the time of day and cognition.

For example, Participant 1, an LPN, said, *"lots of times that a factor is what time of the day it is too. Like little things in elderly can play them out like even having a bath they can be good before their bath and after their bath they are really tired and their balance will like be off afterwards because they are tired. With dementia patients their cognitive ability can change from minute-to-minute kind of thing. So those are all extra factors to take into account".*

Steve, a PT, noted that whether a patient is *"just not feeling well or they don't believe that they should be engaging in any type of balance testing"* will impact whether an assessment was conducted.

4.2.3.4. Challenges: Time and Environment Dependent

Physical therapists discussed how not enough time influenced their interaction with the client. A shortage of time is a factor in choosing the type of test to assess older adults' balance.

Emad, a PT, mentioned, "*There are other balance assessment tests I don't use. So, when I am using the balance test I try to use the brief ones which saves for me the time and they give me the brief information about balance and the risk for falls."*

Limited amount of time also impacts what part of an assessment a health care provider might use or if a gold standard test is chosen to assess balance.

Moira, a PT said, "*the challenge of doing all of the tests on every person if that is the gold standard are related to how much time I have, how much time they have*."

Having more than enough time in a session was only discussed by a physical therapist who worked in a specialized clinic in the northern half of Saskatchewan.

Danielle explained how, *"we have a full hour plus if we need it so we have the luxury of time here. The more time the better…it's really hard when you only have like 20-30 minutes with a client."*

Linda, an LPN, described how attending to patients was impacted by time.

"*sometimes there is a question of lack of adequate time. Sometimes there is 1 nurse for 30 residents."*

When conducting the TLR Linda explained how lack of time and short staffing poses a challenge to complete the TLR and forces her to rely on visual observation.

Linda explained *"I will kind of take the most pertinent sections and sit down and go through the checklist that way and for other parts of it I just use casual observation and I get feedback from the care aids."*

A work environment was defined as an area or space a participant was working in and how it impacted the health care provider's assessment of balance. Participants spoke about working in two different types of work environments: institutional care setting or outpatient setting. Health professionals who worked in an institutional setting found that a limited amount of space posed as a challenge when conducting balance assessments.

Steve, a PT, said, *"Depending on the location and the setting sometimes you are, you're limited by space and by equipment so you are not able to perform a full physical assessment or a full dynamic balance assessment".*

Participant 1, an LPN, also described their experience and said, *"Lot's of times if they have lots of equipment the space is a factor as well in their room."*

One of the physical therapists who worked in an outpatient setting discussed how they had no reliable way to standardized the assessments they were administering.

Melanie, a PT, explained, "*I work in a mobile situation I'm not in a clinic so I don't have access to, any like more specific pieces of equipment that I might want to use so I don't have necessarily a consistent surface area that I might get to do a TUG test on which would be more ideal*".

4.2.3.5. Resources Disconnect:

There was a disconnect with the assessments health care providers were using and the literature on balance resources available for health care providers to refer to. Participants did not know how to respond to the question *"what balance resources do you use?"* in the one-on-one interview. Participants either answered the question with assessments that they were familiar with or ones that they used in the setting they worked in.

Melanie a PT explained the use of simple tests during an assessment.

Melanie, a PT, explained, *"… the BERG to me is very simple, the timed up and go, or timed up and go dual tasking is another one I'll use…I'll also use the Tinetti sometimes".*

A majority of the participants mentioned how they use a functional approach for assessment. However, participants had a disconnect as to where to go to get resources and what resources to look at to obtain other knowledge of balance assessment.

Participants discussed how there was not a resource a health care provider they could directly look at to inform up to date current practice.

Steve, a PT, said *"It would be nice to have something like a balance pathway or a balance clinic. So that older adults or families can have access to these resources or maybe some earlier assessments once they start to show some signs".*

4.3. Merging and Integration:

The following describes the merging and integration of phase 1 and phase 2 results (See Figure 4.3. Merging and Integration below for quotes used to identify the connection between phase 1 and phase 2 results). Balance components being regularly assessed are being assessed based on functional tasks performed during activities of daily living. Steve identified how balance components were being assessed alongside functional tasks such as sit to stands, and walking abilities. Challenges such as time may play into a factor of why nurses are not assessing dynamic stability as regularly as rehabilitation therapists. Nurses may rely on movement observation if they do not have time to complete a checklist. Some components of balance may not be regularly assessed due to the lack of time in a session. Physical therapists described how less time in a session drove selection of specific tests that were easier to administer and less lengthy. Some components of balance may not be regularly assessed due to a patient's status impacting the time a health care provider has when assessing balance. If the older adult being

tested was feeling unwell or are tired after a bath, this could dictate how much of a balance assessment would be completed. Another phase 1 finding was the irregular assessment of reactive postural control. Irregular assessment of reactive postural control may be impacted by health care providers use of safer or more functional methods of assessment such as movement observation.

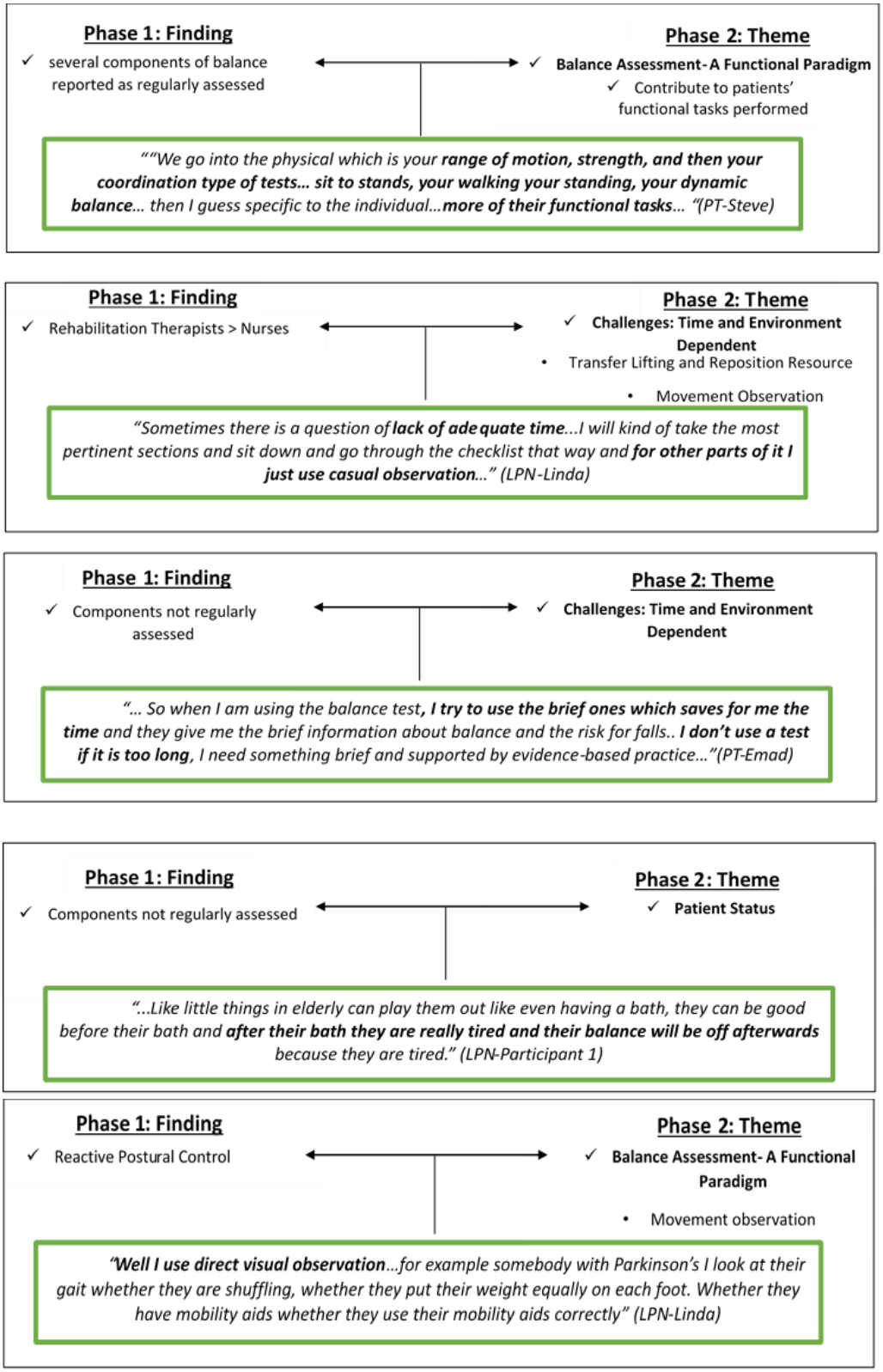

Figure 4.3 Merging and Integration

Chapter 5: Discussion

The overall purpose of this master's research study was to determine: (1) the current practice of assessing the factors influencing balance based on the revision of the systems framework of postural control and (2) health care providers' clinical choices, decisions and enablers and barriers to conducting balance assessment in Saskatchewan. This research study included a mixed method design with two phases. Phase 1 included a survey of health care providers' frequency of assessment of balance components when assessing postural control of older adults. Phase 2 included individual interviews of physical therapists and nurses' experiences conducting balance assessments of older adults in Saskatchewan.

Postural control is defined as the ability to correctly predict, detect and encode the characteristics of any active or passive disturbances in posture (Horak, Shupert & Mirka, 1989; Horak, 2006; Shumway-Cook & Woollacott;). The systems framework of postural control accounts for individuals to select reliable sources of sensory information to develop a corrective postural response. Additionally, this framework allows an individual to execute that response within biomechanical constraints of the body, and physical constraints of the environment (Horak, Shupert & Mirka, 1989). This theory is based on components of postural control studied and supported by research (Horak, 2009); however little research has been conducted to determine if these components are actually included in a balance assessment.

Phase 1 findings determined that there are several components of balance reported as regularly assessed by health care providers in both rural and urban sites in Saskatchewan. The components include: static stability, biomechanical constraints, orientation in space, anticipatory postural control, dynamic stability, and underlying motor systems. These components represent types of balance assessment linked to the theme identified in phase 2, **a functional paradigm**. The identification of impairments in these components of balance can contribute to the patient's functional tasks performed during activities of daily living. The following quote represents the linkage of these two findings from phase 1 and 2.

"We go into the physical which is your range of motion, strength, and then your coordination type of tests… sit to stands, you're walking your standing, your dynamic balance… then I guess specific to the individual…more of their functional tasks, so picking or choosing

tasks that are more important to them whether that is walking a certain distance or a little more complicated like they are still dancing or they are still playing curling. (Steve)".

When health care providers were split into two comparison groups of health professional backgrounds (nurses and rehabilitation therapists); some variation was found in reporting of regular assessment of these parameters. Survey results found rehabilitation therapists were significantly more likely to report assessing dynamic stability than nurses. These results align with previous literature reporting that dynamic stability is one of the most regularly assessed components of balance assessed by physical therapists in Saskatchewan (Oates et al., 2017). Nursing participants from phase two described using the Transferring Lifting and Repositioning Resource when assessing for fall risk. This resource requires nurses to assess the walking abilities of a patient (Transferring Lifting and Repositioning Resource Manual, 3rd edition). Nurses reported they do not regularly assess certain components of balance, such as dynamic stability. Not all components of balance may be assessed by nurses due to the use of functional observation of the patient when assessing for balance. Barriers such as time and limited staff may influence nurses to rely on functional observation of the patient.

"*Sometimes there is a question of lack of adequate time...I will kind of take the most pertinent sections and sit down and go through the checklist that way and for other parts of it I just use casual observation…" (Linda)*

It is within a nurse's scope of practice to administer a multifactorial fall risk assessment which includes assessment of balance components (Scott et al., 2007). However, when a multifactorial fall risk assessment is being administered, and balance is being assessed, there is no recommendation of any specific balance tests (American Geriatrics Society and British Geriatrics Society, 2011; Public Health Agency of Canada, 2016; Reducing Falls and Injuries of Falls, 2015). Additionally, nurses may not perceive it within their scope of practice to assess certain balance components as there may also be differences in training for LPNs verses RNs.

For example, the role of LPNs may require a higher level of consultation and referral to other health care professionals for balance assessment (Miller, 2021 National Nursing Assessment Services, n.d.). Whereas RNs, with a more extensive, specialized university educated

degree, may have higher levels of training that supports a leadership role in complex situations (Interpretation of the RN Scope of Practice, 2015; National Nursing Assessment Services, n.d.). Particularly, if within an LPN's care team includes rehabilitation therapists who may have more expertise and experience with components of balance assessment, LPN's may turn to these health professionals for guidance of assessment of balance of an older adult. For example, interdisciplinary teams using the TLR are suggested to refer individuals with specific needs to other interprofessional team members. These team members can include occupational and/or physical therapists if a specific targeted intervention is needed (Reducing Falls and Injuries of Falls, 2015).

The balance components and terminology used in the systems framework of postural control may also not be as familiar with nurses. Dynamic balance is the only balance component from the systems framework of postural control that is mentioned in the TLR resource manual (Transferring Lifting and Repositioning Resource Manual, 3rd edition). In this resource manual, balance components such as reactive postural control, static balance, limits of stability, orientation in space, sensory systems, underlying systems, are not included (Transferring Lifting and Repositioning Resource Manual, 3rd edition). In comparison, physical therapists are not only taught this terminology but also how to assess the different components of balance using different types of balance tests (Oates, Santoro, Arnold & Sibley, 2018).

This study found that not all of the components in the systems framework of postural control were reported as being regularly assessed by health care providers in Saskatchewan. Possibly contributing to these findings was the emerging theme **a lack of time** health care providers reported they have when assessing balance. This study aligns with previous literature that has reported time as a barrier when assessing balance and fall risk in older adults (Patton & Henry, 2019). Physical therapists explained time in a session with a patient impacted the selection of tests to use for assessment of balance. Physical therapists described how less time in a session drove selection of specific tests that were easier to administer and less lengthy.

"… So when I am using the balance test, I try to use the brief ones which saves for me the time and they give me the brief information about balance and the risk for falls.. I don't use a test if it is too long, I need something brief and supported by evidence-based practice…"(Emad)

Phase two results reported rehabilitation therapists assess only one or some, but not all, of the components of balance. In this study one of the most common tests reported by rehabilitation therapists was the BERG balance scale. Tests such as the BERG balance scale only assess 6 of the 9 balance components described in the systems framework of postural control (Sibley et al., 2015). Sibley et al. (2015) identified that the most complete standardized balance measures that included 8 or 9 components of balance from the systems framework of postural control are the Clinical Gait and Balance Scale, Fullerton Advanced Balance Scale, Mini-BESTest, Unified Balance Scale, and BESTest (Thomas et al., 2004; Hernandez & Rose, 2008; King & Horak, 2013; La Porta et al., 2011; Horak, Wrisley & Frank, 2009). Even though these tests assess the majority or all of the components from the system framework of postural control they are not commonly adopted in practice (Sibley et al., 2015). Additionally, it is interesting to note that the BERG balance scale, which was one of the most common tests reported by physical therapists in this study, takes the same amount of time to complete as the BESTest (Horak, Wrisley & Frank, 2009).

Contributing to the phase 1 finding that not all components of balance were being regularly assessed by the majority of health care providers, was the emerging theme **status of a patient**. The status of a patient may have bearing on how much time a health care provider has when assessing balance. Participants described how if the older adult being tested was feeling unwell, time of day, or cognition, dictated how much of a balance assessment would be completed. If a health care provider could not complete an assessment due to the patient's status this may result in not all components of balance being assessed.

"*...Like little things in elderly can play them out like even having a bath they can be good before their bath and after their bath they are really tired and their balance will like be off afterwards because they are tired." (Participant 1)*

Rehabilitation therapists were significantly less likely to report assessing confidence when compared to nurses. In fact, only 37% of the sample of rehabilitation therapists reported regularly assessing confidence compared to 61% of nurses. A person's level of confidence in the ability to maintain balance while performing specific daily activities can be measured by scales such as the Fall's Efficacy Scale or Activities-Specific Balance Confidence Scale (Hatch, Gill-Body, &

Portney, 2003). Literature has reported that poor confidence in one's balance abilities is related to poor control of balance and gait (Schinkel-Ivy, Inness & Mansfield, 2016). Due to this it has been suggested that one's confidence in balance should also be assessed during a balance assessment (Schinkel-Ivy, Inness & Mansfield, 2016). However, this study's results align with previous literature which reported balance confidence not being regularly assessed by physical therapists (Sibley et al., 2011). Results from this study may be explained by perception of scope of practice within a team setting. While using the TLR, and other observations of safety in movement, nurses are required to continuously assess the confidence of a patient's balance when selecting the appropriate way for a patient to move out of bed (Transferring Lifting and Repositioning Resource Manual, 3rd edition). Physical therapists, or other health care providers, may perceive nurses as the experts in assessing balance confidence while using the tools such as the TLR. This may result in physical therapists deciding not to assess balance confidence of the older adult. This may present as a gap in assessment by rehabilitation therapists resulting in missing an important component that could impact risk of falling.

One of the components reported not regularly assessed by approximately half of the respondents was reactive postural control. Previous literature has reported similar findings among physical therapists (Sibley et al., 2011; Oates et al., 2017). However, no study to my knowledge has investigated this among other health care providers. Reactive postural control is one of the most important components of balance to assess; the ability to successfully react following a loss of balance determines whether an individual will fall (Maki & Mcilroy, 1996).

Irregular assessment of reactive postural control may be impacted by health care providers use of other methods of assessment that may be deemed safer or more functional such as movement observation. During functional tasks, movement observation may be used where anticipatory and dynamic balance is assessed, but not unexpected reactions to a displacing force. The present study findings indicated that health care providers regularly assess dynamic stability based on a functional paradigm when assessing components of balance.

"Well, I use direct visual observation. I use my knowledge of disease process specifically with um people with a diagnosis of Parkinson's. Ok for example somebody with Parkinson's I look at their gait whether they are shuffling, whether they put their weight equally on each foot. Whether they have mobility aids whether they use their mobility aids correctly. I look to see if they require

a change in mobility aids as they disease progresses or just how they are handling them…" (Linda)

Previous literature has reported in other professions, such as physical therapy, that movement observation can be utilized as a means to assessing reactive postural control tasks (Oates, Santoro, Arnold & Sibley, 2018; Sibley, Innes, Straus, Salbach & Jagal, 2013). Movement observation has also occurred in the context of integrated assessments of dynamic or functional balance tasks (Oates, Santoro, Arnold & Sibley, 2018; Sibley, Innes, Straus, Salbach & Jagal, 2013). On the other hand, others have debated that this observational approach does not specifically probe postural reactions following instability and it is unclear how clinicians would evaluate reactive control with this technique (Sibley, Innes, Straus, Salbach & Jagal., 2013). In any case, reactive postural control is not commonly measured by either rehabilitation therapists or nurses. Reactive postural control may not be regularly assessed as it may not be deemed as necessary if an older adult individual has impairments in other components being assessed. For example, if an individual cannot effectively engage in proper anticipatory postural control strategies it may not be appropriate to assess reactive postural control for safety reasons (Sibley et al., 2015). Future research should further determine how movement observation is used to assess reactive postural control by health care providers. Additionally, future studies should investigate if impairments in other balance components would be useful as an indicator whether to safely progress to assess reactive postural control.

There were no significant differences in the frequency of assessment of balance components amongst practice location (rural vs. urban) in Saskatchewan. Based on the limited scope of the present study, these findings suggested that rural health practitioners are completing balance assessments in the same way as their urban counterpart. Urban and rural participants both reported using a **functional paradigm** when assessing balance and reported how it was helpful to collaborate with other health care providers on their work team. Urban and rural participants identified similar barriers when administering balance assessment such as time, the work environment they performed their assessment of balance in, and shortage of staff. This study's results may have not captured as a wide range of experiences in Northern rural sites, as rural sites that were captured in my study were close to urban centers.

5.1. Strengths and Limitations:

5.1.1. Strengths:

There were multiple strengths to this study. First, to my knowledge, this was the first mixed methods study identifying current practice of health care providers' assessment of balance components based on the systems framework of postural control. Additionally, to my knowledge, this study was the first to identify experiences of these health care providers while conducting balance assessments in Saskatchewan. Second, the survey developed for phase 1 of this study was adapted from two previous studies Sibley et al. (2011) and Oates et al. (2017). The survey from phase one was then modified from the systems framework of postural control developed by Horak (Horak, Shupert & Mirka, 1989; Horak, 2006). Third, this study included open ended questions that led to the suggestions of a need for balance resources for health care providers in Saskatchewan (refer to clinical application section for more discussion on this topic). Fourth, previous literature has only reported balance assessment practices and experiences of physical therapists (McGinnis et al., 2009; Oates et al., 2017; Sibley et al., 2011). This study however did not just look at physical therapists' practices and experiences. This study looked at other health care provider's role and decision-making process of balance assessment in Saskatchewan. In particular, this study included a high number of licensed practical nurses. Identification of a high number of licensed practical nurses assessing balance in older adults furthers the understanding of which health care providers are assessing balance in Saskatchewan. Additionally, this helps to understand how balance is assessed by more than one health care provider.

5.1.2. Limitations:

This study does have some limitations. First, Sibley et al. (2011) and Oates et al. (2017) questionnaires were based upon balance practices of physical therapists. Terminology used in the survey for the first and second phase may not have been familiar to different practice areas. This may have affected their answers to each of the questionnaire. In phase two, participants did not know how to respond to the question *"what balance resources do you use?".* Participants either answered the question with assessments that they were familiar with or ones that they used in the setting they worked in.

Second, phase 2 results were not analyzed based on rural or urban work location because of no differences found in phase 1. It is possible a more in-depth study with an intentional

recruitment of participants in more diverse rural and remote communities may have yielded different results. Limited scope of recruitment may be explained by the reduced number of health care providers in rural areas in Saskatchewan. For example, Bath et al. (2015), found 11.2% of physiotherapists with an active licence to work in Saskatchewan listed a rural location as their primary place of employment.

Third, specific balance assessments that were surveyed in previous studies such as Sibley et al. (2011) and Oates et al. (2017) were not included in phase 1 survey. Inclusion of these assessments would have aided in more of an understanding of balance assessment practices in Saskatchewan. Because this survey was part of a larger survey on fall risk assessment, there were limitations in the length of the survey to avoid participant burden. Additional questions added to the survey may have increased the length of time the larger survey was completed by participants. Since it is suggested that online web surveys should be no longer than 20 minutes maximum to ensure participants completion of a survey, additional questions about balance assessment use were not included (Revilla & Ochoa, 2017).

Fourth, saturation may not have been reached due to the small sample size of each profession of participants in phase 2. For example, three LPNs experiences may have provided data to identify common themes but not enough data to identify if further collection may have been needed particularly given the different practice locations as well as differences in training between LPNs and RNs. It is suggested that saturation should be focused on reaching the point where further data collection becomes 'counter-productive', and 'new' data collected would not add to the overall theory (Saunders et al., 2018; Strauss & Corbin 1999: p. 136).

5.2. Clinical Application:

Development of an evidence-based balance resource pathway, including the systems framework of postural control, could be beneficial to improving balance assessment of older adults in Saskatchewan. Additionally, participants identified a need for a specialized balance clinic for balance assessment and intervention in Saskatchewan. A center such as this could draw on the expertise from a team of health care providers. This in turn could lead to an improved and targeted intervention. One of the emergent themes of this study was a **resource disconnect**. Health care providers felt somewhat at loss for where to seek resources, and find direct information for up-to-date practice guidelines on balance assessment. Since most balance

measures do not assess all components of balance, it has been suggested, health care providers select measures including all or most components of balance (Sibley et al., 2015). Selection of different tests to assess components of balance may minimize participants' challenge of limited amount of space when assessing balance. It has been suggested, in addition to the systems framework of postural controls components, confidence and secondary cognitive tasks should be included (Sibley et al., 2015).

A high number of our participants (73%) reported having some education in fall risk screening and assessment. We did not have a large enough sample to compare knowledge for early verses later career health care providers. This may have helped clarify how knowledge for early verses later career health care providers impacted balance assessment practices.

Previous literature has reported that academic education significantly contributes to balance assessment decisions (McGinnis et al., 2009). Understanding of different balance tests by other health care providers, such as nurses, could improve the assessment of balance of an older adult. In this study, a large number of respondents (79.6%) included registered nurses and LPNs. These participants confirmed they assess balance of an older adult primarily within a functional paradigm of movement observation. It has been reported that nurses may not have the same background knowledge as rehabilitation therapists to assess balance with specific tests in their everyday practice (Patton & Henrey, 2019). Balance components from the systems framework of postural control could be included in health care professional training curriculums, and fall risk screening and assessment programs. It has been reported standardized measures along with the use of movement observation could enable health practitioners to make more reliable comparisons over time, among groups or with respect to comparative norms (Oates et al., 2017). Understanding of these components by other health care providers could improve assessment of balance and reduce fall risk in older adults.

Time was also reported as a factor that influenced the assessment of balance. Since time pressures are a reality, health care providers should potentially look at one risk factor at a time (Close & Lord, 2011). Additionally, health care providers may want to consider reviewing a patient's progress in subsequent consultations (Close & Lord, 2011). This study found that shortage of different health care providers posed as a challenge when assessing balance while working on an interdisciplinary team. In conclusion, the following quote summarizes the importance of interdisciplinary teams and the relationships amongst team members.

"We have the physio team that comes and does their assessments as well…but we have first contact with the patient so we kind of have to do our own thing without relying on physio because they are not there every other day of the week either…" (Participant 1, an LPN)

Chapter 6: Conclusion

Balance components regularly assessed by health care providers in both rural and urban sites in Saskatchewan may be assessed for functional activities of daily living. Perception of scope of practice may influence the frequency of assessment of balance components of an older adult. Assessment of reactive postural may be influenced by health care providers scope of practice, familiarity, training and use of assessment tools used in their practice. Across health professions, barriers were found to be similar which include time constraints, patient's status, limited amount of space, and interdisciplinary challenges. An increased understanding of the systems framework of postural control may result in adoption of education of the framework into other health care providers' assessment of balance in Saskatchewan. In turn, this could address challenges of working on an interdisciplinary team with a different knowledge base and training in the assessment of balance of an older adult. Future studies should identify the best way to adapt and incorporate all components of the systems framework of postural control in the assessment of balance in older adults.

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Appendix A: Certificate of Ethics Approval

UNIVERSITY OF SASKATCHEWAN

Behavioural Research Ethics Board (Beh-REB) 10-Sep-2019

Certificate of Re-Approval

Application ID: 272

Principal Investigator: Cathy Arnold Department: School of Rehabilitation Science

Locations Where Research Activities are Conducted: Saskatchewan, Canada

Student(s): Danelle Banman

Funder(s): Saskatchewan Centre for Patient-Oriented Research
Saskatchewan Health Research Foundation

Sponsor: Saskatchewan Health Research Foundation

Title: A Collaborative Approach to Comprehensive Screening and Assessment of Fall Risk for Adults across the Continuum of Care in Saskatchewan Part 1

Approved On: 22/08/2019

Expiry Date: 21/08/2020

Acknowledgment Of: None

Review Type: Delegated Review

* This study, inclusive of all previously approved documents, has been re-approved until the expiry date noted above

CERTIFICATION

The University of Saskatchewan Behavioural Research Ethics Board (Beh-REB) is constituted and operates in accordance with the current version of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2 2014). The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this project, and for ensuring that the authorized project is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

ONGOING REVIEW REQUIREMENTS

In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month prior to the current expiry date each year the project remains open, and upon project completion. Please refer to the following website for further instructions: https://vpresearch.usask.ca/researchers/forms.php.

Digitally Approved by Vivian Ramsden, PhD
Behavioural Research Ethics Board
University of Saskatchewan

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Appendix B: Consent Form for Phase 1

Survey Introduction and Consent (used for both electronic and paper survey)

Reducing falls in Saskatchewan is important for the health of our province. Screening for fall risk and assessing the status of fall risk factors is an important component of preventing falls in older adults. This study aims to examine current fall risk screening and assessment practices of health care providers in Saskatchewan. The results will reveal what assessment tools are currently used and the areas of improvement available for clinicians, researchers and clinical educators to improve fall risk assessment and, hopefully, reduce the number of falls in Saskatchewan. This research project is being conducted by researchers, trainees, patient and family advisors and clinicians at the University of Saskatchewan and within the Saskatchewan Health Authority. This project has been approved by the Behavioral Research Ethics Board at the University of Saskatchewan as well as through the appropriate channels of your professional organization.

Participation in this research project is voluntary and there are no potential risks to participation. You have the option to skip questions you do not feel comfortable answering. Your answers are completely confidential and there will be no identifying information when you submit the survey to the research team. You may refuse to participate or, if you decide to start completing the survey, you have the right to withdraw at any time. Consenting or refusing to participate will not have any effect on your professional life. If you have any questions about your rights as a research participant, or about any ethical issues relating to this study, you can contact the Chair of the Research Ethics Board at the University of Saskatchewan at 306-966-6538.

This survey is hosted by Voxco, a Canadian-owned company whose servers are located in Canada (i.e., data are not subject to US or EU privacy laws) and managed by the Social Sciences Research Laboratory. All data is securely stored on a server in Canada. If you are responding to a paper version of the survey, your responses will be coded by the research team and stored on a secure server at the University of Saskatchewan. Please consider printing this page for your records.

If you have any questions or comments about this study before, during, or after participation, please contact Cathy Arnold at 309-966-6588 or cathy.arnold@usask.ca. Please note that the security of email messages is not guaranteed. Messages may be forged, forwarded, kept indefinitely or seen by others using the internet. Do not send email to discuss information you think is sensitive.

Your responses are highly valued and will help advance assessment of fall risk.

SHOULD YOU BE PRESENTED WITH THIS SURVEY MULTIPLE TIMES, PLEASE ONLY COMPLETE IT ONCE.

Appendix C: Survey for Phase 1

Q15 Please indicate if and how often within your assessments of balance for older adults you incorporate each of the following areas?

Q15		**No, never (0%)**	**Yes, rarely (1-20%)**	**Yes, occasionally (21-40%)**	**Yes, sometimes (41-59%)**	**Yes, frequently (60-79%)**	**Yes, most of the time (≥80%)**
A.	**Biomechanical Constraints:** Degrees of freedom or joint motion, quality of base of support.	☒	☐	☐	☐		☐
B.	**Limits of Stability:** Ability to move the COM in the anterior-posterior or medio-lateral direction as far as possible without changing the base of support (i.e., Functional Reach Test).	☒	☐	☐	☐		☐
C.	**Static Stability**: Ability to maintain balance in an unsupported stance for a measured period of time when the base of support does not change (i.e. stance includes wide, narrow, one legged or tandem).	☐	☐	☐	☐		☐
D.	**Orientation in Space:** The ability to orient the body parts via internal	☒	☐	☐	☐		☐

	references with respect to gravity**,** support surface and visual surroundings (verticality, postural alignment).						
E.	**Underlying Motor Systems:** Functional **s**trength (i.e., strength for ankle and hip strategies), Coordination (i.e., testing for ataxia)	☒	☐	☐	☐	☐	E.
F.	**Reactive Postural Control:** Ability to regain balance in response to unexpected perturbation (i.e. in-place ankle and hip strategies or changing the base of support with stepping or reach to grasp strategies).	☐	☐	☐	☐		☐
G.	**Anticipatory Postural Control:** Ability to shift and control balance in anticipation of postural transition from one body position to another (i.e., stepping, sitting to standing, reaching or lifting)	☒	☐	☐	☐		☐
H.	**Dynamic Stability:**	☒	☐	☐	☐		☐

	Ongoing control of balance as the base of support changes (i.e., postural transitions, gait)						
I.	**Sensory Strategies**: Ability to re-weight visual, vestibular and somatosensory information when input is altered (i.e. eyes open and closed, standing on a foam pad)	☒	☐	☐	☐		☐
J.	**Cognitive Processing**: Ability to maintain stability when attending to additional tasks or responding to commands during a task (i.e., dual tasking)	☐	☐	☐	☐		☐
K.	**Confidence:** Self efficacy in the ability to maintain balance (i.e., ABC scale)	☐	☐	☐	☐		☐

Appendix D: Consent Phase 2

UNIVERSITY OF SASKATCHEWAN

Participant consent form
HEALTH CARE PROVIDERS' BALANCE ASSESSMENT PRACTICES

You are invited to participate in a study entitled: A collaborative approach to comprehensive screening and assessment of fall risk for older adults across the continuum of care in Saskatchewan

Principal investigator: Dr Cathy Arnold (Faculty), School of Rehabilitation Science, University of Saskatchewan, cathy.arnold@usask.ca

Co-Principal Investigator: Daphne Kemp (RSW), Saskatchewan Health Authority, Saskatoon, daphne.kemp@saskhealthauthority.ca

Co-investigators: Dr Alex Crizzle (Faculty), School of Public Health, University of Saskatchewan, alex.crizzle@usask.ca; Dr Shanthi Johnson (Faculty), University of Alberta, shanthi.johnson@ualberta.ca; Ms. Kavitha Ramachandran (Research Associate, PhD Candidate), University of Saskatchewan, kavitha.r@usask.ca

Student researcher; Danelle Banman, College of Kinesiology, University of Saskatchewan, djm524@mail.usask.ca

Collaborators:
Jason Parkvold (Saskatchewan Health Authority); Darcy McIntyre (Saskatchewan Health Authority); Cathy Billett (Saskatchewan Health Authority); Laura Bouvier (Saskatchewan Health Authority); Gord Moker (Patient advisor); Janet Barnes (Patient advisor); Heather Dyck (Patient advisor); Graham Fast (Saskatchewan Health Authority); Kelly Froelich (Ministry of Health)

Purpose and objectives of study: Reducing falls in Saskatchewan is important for the health of our province. Screening for fall risk and assessing the status of fall risk factors is an important component of preventing falls in older adults. The purpose of this study is to understand the decision-making processes of health care providers in Saskatchewan related to balance assessment in older adults who have fallen or are at risk for falling. The results will inform our research team about how to support providers in the province and facilitate clinical assessment with the appropriate tools.

Procedures: As a health care provider who provides care to community-dwelling older adults in Saskatchewan, you are invited to participate in a single individual telephone interview. The interview will occur at a time that is convenient to you. You do not have to answer any questions

that make you feel uncomfortable or that you do not want to answer. The interview will last no more than 1 hour. The interview will be audiotaped, and I will also take brief notes during our conversation. During the interview you can have the recording device turned off without giving any reason. You will be asked questions about your experience with balance assessment tools and processes you use to decide which components to include as part of fall risk assessment in older adults. The interview will be transcribed by myself after the interview is conducted. Prior to data being included in the final report, you will be given the opportunity to confirm the accuracy of our conversation and to add or clarify any points that you wish. You will have up to 2 weeks to clarify or provide edits to the transcript.

Funding: The project has been funded by a grant from the Saskatchewan Health Research Foundation and the Saskatchewan Centre for Patient-Oriented Research.

Potential risks: There are no anticipated physical, social or legal harms as a result of participation.

Potential benefits: Your responses will contribute to provincial efforts to improve falls risk screening and assessment in older adults. Personal reflection about your practices may increase your awareness and prompt individual changes to the way that you conduct balance assessment.

Compensation: No reimbursement will be offered in exchange for your participation in this study.

Confidentiality: All the information that you provide in the interview is completely confidential. It will not be shared with anyone outside of the research team. Although the data from this research project will be summarized and shared, the data will be reported in aggregate form, so it will not be possible to identify individuals. Your name will not appear on any report resulting from this study. We will be using de-identified direct quotations from the data in order to explain the findings.

Storage of data: : All data including consent forms and completed questionnaires will be stored in a locked cabinet in the office of the principal investigator for at least 5 years after publication. The consent forms and relevant data will be stored separately. Data will also be stored electronically on a password protected computer and backed up on a server at the University of Saskatchewan. Upon expiration of the storage period, electronic files will be permanently deleted and paper files shredded.

Right to withdraw: Participation in the study is voluntary and you can withdraw from the study at any time without penalty. Any withdrawal will not negatively affect your relationship with employers, professional medical association, researchers or the university. If you withdraw from the study, you will be given the option to remove your data from the study. Your right to withdraw data from the study will apply until I am given your acknowledgement of the transcripts. After this it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

Follow up: To obtain a copy of results of the study, please contact Dr Cathy Arnold at cathy.arnold@usask.ca.

Questions or concerns: If you have questions or concerns before, during or after participation, please contact Cathy Arnold at 306-966-6588 or via email cathy.arnold@usask.ca. Please note that the security of email messages is not guaranteed. Messages may be forged, forwarded, kept indefinitely or seen by others using the internet. Do not send email to discuss information you think is sensitive.

This project was reviewed on ethical grounds by the U of S Behavioral Research Ethics Board. Any questions regarding your rights as a participant may be addressed to the Research Ethics Office toll free at 1-888-966-2975 or ethics.office@usask.ca

ORAL CONSENT TO PARTICIPATE

I have read (or someone has read to me) the information in this consent form.
I understand the purpose and procedures and the possible risks and benefits of the study.
I was given sufficient time to think about it.
I had the opportunity to ask questions and have received satisfactory answers.
I understand that I am free to withdraw from this study at any time for any reason and the decision to stop taking part will not affect my relationship with the researchers nor my employers.
I give permission to the use and disclosure of my de-identified information collected for the research purposes described in this form.
I understand that by signing this document I do not waive any of my legal rights.
I will be given a signed copy of this consent form.
I would be willing to be contacted if other research opportunities arise in which I might be eligible ☐YES ☐NO

I choose to use my own name, ☐YES _____ ☐No
OR The pseudonym I choose for myself is: _____

I agree to participate in this study:

_____	_____	_____
Printed name of participant:	Signature	Date
_____	_____	_____
Printed name of person obtaining consent:	Signature	Date

Appendix E: Interview Guide Phase 2

UNIVERSITY OF SASKATCHEWAN

Health Care Provider Balance Assessment INTERVIEW GUIDE

Principal investigator: Dr Cathy Arnold (Faculty), School of Rehabilitation Science, University of Saskatchewan, cathy.arnold@usask.ca

Co-Principal Investigator: Daphne Kemp (RSW), Saskatchewan Health Authority, Saskatoon, daphne.kemp@saskhealthauthority.ca

Co-investigators: Dr Alex Crizzle (Faculty), School of Public Health, University of Saskatchewan, alex.crizzle@usask.ca; Dr Shanthi Johnson (Faculty), University of Alberta, shanthi.johnson@ualberta.ca. Ms. Kavitha Ramachandran (Research Associate, PhD Candidate), University of Saskatchewan, kavitha.r@usask.ca

Student researcher; Danelle Banman, College of Kinesiology, University of Saskatchewan, djm524@mail.usask.ca

INTRODUCTION

Thank you for agreeing to speak with me today**.** My name is [name] and I am a graduate student researcher in the College of Kinesiology at the University of Saskatchewan. I will be audiotaping our discussion and I will also be taking notes throughout our conversation. I am interested in understanding your experiences with balance assessment of older adults at risk for falls and how you decide the tools and processes that are used.

You have been asked to give voluntary oral consent to this interview. You have been given the opportunity to ask any questions about the study. A copy of the form has been given to you so that you can be reminded of what we discussed.

The information you share with me today is completely confidential. You have been given the option to use a false name (pseudonym) and your responses will not have any identifying information. Your responses will only be shared with members of the study team and will be compiled with other participants in the study. The information that we gather will be used to inform education and training as well as may improve the provision of fall prevention efforts in Saskatchewan.

INTERVIEW QUESTIONS and Recording Form (For Interviewer Use)
Date: _____
Participant Number:_____
Researcher's Initial:_____

What would you like your pseudo name to be? _____
First, I am going to ask you some demographic questions about your education and practice area: Can you please list degrees /special training such as in assessment of balance or in older adult fall prevention that you have received training for?:_____

Professional Practice:

How many years have you been in practise? _____
How many years have you assessed older adults in your practise?_____
What resources, if any, do you use for informing assessment of balance?_____

Now, I am going to ask you some questions about how you assess balance in older adults in your practice.

Q1 What do you think are the most important components to assess for balance? Can you explain?

Probe: There are different components or factors that contribute to balance. Do you know what they are? Do you assess all of these components? How did you know to assess for these components? What resources do you use to decide on what you use?

Q2 Have you used any specific balance measures (tools or processes)? If yes, what types or names of tools have you used to assess balance in your patients?

Probe: Are there any that you are aware of that you never use? If there are measures you know of that you don't use, can you explain why? Which of these methods you have described do you use the most frequently? Are there reasons why you might choose one tool over another?

Probe: are there different tools you would use that are dependent on the patient's or client's age, functional ability.. anything else?

Probe: If you work in a rural or urban setting, is there anything about the geographical location or environment you work in that you think impacts your choice of assessment tools or measures?

Q3 In regards to patients or clients that you have examined who had potential/actual balance deficits, can you describe an example of how you approached the assessment? You might choose to think about a particular recent case, how you decided what to include in the assessment, any difficulties encountered, what was the outcome of the assessment (how did you use the information from the assessment to address this person's fall risk?)

Q4 What are things that have helped or supported you in balance assessment and what are some of the challenges you experience when conducting balance assessments?

Probe: any resources, people, environmental factors, time factors that contribute to this? For example, if you work in a rural or urban setting, is there anything about the geographical location or environment that you think impacts your ability to assess and follow-up with balance deficits in the older adults you see?

Q5 Is there anything else you would like to tell me about examining older adults with potential balance deficits? Or anything else to add that would be helpful in our understanding of balance assessment practices in Saskatchewan?

Appendix F: Reflective Journal Entries

Participant Reflection: Participant 3, Sept 30th

This was my first session that I conducted with a participant. The interview did not take very long, the longest part was the consent. I have to be mindful that a participant can answer 2 main questions sometimes in 1 question if they begin to provide more detail. This is ok as it allows me to prompt using the probes in my questionnaire. What I found hard was trying to check to make sure that I asked all the questions I wanted and also made sure that I listened to the participant while they were responding. I felt how I asked the questions to clarify when needed was also good. I think it helped the participant understand what I was trying to ask them. I do believe it would be a little more beneficial to use maybe an example next time especially when asking about geographical location and the strength and challenges.

Participant Reflection: Participant 1, Oct 1st

This session I thought went more smoothly. I have to be mindful that not all professions know what all the balance components are. I have to also remember to make sure that if the participant is explaining something about an aide or a challenge or anything they can identify with a balance/fall assessment that I always try to ask if they can explain if this impacts how they assess balance.

Participant Reflection: Participant 4, Oct 1st

This participant also I feel was trying to give her knowledge about balance and balance assessment in general. I had to probe her multiple times to get her experience with balance assessment. I am not sure if this means that her knowledge is more vast because she understands how complex balance can be and from what profession you are asking how balance is assessed . I need to make sure I stick to the script as sometimes I would word the questions differently and I think it may have confused the participant.

Participant Reflection: Participant 2, Oct 10th

This participant worked as an outpatient physical therapist. This participants experience seemed similar but different to the other physical therapists I have interviewed so far. This participant knew about the different assessments that could be done during a session but the only reason for this is due to them making up a balance assessment handbook. This participant actually looked through the literature to do this so they could refer to it while they were assessing participants. I feel that health care providers should be looking up best practice but it seems so far this has only been done by 2 participants. This could be due to profession as LPNs are required to use the TLR in their practice however could I also be closed minded as to thinking all physical therapists should just naturally do this as it should be in their best practice? I will have to keep this in mind and probe as much as I can so I can get a better understanding of this.

Participant Reflection: Participant 10, Oct 10th

When I was calling to recruit more LPNs, this participant wanted to do their phone interview at that moment. This somewhat threw me off as I was not expecting them to want to do that. However, now that I have been through a few interviews I feel this has helped me be able to administer the questions better to the participant. This participant was an LPN. Again, when I had asked for their knowledge about balance components, they did not know how to answer the question. I had to probe the participant to explain their experience during an encounter with a resident. During this interview I felt like I did a better job of probing for information with each question. I feel I need to keep this in mind as I continue forward with the other interviews as I feel I then can get a better understanding of each participants experience by asking to explain more.

Participant Reflection: Participant 6, Oct 15th

This participant worked in a unique situation where they worked on an interdisciplinary team. They also had an increase in available time where they were able to test participants for as long as needed. This is quite different than other participants situations I have interviewed so far. While asking questions I feel like I probed clearly. Since this participant was a physical therapist it seemed that it was easier to probe for balance components they were testing for.

Participant Reflection: Participant 9, Oct 15th

This participant had a lot to say and I needed to make sure to keep them on track with answering each question. I will need to make sure in the future when analyzing to not ignore what the other experiences they shared may be as there might be important information that can be helpful in the analysis. This participant also had been working in their profession since the 1980's.

Participant Reflection: Participant 8, Oct 16th

This participant was another LPN. A few questions I was not as short and to the point as I would have liked to be, however by the end of the interview, I felt that it was going smoother and that when I tried to make myself clearer when interviewing they were able to share their experience related to the question.

Participant Reflection: Participant 7, Oct 18th

This participant was a physiotherapist who worked in an acute care setting. This participant was detailed but to the point when sharing their experiences. What was interesting was how they mentioned school experiences and shadowing another team member for a while helped with being able to assess an older adult's balance.