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Reducing Falls and Fall-Related Hospital Transfers in Geriatric Assisted Living Residents

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Reducing Falls and Fall-Related Hospital Transfers in Geriatric Assisted Living Residents

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By

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Abstract

Background: Falls among older adults are frequent, rendering significant costs to both the individual and the healthcare system, and are preventable. In 2021, fall-related deaths in adults over the age of 65 were calculated at a rate of 78.0 per 100,000 people, and nonfatal falls were reported at 28% of all older adults (Centers for Disease Control and Prevention [CDC], 2023). In Pennsylvania, approximately 27.9% of older adults fell in 2020 (CDC, 2023). A multifactorial approach to reducing falls can be achieved through the implementation of fall risk screening tools and intervention bundles (Beato et al., 2019; Burland et al., 2013; Francis-Coad et al., 2018; Hewitt et al., 2017; McGibbon et al., 2019; Montero-Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Sherington et al., 2017). **Problem**: Assisted living facilities do not have the tools to decrease the incidence of falls. Falls and fall-related hospital transfers can be decreased by implementing fall risk assessment tools and exercise interventions. **Methods**: The use of fall risk assessment tools and exercise interventions to reduce falls were supported by a thorough review of the literature. This project applied a convenience sample of residents from an assisted living facility and applied the plan, do, study, act (PDSA) translation model. **Intervention**: Participants voluntarily engaged in an 8-week exercise intervention focusing on strength, balance, and ambulation training. **Results**: Results of the project revealed a reduction in the risk of falls through descriptive statistics and the Wilcoxon ranked-sign test of pre- and post-project implementation data analysis. **Conclusion**: Implementation of fall risk assessment tools and exercise interventions reduces the fall risk gait, balance, and total fall risk scores.

Keywords: geriatrics, older adult, assisted living facility, falls risk assessment, falls prevention

Reducing Falls and Fall-Related Hospital Transfers in Geriatric Assisted Living Residents

Background

Falls among adults over age 65 occur often, are costly, and are preventable. Falls are the leading cause of both fatal and nonfatal injuries in older adults (Centers for Disease Control and Prevention [CDC], 2023). In 2015, the total overall cost associated with fatal and nonfatal falls among adults 65 and older was $50 billion, with Medicare and Medicaid paying for nearly 75% of those costs (CDC, 2021; Florence et al., 2018). In 2021, fall-related deaths in adults over age 65 occurred at a rate of 78.0 per 100,000 people, and nonfatal falls were reported in 28% of all older adults (CDC, 2023; Florence et al., 2018). Total falls were estimated at 36 million annually in 2020 (CDC, 2023). In Pennsylvania, approximately 27.9% of older adults fell in 2020 (CDC, 2023). Falls among older adults are a public health crisis as the population rapidly ages.

In nursing facilities, falls are a common occurrence that can lead to decreased quality of life, injuries, and increased risk of death (Agency for Healthcare Research and Quality [AHRQ], 2017; CDC, 2023; Florence et al., 2018). In the United States, approximately 1.3 million falls occur annually among residents who reside in nursing facilities (AHRQ, 2017). 1 in 3 of those who fall, will fall two or more times in a year (AHRQ, 2017). Approximately 10% of residents sustain a serious injury including fractures and death (AHRQ, 2017).

Falls are a complex problem given the multiple risk factors that contribute to falls. When evaluating a resident's risk of falling, medications, chronic conditions, history of falls, age, overall strength and endurance, eyesight, footwear, use of an assistive device, and the environment should be considered (Beato et al., 2019; Burland et al., 2013; Francis-Coad et al., 2018; Hewitt et al., 2017; McGibbon et al., 2019; Montero-Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Sherington et al., 2017). Evaluation requires a comprehensive assessment of factors to combat the risk of falls in older adults.

Problem Statement

Implementing a fall risk screening bundle and exercise intervention program can reduce the incidence of falls in nursing facilities and community dwellings among older adults (Beato et al., 2019; Burland et al., 2013; Francis-Coad et al., 2018; Hewitt et al., 2017; Kovac et al., 2013; McGibbon et al., 2019; Montero-Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Park, 2018; Sherington et al., 2017). Using a multifactorial approach to evaluate residents at risk for falling and implementing subsequent targeted interventions can reduce falls, fall-related injuries, and healthcare costs among older adults (AHRQ, 2017, Beato et al., 2019; Burland et al., 2013; CDC, 2021; Florence et al., 2018; Francis-Coad et al., 2018; Hewitt et al., 2017; Kovac et al., 2013; McGibbon et al., 2019; Montero-Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Park, 2018; Sherington et al., 2017). Employing a fall risk bundle comprised of tools and a medical chart review and an exercise intervention program has been shown to reduce falls, transfers to the hospital, and healthcare costs (AHRQ, 2017; Beato et al., 2019; Burland et al., 2013; CDC, 2021; Florence et al., 2018; Francis-Coad et al., 2018; Hewitt et al., 2017; Kovac et al., 2013; McGibbon et al., 2019; Montero-Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Park, 2018; Sherington et al., 2017).

Skilled nursing facilities and assisted living facilities lack standardized fall risk assessment bundles and interventions. As a result, many assisted living facilities do not have a protocol to screen residents and identify those at high risk of falling. With a lack of heightened awareness, staff cannot implement fall risk interventions, clinicians may not implement essential orders to reduce the risk of falling, and thus residents at risk of falling remain undetected.

Needs Assessment

This quality improvement project was conducted at The Landing of Collegeville, an assisted living facility that is home to approximately 73 residents. The project leader and site leader identified the need for a fall risk assessment bundle and exercise intervention program as a gap in care at this site. The facility does not currently use a fall risk screening tool or bundle nor implement interventions for its residents, making it an ideal setting to implement this project. AHRQ promotes a falls management program for nursing facilities designed to provide individualized person-centered care and improve the facility's fall care processes and outcomes. The goal of the AHRQ program includes improving the safety of residents, decreasing the risk of death, decreasing poor survey results and lawsuits, providing quality improvement tools, and educating staff (AHRQ, 2017). The facility does not calculate a fall rate, fall-related hospital transfers, utilize a fall risk screening tool, fall risk assessment bundle, or fall-related interventions because it is not considered a medical facility.

A SWOT (strengths, weaknesses, opportunities, threats) analysis of The Landing at Collegeville revealed many strengths to support implementing this project. The Landing at Collegeville leadership identified a need for staff education as most of the facility staff are personal care aides, medical technicians, and licensed practice nurses. Opportunities include incentives from insurance companies for reduced fall rates, recognition from The Landing of Collegeville’s parent company for a low fall rate among its facilities, and the interest of outside staff to work at a facility that emphasizes fall precautions. Threats identified include families taking residents out of the facility without adequate knowledge of transferring residents, the facility's current therapy provider ending their contract, and the Prime Fit Wellness instructor leaving the facility (see Appendix A). A root cause analysis revealed falls are impacted by

multiple factors, including staffing, patients, communication, resources, environment, and process (see Appendix B).

Aim, Objectives, and Purpose Statement

This quality improvement project aimed to decrease the incidence of falls and fall-related transfers to the hospital. The following objectives were developed to accomplish this aim:

- During the 5-month implementation phase, 90% of the participants will receive a fall risk assessment bundle evaluation.
- During the 5-month implementation phase, 80% of the participants will complete the fall exercise intervention program.
- After the 5-month implementation phase, the Tinetti POMA fall risk level score will improve by 33% compared to the pre-implementation Tinetti POMA fall risk level score.
- After the 5-month implementation phase, the proportion of falls will be reduced by 10% compared to the pre-implementation proportion of falls.
- After the 5-month implementation phase, the proportion of transfers to the hospital will be reduced by 10% compared to the pre-implementation proportion of hospital transfers.

The purpose of this quality improvement project is to implement an evidence-based fall risk assessment bundle and fall exercise intervention program for assisted living residents over the age of 65 years.

Review of Literature

This project used existing evidence to reduce the incidence of falls by answering the following PICO question: In geriatric patients aged 65 years and older residing in an assisted

living facility, does screening for falls and implementing a fall exercise intervention program decrease the incidence of falls and visits to the hospital, compared to no screening or a fall exercise intervention program?

A thorough review of the literature was conducted in July 2022 using Medline, CINAHL, and PubMed, and repeated three times over the course of the project spanning July 2022 to June 2023. The following were the inclusion criteria: published between 2013 and 2023, adults over 65 years old, full-text articles, and articles written in English. The following search terms were utilized: a) geriatrics or older adult or elderly or aged or older or elder or elderly, b) assisted living facilities or assisted care facilities or long-term care or nursing home, c) assisted living communities, d) falls risk assessment tool, d) falls prevention or preventing falls or prevent falls or reduce falls, e) falls risk screening, f) falls risk assessment, g) falls risk screening in long-term care facilities, and h) fall prevention program in long-term care facilities. A PRISMA diagram was used to organize this search (see Appendix C). Articles included both long-term care residents, assisted living residents, independent living residents, and community-dwelling older adults to broaden the research available on this topic.

A critical appraisal was conducted of 12 articles using the Johns Hopkins evidenced-based practice appraisal tools (Dang et al., 2022). Articles appraised included four retrospective study designs, three systematic reviews and meta-analyses, one systematic review, one systematic review of the literature, one cluster randomized controlled trial, one quasi-experimental, and one randomized controlled trial. Four articles were appraised at Level I, two articles were appraised at Level II, five articles were appraised at Level III, and one article was appraised at Level IV, with a quality rating of A or B (see Appendix D).

Several themes were identified from the literature review. Authors highlighted a lack of consensus on a recommended fall risk assessment tool for screening older adults in assisted living settings (Beato et al., 2019; Burland et al., 2013; McGibbon et al., 2019; Montero-Odasso et al., 2021; Norman & Hirdes, 2020; Nunan et al., 2018; Parks, 2018). Without a reliable and valid tool to identify residents at high risk of falling, fall prevention interventions are difficult to implement (Beato et al., 2019; McGibbon et al., 2019; Montero-Odasso et al., 2021; Norman & Hirdes, 2020; Nunan et al., 2018). A single fall risk assessment tool does not predict falls, therefore highlighting the need for a multifactorial approach (Beato et al., 2019; McGibbon et al., 2019; Montero-Odasso et al., 2021; Norman & Hirdes, 2020; Nunan et al., 2018).

The second theme identified was researchers stressing the importance of evaluating each resident holistically to consider all compounding factors leading to falls (Beato et al., 2019; Burland et al., 2013; Francis-Coad et al., 2018; Hewitt et al., 2017; McGibbon et al., 2019; Montero-Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Sherington et al., 2017). Residents require a multifactorial approach for fall prevention and researchers have concluded that specific interventions to target multifactorial causes of falls are not easily found (Beato et al., 2019; Burland et al., 2013; Francis-Coad et al., 2018; Hewitt et al., 2017; McGibbon et al., 2019; Montero-Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Sherington et al., 2017). A history of falls was a reliable risk factor for predicting future falls (McGibbon et al., 2019; Moyer et al., 2017; Norman & Hirdes, 2020).

The final theme from the literature highlighted fall prevention interventions as effective in reducing falls, with strength training, gait training, and balance training showing the greatest reduction in fall rates (Beato et al., 2019; Hewitt et al., 2017; McGibbon et al., 2019; Montero-

Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Sherington et al., 2017). The combining strength, gait, and balance training interventions varied by study. Most studies implemented different interventions, including medication review; a focus on gait, strength, and balance training; implementing an exercise program; managing osteoporosis and risk of fractures; performing environmental modifications; and cardiovascular interventions (Burland et al., 2013; Hewitt et al., 2017; McGibbon et al., 2019; Montero-Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Parks, 2018).

Limitations identified in the literature included a lack of high-quality studies in assisted living settings. Most studies were conducted in long-term care nursing homes or community-dwelling populations. Additionally, there was a lack of studies conducted in the United States. Studies incorporated in the review included those from Australia, the United Kingdom, and Canada, as these countries have similar patient populations and elder care management to the United States. A lack of standard fall risk assessment tools and specific exercise interventions were present. Future research should compare specific fall risk assessment tools to determine the tool with the highest reliability and validity to implement in older adults. Current evidence for evaluating a specific reliable tool to identify those at high risk of falls and implementing specific fall prevention exercise interventions in the assisted living setting is sparse. Additional research should focus on improving fall prevention outcomes in this vulnerable assisted living population.

Theoretical Model

Neuman's (1995) systems model, a holistic systems-based approach to the care of the patient, was the theoretical framework used to guide this project. The model focuses on the response of the patient's system to stressors and implements primary, secondary, and tertiary prevention interventions to maintain system wellness (Neuman, 1995; Smith, 2018). The patient

is made up of five characteristics: (a) physiological, (b) psychological, (c) sociocultural, (d) developmental, and (e) spiritual (Neuman, 1995; Smith 2018). The application of Neuman's theory to geriatrics emphasizes the need for a holistic approach to evaluate the internal and external factors contributing to falls and implement interventions to prevent falls from occurring. As geriatric patients age, multiple risk factors contribute to the threat of falls, with the possibility of impacting all five characteristics of Neuman's model. Risk factors that can lead to a higher risk of falls include specific chronic conditions, certain medications, footwear, eyesight, overall strength and endurance, use of an assistive device, history of falls, and the environment. Evaluation, therefore, requires a holistic approach for an individual. Finally, fall prevention aligns with the model's focus on primary, secondary, and tertiary prevention, with opportunities to impact all three levels of prevention to maintain system wellness.

Translation Model

The translation model used to guide this quality improvement project was the plan, do, study, act (PDSA) model (Institute for Healthcare Improvement, 2022). This model includes guiding questions in each section, such as: a) What are we trying to accomplish? b) How will we know that a change is an improvement? and c) What change can we make that will result in improvement? (Institute for Healthcare Improvement, 2022). In the planning phase, a lack of fall risk assessment tools was identified, which led to the construction of a fall risk assessment bundle and exercise intervention program. From this gap, the fall risk assessment bundle and exercise intervention program were implemented for an assisted living population, guided by the do phase. Following post-implementation, evaluation occurred to determine if the objectives were met and outcomes were improved, modeling the do phase. Finally, the act phase allowed adjustments to the project implementation to improve the experience of the residents, staff, and

facility. The PDSA model is a cyclical evaluation of a problem with a continued reassessment of the implemented interventions for continuous improvement (Institute for Healthcare Improvement, 2022). A sample of this model is found in Appendix E.

Methodology

Participants

Participants were comprised of a convenience sampling of residents from an assisted living facility in southeastern Pennsylvania who: (a) are identified by the site leader and Prime Fitness instructor as residents with gait or balance challenges, and (b) residents who were likely to complete the intervention phase in its entirety. Inclusion criteria included being 65 years or older, residing in the assisted living facility, having a mini-mental state examination (MMSE) score of 13 or higher, and having a Tinetti performance-oriented mobility assessment (Tinetti POMA) score between 0 and 24. Exclusion criteria included being aged 64 and younger, residing in independent living, being chairbound or bedbound, having an MMSE score of 17 or less, and having a Tinetti POMA score between 25 and 28. The Landing of Collegeville's 2022 census confirmed 100% of the residents were over 65 years old and were assisted living residents.

Setting

The project occurred at The Landing of Collegeville, an assisted living facility in Collegeville, PA. The facility consists of 95 assisted living beds and 20 memory support assisted living beds. The site provides therapy services including physical therapy (PT), occupational therapy (OT), and speech therapy (ST) through Fox Rehab, and a Prime Fit Wellness instructor who provides a focus on health and wellness by offering yoga, stretching, balance exercises, and reiki. The clinical oversight of residents is done by licensed practical nursing (LPN), medical technicians, and personal care aides. Additionally, a physician and a physician assistant (PA)

perform rounds in the building, conducting visits with most residents 2 days per week, providing medical oversight and management.

The layout of the building includes two stories of living space for residents. The center of the building consists of a large dining area. On the first floor, the resident rooms extend to the end of the hallways. Nearly halfway down the first-floor hallways are the laundry rooms. An activities room, therapy, salon, and movie room are found on the second floor, followed by resident rooms extending to the end of the hallways. Staples of the building include spacious hallways and living quarters with large entrances into rooms and bathrooms. Rooms are open-concept floorplans with easy access to all necessities. Additionally, natural light is abundant from many windows throughout the building.

The site leader's office is located at the entrance of the building on the first floor. She interacts with the residents and educates the staff regarding the project. Assisted living residents are more independent than nursing home residents, creating challenges of constant availability due to residents leaving the building for family outings, shopping, activity, or food. Staffing ratios at the facility included 2:25 during the day shift and evening shift and 1:25 during the night shift, lending less opportunity to implement the fall risk assessment bundle. To overcome this barrier, the site would consider hiring an intern to implement the fall exercise intervention program in the future.

Another barrier involved the residents limited free time due to a robust facility activities program in which most residents participated throughout the day. Though activities are an essential part of resident stimulation, working around the schedule of numerous activities to implement the intervention program was a challenge. To combat this challenge, the project leader adjusted their time in the building to work with residents when activities were not

occurring. For this project, the project leader and Prime Fit Wellness instructor conducted the project. The site leader and project leader assessed whether residents met the inclusion criteria.

Tools

This project used two tools during the implementation: MMSE and Tinetti POMA. The MMSE tool was used to assess the residents for cognitive impairment as poor cognitive impairment increases the risk of falls (McGibbon et al., 2019; Moyer et al., 2017). The MMSE consists of 11 questions with differing points per question and residents are awarded points based on the number of items they get correct per question (Larner, 2018). A score of 24 to 30 indicates no cognitive impairment, 18 to 23 indicates mild cognitive impairment and 0 to 17 indicates severe cognitive impairment (Department of Health and Aged Care, 2022). The MMSE tool in community-dwelling older adults scored 0.64 for sensitivity and 0.8 in specificity and was therefore chosen by the project leader for its reliability (Larner, 2018).

The Tinetti POMA fall risk assessment tool consists of two evaluations: resident balance and gait (Tinetti, 1986). The assessment takes approximately 5 to 10 minutes to administer and calculates a score based on the results (Tinetti, 1986). A three-point ordinal scale is used to score each question, with scores ranging from 0 to 2. Zero indicates the highest level of impairment and 2 indicates the resident's highest level of independence with balance and gait ability (Tinetti, 1986). Scores between 25 and 28 indicate a low fall risk, 19 and 24 indicate a medium fall risk and less than 19 indicates a high fall risk (Tinetti, 1986). This assessment tool has a reported sensitivity of 68% and specificity of 78% (Harada et al., as cited in Beato et al., 2019) and was consequently chosen by the project leader.

These tools were used in conjunction with three additional risk stratification assessments to measure the resident's risk of falling to form a fall risk assessment bundle. The exercise

intervention program comprised strength, balance, and ambulation sessions and were implemented to reduce falls and transfers to the hospital. No permission was necessary to use these tools.

Intervention

Staff participating included the project leader, the Prime Fitness instructor, and the facility site leader. The project leader was a doctoral student responsible for the operation, implementation, data collection, and data analysis of the project, which included administering the Tinetti POMA assessment tool, MMSE assessment, medical chart review, and administering the strength and ambulation parts of the exercise program. The Prime Fitness instructor assisted in recruitment and implementing weekly balance exercises of the program. The site leader was the manager of the building at The Landing of Collegeville and assisted with recruitment by inviting residents to participate and providing resident data.

The intervention of this project used a bundle approach to assess a resident's risk of falls and based on the results, implement a fall exercise intervention program. The fall risk assessment bundle included: (a) MMSE, (b) Tinetti POMA, (c) a history of falls, (d) a medication review using the American Geriatric Society (2019) expert panels Beers criteria, and (e) use of an assistive device. Pre-implementation activities included reviewing resident records, identifying residents with gait or balance challenges, reviewing the exercises used in the intervention with the Prime Fitness instructor, and solidifying the responsibilities of those participating in the project implementation. The project leader and Prime Fitness instructor met to review the Tinetti POMA tool and fall exercise intervention program to thoroughly explain the project, answer all questions, and set expectations for the program before implementation. The project leader gathered the history of falls and the use of an assistive device from the electronic health record

(EHR). The site leader provided the project leader with the most recent medication list for review.

From the fall risk assessment bundle, the project leader analyzed the results of the Tinetti POMA and MMSE assessments to identify which residents participated in the fall exercise intervention program. The falls exercise intervention program was carried out by the project leader and Prime Fitness instructor and consisted of strength training, balance training, and ambulating three times per week for 20-30 minutes per session per person (see Appendix F). The decision was made to recruit residents twice throughout the project implementation to generate higher participation of residents, yielding two cohorts of participants. The project leader observed the Prime Fitness instructor administering the balance training during the start of both cohorts to ensure intervention fidelity was achieved amongst both groups. Residents remained in the fall exercise intervention program for 8 weeks, completing seven strength exercises, seven balance exercises, and a 20-minute walk per week (see Appendix G). The participation of the residents was recorded after each session to capture the accuracy of attendance by the project leader and Prime Fitness instructor.

Data Collection

Preintervention

The project leader met with the site leader to collect the rate of falls and fall-related transfers to the hospital. Falls and transfers to the hospital were recorded in separate sections of the facility EHR and were not able to be extracted into a report for review. Falls were recorded in the form of an incident report by staff from the facility. Details of the fall included the location of the fall, an explanation by the resident of what occurred, assessment of pain or injuries, the results of vital sign monitoring and physical exam by the nurse, the post-fall conclusion of time

with the resident, and documenting who was notified of the fall. Incident reports of falls before project implementation were provided to the project leader by the site leader via paper copies. The project leader reviewed paper records of resident face sheets, medication lists, and medical problem lists to identify potential participants and received support from residents, families, and site leadership.

Intervention

The MMSE and Tinetti POMA assessments were completed by each participant and scores were reviewed by the project leader to identify eligible participants. Demographic data were collected once participants were identified and included in the project. Demographic data included age, gender, fall history, types of medications, use of assistive devices, and medical history. Paper copies of resident charts were stored in the home office of the project leader in a locked cabinet. After completion of the 8-week exercise intervention, participants completed the Tinetti POMA assessment for a second time. The project leader also collected participants' reasons for refusing to participate if participants elected to forgo partial or full completion of the exercise intervention.

The falls incident reports were to be collected during implementation through chart review however the site leader left before the conclusion of project implementation. Efforts to contact the new site leader were made without success. Fall-related hospital transfers to the hospital were unavailable due to the inability to extract the data from the EHR. Completion of exercise sessions was recorded on a paper spreadsheet and kept in the Prime Fitness instructor’s office in a locked cabinet. Only the Prime Fitness instructor, project leader, and site leader had access to the cabinet. Following completion of each 8-week exercise program, data were transferred to an electronic spreadsheet. Paper copies of the exercise completion and resident

EHR charts remained in the locked cabinet at the facility site and the project leader's home office until project completion. Demographic data were collected from a review of paper copies of the EHR, documented from completed MMSE and Tinetti POMA assessments and recorded during the completion of each exercise intervention session. The electronic spreadsheet was password-protected and stored on the project leader's password-protected laptop.

Postintervention

The project leader conducted post-implementation statistical analysis and evaluation after the exercise intervention. Conclusions from the data were analyzed and described. Following the completion of the project, all paper copies were shredded, and the electronic spreadsheet will be permanently deleted after 3 years.

Cost Analysis

The costs for implementing this project included supplies, oversight of project implementation at the facility, review of resident records, and use of the Prime Fitness instructor and site leader. Oversight and review of records required the time of the project leader, site leader, and Prime Fitness instructor. Project supplies included paper for the two assessment tools, printer access, printer ink, and pens. The cost was absorbed by the project leader. Implementing the fall exercise intervention program averaged 90 minutes per week per resident. The project leader implemented two of three sessions and the Prime Fitness instructor implemented the third. The MMSE and Tinetti POMA assessments were administered by the project leader. It is therefore estimated each resident took approximately 23 minutes to complete the fall risk assessment evaluation at the beginning and end of the 8-week program and 90 minutes per week to participate in the fall exercise intervention program. The project leader volunteered their time

to implement this project at no cost. The clinical site volunteered the project site leader and Prime Fitness instructor's time at no additional cost.

On average, the cost savings of one resident transferred to the hospital were significant. Burns et al. (2016) estimated the average cost per fall of a resident transferred to the emergency department was $4,829, the average cost of a fatal fall was $26,340, the average cost of a nonfatal fall was $9,780, and the average cost of a hospital stay was $30,550 in 2015. As the population ages, falls will drive significant costs to the healthcare system.

The total cost to implement this project was $175, paid by the project leader. The cost savings of preventing a fall or a fall-related hospital transfer will depend on the decrease in fall and fall-related hospital transfer rates calculated at the end of the project. One resident would cover the cost of this project if prevented from transferring to the hospital for a fall-related injury. A budget analysis of the project is found in Appendix H.

Timeline

The timeline for the project started in May 2022 with project and site selection and ended with project dissemination in August 2023. The project proposal application was submitted to the Messiah University Institutional Review Board (IRB) in November 2022 and IRB exemption was granted in December 2022. Before the implementation of the project, the project leader met with facility staff and leadership at The Landing of Collegeville for project introduction and education in January 2023. Project implementation began in mid-January 2023 and continued through May 2023. Post-implementation data analysis began in May 2023 and was completed by July 2023. Interpretation and dissemination of results were shared with facility leadership and facility staff in August 2023. The project timeline can be found in the Gantt chart in Appendix I.

Ethics and Human Subject Protection

Messiah University IRB exemption was obtained before initiating this DNP project. This project was approved as a quality improvement project and did not require IRB approval from the clinical site as no IRB is governing The Landing of Collegeville. All participants are protected by the Health Insurance Portability and Accountability Act of 1996 (HIPAA) which, among other guarantees, protects the privacy of patient's health information (U.S. Department of Health and Human Services, 2016). The project carefully followed the standards of care and ethics for nursing outlined by the American Nurses Association (ANA, 2015). All information collected to evaluate the impact of this project was aggregated data from the project participants. All data were stored in the facility's secured EHR and recorded on an Excel spreadsheet; paper copies of data were locked in a filing cabinet behind a locked office door. Access to the facility's EHR was restricted from the project leader and resident information was instead provided to the site leader via deidentified paper copies. All electronic files containing identifiable information were password-protected to prevent access by unauthorized users and only the project leader had access to the passwords. Data will be stored for 3 years. After the project, paper copies of data were shredded, and electronic data will be deleted from the laptop's documents folder and trash folder after 3 years.

The risk to patients participating in this project was no different from the risks of patients receiving standard exercise activities. During recruitment, participants received an information handout explaining the program's details, duration, and providing the project leader's contact information (see Appendix J). The information handout document included information about a minimal risk of muscle soreness of which residents should be aware before participating in the

project. Additionally, the document communicated to participants that they could withdraw their participation from the study at any time without consequence.

Results

Analysis and Evaluation

Statistical analysis and evaluation were completed after all data were collected. The analysis started with data cleaning and a codebook was developed. Missing data were random and comprised 29% of the total sample. Missing data included participants missing either the individual ambulation, strength, or balance exercise session due to a scheduling conflict, illness, or injury. Therefore, these data were not included in the final analysis. There were no outliers identified. The level of significance was set at .05 before data analysis began. Data were entered and analyzed with IBM SPSS Statistics, Version 29.0. Each variable's level of measurement was identified to guide statistical analysis and determine the appropriate statistical test.

Descriptive statistics were calculated on demographic data as there was no comparison group in this project. The small convenience sample of 2 male and 2 female participants ranged from 79 – 86 years old (M = 82.3, SD = 3). After a review of the medical problem list, participants had a median of 6 medical comorbidities. On average, participants had a median medication score of nearly 10 medications, fluctuating from 7 to 12 medications. No participants had severe cognitive impairment based on MMSE scores, ranging from 19-30. All participants reported a history of falls. All partakers used an assistive device for ambulation on admission to the project varying from a cane to a rollator walker. A table of demographic and descriptive statistics can be found in Appendix K.

Four total participants completed the exercise intervention out of six. A dependent samples t-test was initially conducted on the pre-and post-Tinetti POMA balance, gait, and total

scores. No skewness was noted for differences amongst scores, but kurtosis was not met, violating the assumptions of this test (skewness = 0, kurtosis = 1.5). The decision was made to conduct the nonparametric Wilcoxon Ranked-Sign test due to a violation of assumptions of the dependent samples t-test. Wilcoxon Ranked-Sign test supports greater accuracy of results when violations occur, provides the ability to evaluate small sample sizes, and is superior when convenience sampling is used (Kim et al., 2022). The proportion of falls and fall-related transfers to the hospital data were not available to compare pre-and post-project implementation.

The pre-POMA balance, gait, and total median scores were compared to the post-POMA balance, gait, and total median scores. No statistical significance was noted between pre- and-post POMA scores. The pre-POMA balance score improved (*Mdn.* = 11.5) compared to post-POMA balance score (*Mdn.* = 13.5), z = -1.63, p = .102, r = .57. The pre-POMA gait score increased (*Mdn.* = 10) compared to post-POMA gait score (*Mdn.* = 0.75), z = -1.34, p = .18, r = .46. Pre-POMA total score raised (*Mdn.* = 21.5) compared to post-POMA total score (*Mdn.* = 24.5), z = 1.63, p = .102, r = .57. Three out of four participants improved their balance score and total POMA score, but one remained the same. Two out of four participants improved their gait score and the remaining two stayed at the same level. A graph of POMA results can be found in Appendix K. Two out of four participants moved from medium fall risk to low fall risk whereas the other two scores did not change the fall risk. The effect size was calculated and showed clinical significance. The effect size shows the strength and value of an intervention on a population (Kim et al., 2022). The effect size of the balance score and total score was large, and the effect size of gait was medium, yielding clinical significance. A table of Tinetti POMA scores and test statistics can be found in Appendix K.

Discussion

Summary of Findings

Although the Tinetti POMA scores did not confirm the statistical significance of exercise interventions on fall risk scores, the medium and large effect size demonstrates clinical significance and was witnessed over the course of the intervention implementation by the project leader. Three of four participants showed improvement in Tinetti POMA scores of either gait, balance, or total when scores were compared pre-intervention to post-intervention. The small sample size increased the risk of a Type II error and limited the more accurate statistical analysis to be run to evaluate outcome measures (Kim et al., 2022)

Two out of five objectives set before project implementation were met. All participants received a fall risk assessment bundle before the start of the exercise intervention. Two out of four participants moved from a medium fall risk score to a low fall risk score after evaluating pre- and-post POMA total scores. The remaining three objectives were not met due to missing data or participants dropping out of the intervention. The facility could not calculate the percentage fall risk score to evaluate pre-implementation and post-implementation exercise interventions on their population. The facility did not track if residents were transferred to the hospital related to sustaining a fall. Two out of the six participants who started the exercise intervention left. One cited the time commitment was too great and the other cited interference with social activities she participated in throughout the facility.

Limitations

Several limitations were identified throughout this quality improvement project. The sample size was small due to limited time from the project leader and the inability to hire an intern to complete the exercise intervention sessions. Exercise intervention sessions consisted of

forty-eight sessions conducted over the course of the implementation phase, taking approximately twenty to thirty minutes complete per session per person. The small sample size impacted the results greatly as this was likely a factor for nonstatistical significance in this project. Outcome objectives were set before understanding the lack of data available from the facility and therefore two out of five were not met given a lack of data to analyze. No statistical tests were run on these outcomes which could have shown the financial impact of this project on the use of the healthcare dollar, facility transportation fee to the hospital, and resident medical bills. The convenience sampling strategy limited the ability to apply these results to other populations. The literature review provided limited evidence to support specific tools for fall risk assessment and exercise interventions for the assisted living population. Several studies showed an overall reduction in falls rates but most of those studies were conducted in either long-term care nursing homes or community-based settings (Burland et al., 2013; Frances-Coad et al., 2018; Hewitt et al., 2017; Kovac et al., 2013; McGibbon et al., 2019; Montero-Odasso et al., 2021; Moyer et al., 2017; Norman & Hirdes, 2020; Nunan et al., 2018; Park, 2018; Sherrington et al., 2017).

Project Implications

The project findings highlighted implications for both the project site and the need for future research. The facility's inability to provide a fall rate or fall-related hospital transfers demonstrated the need for a reliable tracking system to identify opportunities for improved outcomes, cost reduction, and provide high-quality outcomes for their residents. If these two outcomes could have been calculated, the facility would be able to demonstrate the importance of this opportunity to show a return on investment in adopting this project as standard practice. By showing financial savings, hiring an intern would increase the sustainability of the project at

the Landing of Collegeville given the time commitment of the exercise intervention sessions. Literature search findings stressed the need for future research to establish a standardized fall risk assessment bundle and exercise intervention program for geriatric residents in an assisted living setting.

Findings from this project demonstrated that exercise interventions did improve the Tinetti POMA fall risk scores. Further research is needed to determine if the evidence supports the Tinetti POMA fall risk tool for the assisted living setting. The overall improvement in the level of fall risk applies to residents in several care settings. The tool was relatively easy to perform, required no equipment other than a chair, and was quick to conduct. Reducing the risk of falls reduces the risk of injury, improves the quality of life of residents, and decreases healthcare costs, benefiting all healthcare settings.

Significance to Advanced Practice Nursing

The significance of reducing falls in an assisted living resident population can impact healthcare costs, resident injury, quality of life, and facility reimbursement. Fall prevention can be achieved by screening residents to determine their fall risk. Improving screening for falls can allow assisted living facilities to implement interventions to reduce the incidence of falls. Early assessment is a proactive approach to a preventable high-cost and high-mortality incident and can lead to early implementation of fall prevention interventions. Through this measure, facilities can impact the quality of life of their residents, improve their healthcare reimbursement, and reduce the number of residents who fall.

Conclusion

Falls are costly, preventable, and occur often in the geriatric population. The literature supports implementing a fall risk assessment bundle and exercise intervention program to reduce

the incidence of falls in geriatric adults. To apply this evidence, this quality improvement project implemented a fall risk assessment bundle and exercise intervention program at an assisted living facility. The bundle and exercise interventions used components of multiple programs that successfully reduced the risk level of falls in older adults. The strengths and limitations identified over the course of this project provide future considerations for targeting the gap in care for fall prevention in assisted living facilities. By addressing the lack of such fall risk assessment screening and interventions at an assisted living facility, a reduction in the fall risk level of residents was shown through exercise interventions. Although statistical significance was not demonstrated, the project did achieve clinical significance and the effect size of the intervention was immense on resident gait, mobility, and balance.

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Appendix A

SWOT Analysis

Strengths (Internal):

- Leadership support
- Professionally licensed activities staff
- Dedicated Prime Fitness Corporation contractor
- Fox Rehab – same therapists for nearly 4 years
- Design of facility – wide hallways, spacious floorplans, an abundance of natural light
- Robust activities programs – yoga instructor, Reiki master, music department, library, artist, salon, movie theater.

Weaknesses (Internal):

- Lack of falls risk assessment tool
- Lack of falls protocol for high-risk residents
- Lack of higher critically thinking nurses present on site
- Need for additional financial support
- Staffing shortage
- Staff education on topic

Opportunities (External):

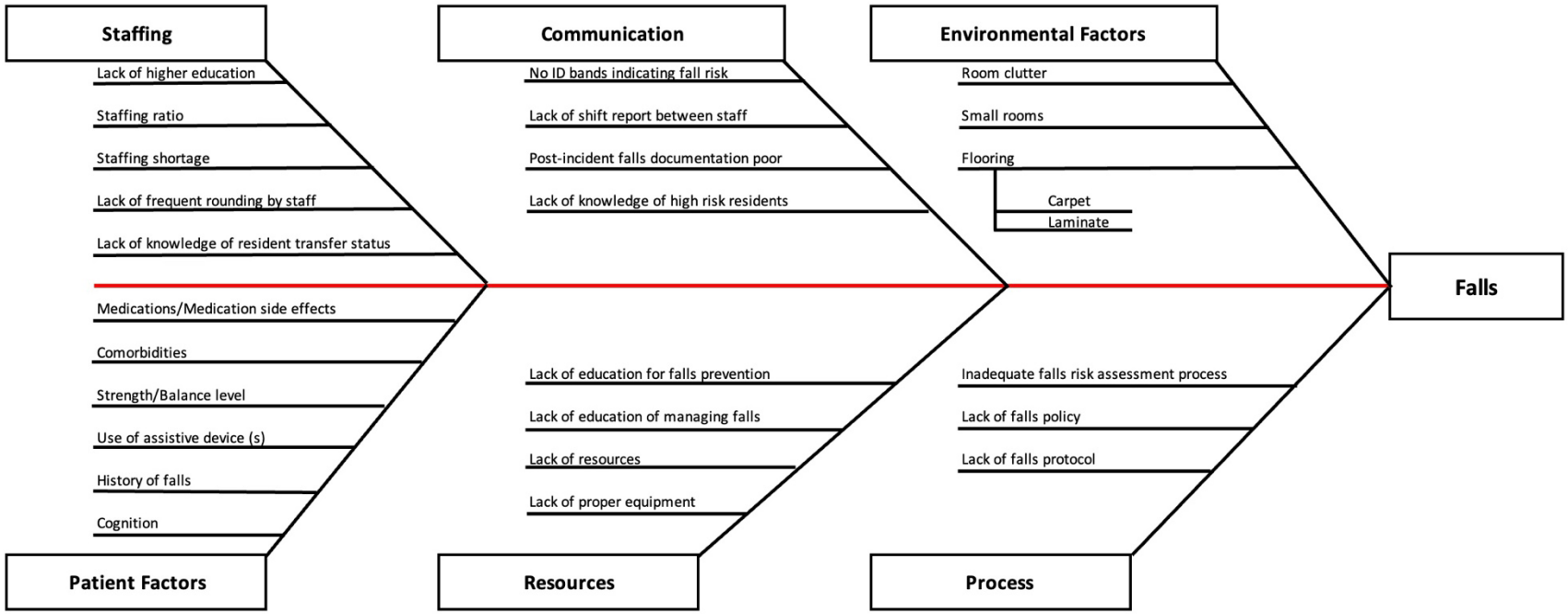
- Improve reimbursement from insurance companies for reduced fall rates
- Recognition from The Landing of Collegeville parent company for lower fall rates among all its buildings
- Increased interest from outside staff and residents to be in a facility that emphasizes falls precautions

Threats (External):

- Financial concern with increasing costs of facility room and board
- Serious injury from falls
- Death of residents from falls
- Increased length of stay in another facility at higher costs
- Decreased resident satisfaction
- Increased fear of falling

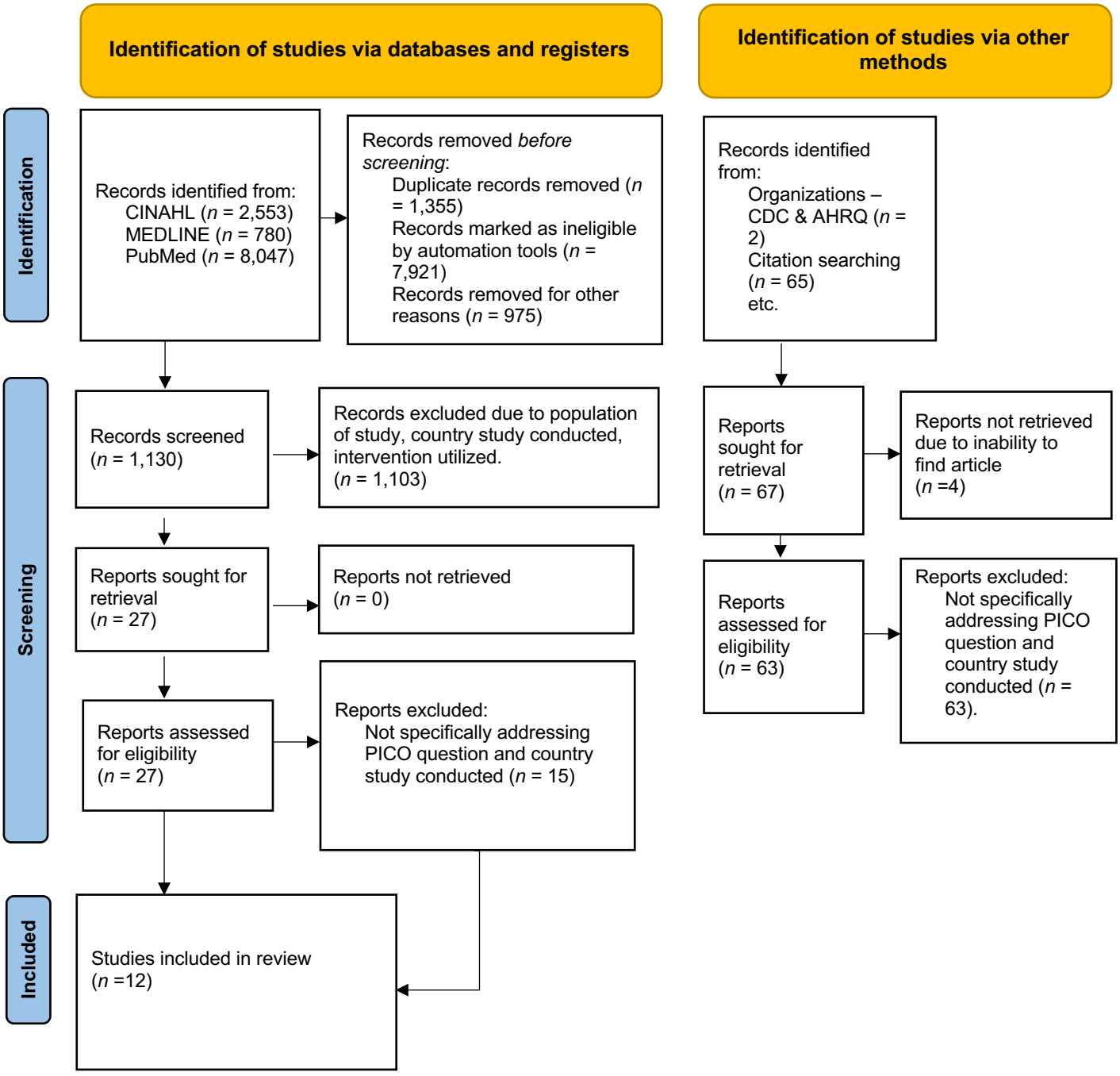
Appendix B

Root Cause Analysis



Appendix C

PRISMA



Articles included were of older adults 65 years and older who's primary outcomes included falls risk assessment and falls risk interventions and management in community dwelling, assisted living, and nursing home patients.

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021; 372: n71.doi:10.1136/bmj. n71. For more information, visit: http://www.prisma-statement.org/

Appendix D

Literature Review Table

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
1	Beato et al., 2019, Journal of Geriatric Physical Therapy, & 2019.	Retrospective study with data collected through chart review.	Purpose was to examine the effects of the Otago home-based program on assisted living residents to determine if the program will reduce the risk and incidences of falls. Patients included were those who scored an 18 or lower on the Tinetti Performance-Oriented Mobility Assessment (POMA). Paper-based data collection was done with the medical records.	Convenience sampling, *n* = 30 charts, 2 assisted living facilities in Orlando Florida.	Evaluate fall risk using the Tinetti POMA tool, implementation of a structured walking program 2x per week, progressive lower extremity strengthening 3x per week, and balance training with increasing difficulty 3x per week for 4-9 weeks. Baseline data for residents were evaluated 1 year prior to the implementation of the program and	SPSS Statistical Software (v22, IBM Statistics). P<0.05 = statistical significance.	Of the 30 residents evaluated, there was a significant decrease in the number of falls (1.4 preintervention and 0.6 postintervention per person, ($p < 0.01$), the Tinetti POMA evaluation for risk of falls also decreased ($p<0.01$) & the scores of the residents improved when given the Tinetti POMA evaluation postintervention ($p<0.01$). All above was statistically significant. At 1 year post	Limitation: 28 of the participants were also receiving OT during the study. Limitation: an additional strength training exercise was added that was not in the original Otago-based strengthening and balance program. Limitation: ambulation was decreased from a goal of 30 minutes (in the original Otago-based program) to 15 minutes. Limitations: there was no comparison	Level III, quality A.

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
					followed for 1 year after implementation.		intervention, there was a 60% reduction in falls of the residents in the study. The number of falls and frequency of falls were reduced after the intervention was implemented.	group to determine if the program itself improved the number of falls or risk of falls. Limitation: there is a lack of generalizability d/t a lack of diversity and 80% of the sample being female.	
2	Burland et al., The Geronotologist, & 2013.	Quasi-experimental, pre/post, comparison group design collected from occurrence reports and administrative health care use data.	Purpose was to evaluate the effectiveness of a fall management program in nursing homes in Canada, increase resident mobility & decrease injurious falls through multiple strategies by comparing rates of three	1,046 total residents were included from two regions, 5 nursing homes were included in the program nursing homes and compared to 7 nursing homes in the non-program group with similar age, sex, level of care, use of	Implementation of a falls management program including education for staff, residents, and families in the form of training sessions or self-paced learning packets, risk reduction strategies, regular fall	P<0.05 = statistical significance	Program nursing homes had more falls than nonprogram nursing homes in the preperiod (1.95 vs 1.54; aRR = 1.27, 95% CI = 1.03-1.56; p = .023). Significant increase in falls were noted in the nonprogram nursing homes over time (1.54-2.24;	Strengths: large sample size of nursing home residents. Strengths: participants were <80 years up to 92+ Strength: multifactorial evalution of residents included polypharmacy evaluation, medication review, level of	Level II, quality B.

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
			outcomes, falls, injurious falls, and falls resulting in hospitalization in program nursing homes vs non-program nursing homes. Individual level program nursing home data were analyzed using a pre/post design.	fall risk drugs, and dementia status who did not have a formal fall program in place in Manitoba, Canada	risk assessments and environmental audits, and a post-fall protocol. Education including learning about falls, consequences, risk factors, promoting functionality, fall management strategies, history of falls, reasons for falls and a quiz. Risk reduction strategies included regular toileting, promoting functionality, restraint minimization, exercise and activity, proper		aRR = 1.46, 95% CI = 1.24-1.71; p<0.0001) and by postperiod, both program and nonprogram nursing homes had the same fall rate of 2.24 falls per person-year (ppy). Injurious falls were 0.599 falls ppy in the preperiod and 0.596 in the postperiod (aRR = 0.99, 95% CI = 0/8-1.2; p=0.49). Both program and nonprogram nursing homes had similar rates of injurious falls in the preperiodbut by postperiod, the non-program nursing homes	care, diagnosis of dementia. Limitations: the tyoe of exercises implemented was not defined. Limitations: administrative data did not always contact all needed information. Limitations: possible bias in using occurrence reports for data collection.	

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
					nutrition, medication review, and assistive device review, and a logo to identify residents at high risk of falling.		had a rate of 0.746 while the program nursing homes was 0.596 (aRR = 0.79; 95% CI = 0.67-0.96; p=0.022). Serious injurious falls decreased significantly in the program nursing homes at 0.0336 in the preperiod to 0.020 in the postperiod (aRR = 0.56, 95% CI 0.32-0.96; p=0.043). Falls resulting in hospitalization was significantly lower in program nursing homes at 0.02 compared to nonprogram nursing homes at 0.041		

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
							postperiod (aRR = 0.49; 95% CI = 0.28-0.88; p=0.023). Results showed improved outcomes in program nursing homes from pre to postperiod and compared to nonprogram nursing homes with lower rates of injurious and serious falls requiring hospital transfer.		
3	Francis-Coad et al., Joanna Briggs Institute System for the Unified Management, Assessment, and Review of	Systematic review and meta-analysis using *a priori* published protocol, and Joanna Briggs Institute System for the Unified	Purpose was to examine the most recent evidence of complex interventions for falls prevention at the resident, facility, and organization level.	12 studies included which were cluster RCTs, quasi-experimental pre/post with control group, and quasi-experimental pre/post design, 7 studies	Complex falls prevention interventions that were implemented across two or more levels: resident, facility, organizational. Resident level included resident	Revman V5.3.4. P<0.05 = statistical significance.	Fall rates improved in studies that included additional support for intervention delivery such as extra nursing staff to perform falls risk assessments, consultation for	Strength: the review included many applicable studies 9 out of 12. Limitation: the setting included in the studies were only LTC facilities and excluded	Level II, Quality B.

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
	Information, & 2018.	Management, Assessment, and Review of Information protocol.		included in meta-analysis, population was >65 years of age in LTC residential aged care facilities.	participation & compliance, facility level included engaging facility staff in falls prevention education or practice change, environmental modifications, layout and safety maintenance of resident equipment, and organizational level included staff practices and bringing about practice changes. At any level, interventions that impacted falls prevention were seen.		patients who fell by external staff & physiotherapists. Of the studies applicable to USA (9 total), 3 studies were found to have reliable measurements of the outcomes and appropriate use of statistical analysis (42, 43, 44). Of the 9 applicable, 3 were included in the meta-analysis (42, 43, 44). Of the 9 applicable, 5 studies were found to have weaker designs, incomplete reporting, and variable quality (6, 15, 21, 28, 45). Of the 9 applicable, 1 study had a	assisted living facilities Limitation: interventions among the studies differed. Limitation: overall evidence of the studies was moderate to low quality.	

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
							high sensitivity analysis and was noted to have included additional resources during implementation (16). The review concluded there was no statistical difference in implementing interventions among the three levels to reduce falls rates.		
4	Hewitt et al., Journal of the American Medical Directors Association, & 2017.	Cluster randomized controlled trial.	Primary purpose was to implement and evaluate the efficacy of an exercise program (balance training and progressive resistance training – Sunbeam program) in	Cluster sampling of facilities and participants, participants volunteered to participate, *n* = 221 participants from 16 different residential care aged facilities.	Exercise program 25 weeks long (Sunbeam Program) followed by a 6-month maintenance program. Prior to intervention, there was no routine program	Stata Software, version 13, negative binomial regression was used to analyze the primary outcome measure. P<0.05 = statistical significance.	Outcomes were measured by chart audits for falls incident reports. Results showed a 55% fall rate reduction in the intervention group compared to usual care group, SS (p=0.02) was	Strength: The study included individuals with mild-moderate cognitive impairment. Limitation: The study was conducted in Australia. Limitation: The study did not include	Level I, Quality: A.

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
			residential care settings from 16 residential care aged facilities. Secondary purpose was to determine if the following improved: quality of life, physical performance, functional mobility, fear of falling, and cognition.	Participants were randomized to receive the Sunbeam program or no intervention.	occurring. Stage 1: residents participated in 1 hour twice a week for a total of 50 hours (0-25 weeks long) progressive resistance training (strength training & balance training). Stage 2: residents entered a maintenance program (7-12 months long) which included strength training, weight bearing balance, and functional group exercise sessions twice a week for 30 minutes.		found in overall physical performance. All other secondary measures were not SS.	individuals with severe cognitive impairment. Limitation: Secondary outcomes did not have good participation d/t time taken to collect the data. Limitation: Falls may have been underestimated .	

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
5	Kovac et al., 2013, & European Journal of Physical and Rehabilitation Medicine	Randomized controlled trial with stratified randomization methods to divide participants into a control group and exercise group.	The purpose of this study was to evaluate the effects of a multimodal exercise program including strength, balance, and walking training on balance, functional mobility, and falls rates among older adults with cognitive impairment. The study was approved by the nursing facility Local Ethics Committee.	544 residents were screened with the Mini-mental State Examination (MMSE) and included were those who were identified to have cognitive impairment (a score of <24). 234 residents met the cognitive impairment criteria. Of the 234, only 86 met inclusion criteria to participate in the study and were separated into two groups. Participants were cognitively impaired long-term	Participants were given the Performance Oriented Mobility Assessment (POMA) scale (POMA -G = gait, POMA-B = balance, POMA-T = total score) at 6 months and 12 months. The exercise group received a multimodal exercise program. The control group received usual care. The multimodal exercise program consisted of a 5-minute warmup of flexibility exercises, 3 sets of 10 repetitions of progressive	POMA interrater reliability was considered good at 85% agreement, TUG with a high interrater (Interclass Correlation Coefficient = 0.99) and interrater (Interclass Correlation Coefficients = 0.99) reliability. Katz Index was used to measure the participants level of independence in performing ADLs. Scoring is 0-6 with a score of 6 indicating total	Statistical significance was found in the POMA-B scores between control group and exercise group with the exercise group scores improving (P <0.0001). Statistical significance was seen in the POMA-G group in the second 6 months of the program (P=0.0001). Statistical significance was seen in the POMA-T score in the exercise group (P<0.0001). TUG scores in the second 6-months of the exercise group were statistically	Strength: study methods match my project plan and include cognitively impaired residents. Limitation: No statistical significance was shown in the program to reduce the incidence of falls as POMA scores improved but scores remained in the high falls risk category at the end of the study period. Limitation: residents with mild cognitive impairment verse moderate cognitive impairment were not compared to determine if improvement	Level I, Quality A

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
				care residents from Budapest, Hungary. 62 participants completed the study over 12 months.	exercises focused on strength and balance training, and ended with a 5-minute cool down. Additionally, participants embarked in a walking program once a week. The exercise program was based on the Otago Exercise Program with some modifications made including differences in time and duration of exercises, ambulating, and inclusion of cognitive impairment residents. The control group	independence. Incidence of falls were tracked over a 12-month time. Demographic, anthropometric data, comorbidities,, medications, and number of falls in the previous 12 months was collected from chart review. SPSS version 15.0 was used for statistical procedure performance. Statistical significance was established at 0.05.	significant (P=0.004). No statistical significance was found in the Katz Index scores in either group. No statistical significance was found between groups on the incidence rate of falls or number of fallers.	was seen in one of those groups. Limitation: sample size was small.	

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
					received usual care in social activities such as simple board games, viewing pictures/films, listening to music, arts & crafts, and activities such as embroidery, needlework, and conversations.				
6	McGibbon et al., Journal of the American Medical Directors Association, & 2019.	Retrospective analysis with descriptive data obtained from the Health & Aging Database in retrospective collection over 3 years.	Purpose was to assess the relationships between intrinsic and extrinsic characteristics to fall and injury rates and examine the fall risk prediction tools.	Convenience sampling, *n* = 1141 falls from 888 patients, setting was a chronic care facility in New Brunswick, Canada.	Internal characteristics assessed on admission: measures of comorbidities (Charlson Comorbidity Index), evaluation of mobility on admission (Timed-Up & Go test), evaluation of balance (Berg Balance Scale),	Descriptive statistics including t-tests, x^2, & logistic regression. $P<0.05$ = statistical significance.	Male patients were found to fall (1.6x) more often than female patients ($p<.001$), patients requiring assistive devices upon admission were 1.7x more likely to fall compared to those who were independent ($p<.001$), patients	Strength: large sample size. Limitation: study conducted in Canada. Limitation: if patients fell more than once, the first fall was the only one included in study. Limitation: if patients were admitted to the facility more	Level III, Quality B.

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
					functional independence (Functional Independence Measure), evaluation of cognition (MMSE), evaluation of frailty (Canadian Study of Health & Aging Clinical Frailty Scale), and assessment of falls risk (Morse Fall scale). External characteristics included time of day, location of fall, activity during fall, staff activity at time of fall, environmental factors, medication factors,		identified as fallers were more frail (p<.001), cognitively impaired (p<.001), poor balance (p<.001), and found to score higher on the falls risk assessment tool (p<.001). The individual falls risk assessment tool was not a predictor of falls itself. The odds of dying in the hospital d/t falls admission was 2.8 times that of nonfallers (p<.001). The majority of falls occurred in the patients room.	than once, the first admission was the only admission included in the study. Limitation: study was conducted in 1 facility only. Limitations: the study was conducted at a long-term care facility and compared to the USA skilled nursing facility which did not define if the patients in the study were subacute rehab patients and/or long-term care patients.	

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
					appropriate footwear on, sensory impairment, and use of mobility aid.				
7	Montero-Odasso et al., Journal of the American Medical Directors Association, & 2021.	Systematic Review.	Purpose is to review clinical practice guidelines on fall prevention & management in older adults (>60 years), identify themes and common recommendations, identify, and determine the recommended falls risk stratification and what is applicable across 3 settings (community dwelling, acute care, nursing homes), and identify gaps in the guidelines for future	15 studies were included. Studies were from: USA – 3.5, UK – 3.5, Canada – 2, Australia – 2, France – 1, Korea – 2, & Ireland – 1. 1 study was done in USA & UK (indicated as 0.5 in the numbers above). 15 studies included patients from community dwelling populations, 8 from nursing home, 5 from acute care. 10 studies.	16 areas were identified in the studies: risk stratification, falls risk assessment tools, fractures (fx) & osteoporosis (OP) management, multifactorial interventions, medication review, exercise interventions, vit D supplementation, hip protectors, vision modification, environment modification, cognitive	AGREE-II was used to assess the quality of the studies and the GRADE agreement Fleiss k was used to score the articles.	All guidelines highlighted the importance of screening for falls risk and implementing exercise interventions. Recommendations for practice included performing risk stratification screening and implementing gait and balance testing for residents who were identified as high risk of falling, making environmental modifications, using a multifactorial interventions used for falls	Strength: the studies yielded high strength and quality for recommendations. Limitation: not all results were from acceptable countries. Limitation: Not all studies included my population. Limitation: it was difficult to pull the results from the article that included my population. Limitation: the article did not share specific types of studies evaluated to generate the practice	Level IV, B.

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
			practice. PRISMA guidelines were followed and the study was performed under the World Falls Guidelines for Prevention & Management of Falls in Older Adults.		factors management, physiotherapy referral, falls education, cardiovascular intervention, footwear evaluation and intervention, and technology.		management, active management of OP & fx, & cardiovascular interventions. 10 studies scored high levels of strength & quality, of those, 5 included nursing home residents in their population studied. Medication review, multifactorial intervention implementation, and environmental factors were recommended in 14 guidelines, risk stratification to assess for high-falls risk and if high-risk, using gait and balance testing	guidelines the authors evaluated.	

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
							was recommended in 13 studies. Of the 5 studies that included nursing home population, all yielded strong and high/moderate quality recommendations on risk stratification (most common tests used TUG, Berg Balance Scale, and Tinetti Performance-oriented mobility assessment tool), falls risk assessment tools, multifactorial interventions, medication review, implementing exercise interventions, and performing		

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
							environmental modifications.		
8	Moyer et al., Physiotherapy Theory and Practice, & 2017.	Pilot study - retrospective observational study with stepwise multiregression analysis. Data collection through screening assessment.	Determine the relationship of clinical impairment & activity to falls in NH residents and determine if predictor variables can determine the number of falls during the previous 6 months. Clinical outcome tools and predictor variables were determined prior to the start of the study. Study approved by the Angelo State University Institutional Review board.	Convenience sampling of all residents who fell, *n* = 17, long term care nursing home residents.	MMSE, # of medications, FIM, assistive device use was all assessed.	Handheld dynamometer strength test, Jamar hand dynamometer, AROM of ankle plantar flexion & dorsiflexion, 4-meter walk test (highly re-test reliability), TUG test (highly retest reliability), Five Time Sit to Stand test (high retest reliability). Linear regression, R values, R^2, p-values, correlation coefficients, SD, variance.	Final model to use: Five TSTS (p=0.007), R ankle DF strength (p=0.03), TUG (p=0.027), R ankle DF AROM (p=0.04). These tests were statistically significant to predict falls when combined but not as individual predictors.	Strength: Multifactorial approach, wholistic approach to the evaluation of the risk of falling. Limitation: most participants in study were R handed, limiting the ability of L handed patients to show a correlation between the handheld dynamometer and risk of falls. Limitation: study conducted among long-term care residents rather than assisted living residents.	Level III, Quality: B

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
						P<0.05 = statistical significance.		Limitation: sample size is small and likely not generalizable. Limitation: one participants strength was recorded incorrectly.	
9	Norman, K. J., & Hirdes, J., P., Canadian Journal on Aging, & 2020.	Retrospective cohort design study using secondary data. Data collected through EHR review MDS 2.0.	Purpose was to compare the effectiveness of the interRAI assessment tool (CAP), the Scott Fall Risk Tool (SFRS), and an internally developed modified fall risk tool to predicting falls among LTC residents.	Convenience sampling, 18 LTC homes in Novia Scotia & New Brunswick Canada, *n* = 1553 residents to evaluate the CAP tool and *n* = 587 residents to evaluate the SFRS tool.	interRAI tool assesses fall hx to categorize residents risk as no risk/low risk (no falls in past 180 days), moderate risk (1 fall in past 180 days), and high risk (more than 1 fall in past 180 days). Depending on results, this will trigger Clinical Assessment protocols (CAP) for	Statistical software R version 3.4.0 logistic regression. P<0.05 = statistical significance. Sensitivity, specificity, and logistic regression were calculated. CAP c-statistic 0.673, FRA c-statistic 0.529, and SFRS c-statistic 0.609.	Of the 1553 residents, 853 fell in the 90-day window after the assessments were completed. 81 fell 3 or more times during that period. History of falls was the only risk factor that was found to be statistically significant to predict future falls. Sensitivity & specificity results of the three tools:	Strength: large sample size Limitation: secondary data could introduce bias. Limitation: may be missing data or incompletion of the falls risk tools in the EHR. Limitation: there could have been additional confounding variables that would impact the internal validity of the study.	Level III, Quality: B

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
					clinicians to implement interventions. -SFRS tool assesses 11 risk factors for falling and assigns them a point value. Scores are out of 19 and a score of 7 or greater indicates high risk of falling, scores of 12 or greater indicate very high risk of falling with possible unsafe ambulation. -modified FRA tool evaluated 14 risk factors for risk of falling, each factor is given a point value of 1, points totally 4-10 indicates a high risk of		CAP results had a higher specificity overall but less sensitivity, modified FRA tool had high sensitivity and low specificity, SFRS showed moderate specificity and sensitivity. Multivariate analysis was done to control for dx (PD, AD, MS, COPD, CVD), this showed the highest accuracy was from CAP, moderate accuracy from modified FRA tool, and SFRS. CAP was the most accurate tool at predicting falls risk in residents at all levels.		

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
					falling and 10-14 indicates very high risk of falling and possible unsafe ambulation. Data were evaluated for 90 days after the most recent risk assessment tool was completed to evaluate fall risk.				
10	Nunan et al., Australasian Journal on Ageing, & 2018.	Systematic review of the literature. 14 studies used a prospective validation design and 1 used a retrospective validation design. Studies were from the following countries: Germany – 1, Australia	The purpose of this review was to appraise current literature on falls risk assessment tools (FRATs) and their recommendations for clinicians on residents in long-term care (LTC). The review only included	15 published papers were reviewed which included psychometric properties reported validity, reliability, inter-rater reliability, LTC residents, and residents 60 years or older.	16 FRATs were identified in the 15 studies. 3 themes were identified which included algorithms, Functional Mobility Assessments (FMAs), and Multifactorial Assessment Tools (MATs).	Inter-rater reliability, specificity and sensitivity were reported. Newcastle-Ottawa Quality Assessment Scale for Cohort Studies was used to grade the risk of bias	Algorithms – 3, FMAs – 5, MATs – 8 were found from the articles. Of the studies from USA and Australia, 1 used an algorithm, 1 used the FMAs, and 2 used MATs. The following results will just be of the USA & Australia	Strength: the review included studies that reported their psychometric values. Strength: The mean age of the participants was 74.5-87.3 years of age. Limitation: there was a mix of FRATs administered by	Level III, Quality A.

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
		– 3, USA – 1, Sweden – 4, The Netherlands – 3, Iran – 1, and Slovenia – 2.	studies that reported their psychometric values to determine strength & quality of recommendations. Literature search focused on the predictive validity of FRATs in LTC.		Algorithms include a combination of mobility assessments and fall risk assessment questions, FMAs include several mobility assessments including assessing balance, gait, and strength, and MATs include assessment of fall risk factors including identifying intrinsic & extrinsic factors.	and applicability of the studies.	studies: The algorithms did not have consistent specificity and sensitivity when applied to different functional statuses which limited its ability to apply them to the larger LTC population. The authors of the study did not include interrater reliability. FMAs were time consuming, required additional training to administer the tests, and had complex issues identified around the gait, strength, and mobility assessments.	physiotherapists and nurses however physiotherapists not often found in my population. Limitation: only 4 out of 15 studies were from USA or Australia. Limitation: there was bias reported on almost all of the USA/Australian studies, making the feasibility of the results questionable.	

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
							The FMAs used was the Five Repetition Sit to Stand test which showed high specificity (55) and sensitivity (86). The results of this study should be interpreted with caution as the *n* = 18. The MATs used different assessment tools (FARAM, PHFRAT, MFRAT, and QFRAT) and had varying sensitivity and specificity scores making it difficult to compare results. Only 1 study (Stapleton et al) reported even rate method of calculating specificity and		

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
							sensitivity. All of the studies from Australia and USA had varying sensitivity and specificity scores with no clear FRAT that was superior to the others. The PHFRAT showed promising results but more research is needed to confirm these results.		
11	Park, S. H., Aging Clinical and Experimental Research, & 2018.	Systematic review and meta-analysis. The review used guidelines of the Cochrane Handbook for Systematic Reviews of Diagnostic Test Accuracy	Purpose of this review was to compare the diagnostic accuracy of fall risk assessment tools for the elderly, evaluate which tool was used most frequently, determine which tool had	33 articles were included in the review. 7 studies from an inpatient setting, 3 from LTC, and 23 from community dwelling persons in private homes or independent	The Berg Balance Scale (BBS) was used in 5 studies among community-dwelling residents, Downton Fall Risk Index in 2 studies among long-term care (LTC)	BBS had a pooled sensitivity of 0.73 (95% CI, 0.65-0.79), heterogeneity of 82.7%, $x^2 = 23.09$, P=0.001. The pooled specificity was 0.90 (95% CI,	Several falls risk assessment tools are recommended to capture the complexity and multifactorial issues that contribute to falls. BBS, Downton Fall Risk Index, Hendrich II Fall Risk	Limitation: the study did not include all falls risk assessment tools in practice. Limitation: on 3 studies were from the LTC setting and community dwelling studies did not	Level 1, Quality B.

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
		and the PRISMA statement.	the highest predictive validity, and identify which tool was best to use in practice. All articles were then reviewed using the Quality Assessment of Diagnostic Accuracy Studies-2 examining quality of the study, risk of bias, and applicability. The Meta-analysis was performed using MetaDiSc 1.4.	living/retirement communities. 9,743 subjects were included, 3 studies with a mean age of 60s, 23 studies with a mean age of 70s, 7 studies with a mean age 60s. The number of studies were conducted in Brazil – 3, China – 1, Portugal – 1, Italy – 1, Australia – 3, Canada – 5, UK – 3, Sweden – 4, Israel – 1, Turkey – 1, USA – 5, Japan – 1, Netherlands – 2, Thailand – 1, and Denmark – 1.	residents. The Hendrich II Fall Risk Model was used in 3 studies in an acute care setting hospital, Mobility Interaction Fall (MIF) was used in 2 studies in LTC residents. St. Thomas Risk Assessment Tool in Falling elderly inpatients (STRATIFY) was used in 3 studies in an acute care hospital, Timed Up and Go (TUG) was used in 5 studies in community dwelling residents and the Tinetti	0.86-0.93), heterogeneity of 31.9%, x^2=5.87, and P=0.21. Downton Fall Risk Index had a pooled sensitivity of 0.84 (95% CI 0.76-0.91), & pooled specificity of 0.26 (95% CI 0.20-0.33). Heterogeneity of sensitivity of 47.5%, x^2=3.81 & P=0.15 and specificity of 43.7%, x^2=3.55, & P=0.17. Hendrich II Fall Risk Model pooled sensitivity	Model, STRATIFY, TUG test all showed a sensitivity of greater than or equal to 0.7 with low to no inter-study heterogeneity. The Tinetti Balance Scale had high sensitivity of 0.7 with no inter-study heterogeneity and low specificity of 0.5. Results showed the predictive validity of the fall risk assessment tools is not sufficient. The use of a large variety of falls risk assessment tools does not predict fallers with sufficient accuracy.	define patient population.	

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
					Balance scale was used in 2 studies among community dwelling residents.	was 0.76 (95% CI 0.68-0.83) & heterogeneity was 0.0%, x^2=1.10, P=0.58. Pooled specificity was 0.60 (95% CI 0.57-0.62) & heterogeneity 97.7%, x^2=87.03, P<0.001. MIF pooled sensitivity 0.53 (95% CI 0.44-0.61) & heterogeneity 94.8%, x^2=19.36, P<0.001 and pooled specificity 0.73 (95% CI 0.65-0.8) & heterogeneit			

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
						y 64.8%, x^2=2.84 & P=0.09. STRATIFY pooled sensitivity 0.89 (95% CI 0.85-0.93) & heterogeneity 64%, x^2=5.56, P=0.06 and pooled specificity 0.67 (95% CI 0.65-0.69, heterogeneity 96.5%, x^2=57.13, P<0.001. TUG test pooled sensitivity 0.76 (95% CI 0.68-0.83), heterogeneity 0.0% x^2=2.20, p=0.85 and pooled			

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
						specificity 0.49 (95% CI 0.43-0.54), heterogeneity 94.8%, x^2=95.87, and P<0.001. Tinetti Balance scale pooled sensitivity 0.68 (95% CI 0.56-0.79) and heterogeneity 0.0%, x2=0.32, P=0.57 and pooled specificity 0.56 (95% CI 0.49-0.62), heterogeneity 79.2%, x^2=4.8, P=0.03.			
12	Sherrington et al., British Journal of Sports	Systematic review and meta-analysis of	Purpose of this study was to evaluate if exercise	112 RCTs were included in the review, 88 of those	This was not clearly defined in each RCT. All	Incident rate ratios (IRRs) from negative	The effect of exercise on community dwelling older	Strength: large sample size of patients studied.	Level I, Quality: B.

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
	Medicine, & 2017.	RCTs. Meta-analysis and meta-regression were used. The review used PRISMA guidelines and checklist. This review was an update of two previously published systematic reviews to include more updated RCTs.	prevents falls in older adults by examining the study design, sample, or intervention, and if these are associated with reducing falls.	were included in the meta-analysis. 61 trails were conducted in community dwelling older adults, 10 trials in high-care residential facilities (nursing homes), and 4 trials were conducted in low-care residential facilities (hostels). Total participants from all RCTs *n* = 19,478.	trials included an exercise program but defining the specific strength training/balance training activity was lacking.	binomial regressions models or HRs from proportional hazards models were used. Stata V.13 software was used for the meta-analysis for studies that included residential care setting residents. Meta-regression used user-written Stata. Command metareg.	adults was found to be statistically significant ($p<.001$). When adjusted for heterogeneity, the I^2 dropped from 47% to 30% when studies were removed d/t high PEDro scores indicating bias. There was no statistical significance found on exercise in residential facility residents, and the pooled estimated effect was found to be variable. When combine, exercise programs that focused on balance training and 3 or more hours	Limitation: authors did not break down the country in which the 112 RCTs were completed. Limitation: some of the results should be interpreted with caution d/t some studies having a small sample size. Limitation: lack of defining intervention in RCTs. Limitation: no FRAT was discussed, only fall risk interventions.	

Article #	Author, Publication Source, & Date (alphabetical order)	Evidence Type & Specific Research Design	Purpose & Methods	Sample Type, Size, Setting	Intervention	Instruments (include psychometrics)	Results/Findings & Recommendations for practice	Strengths/ Limitations	Evidence Level & Quality Rating
							of exercise per week were statistically significant in falls prevention in a meta-regression analysis ($p<.0001$).		

Appendix E

Theoretical Model

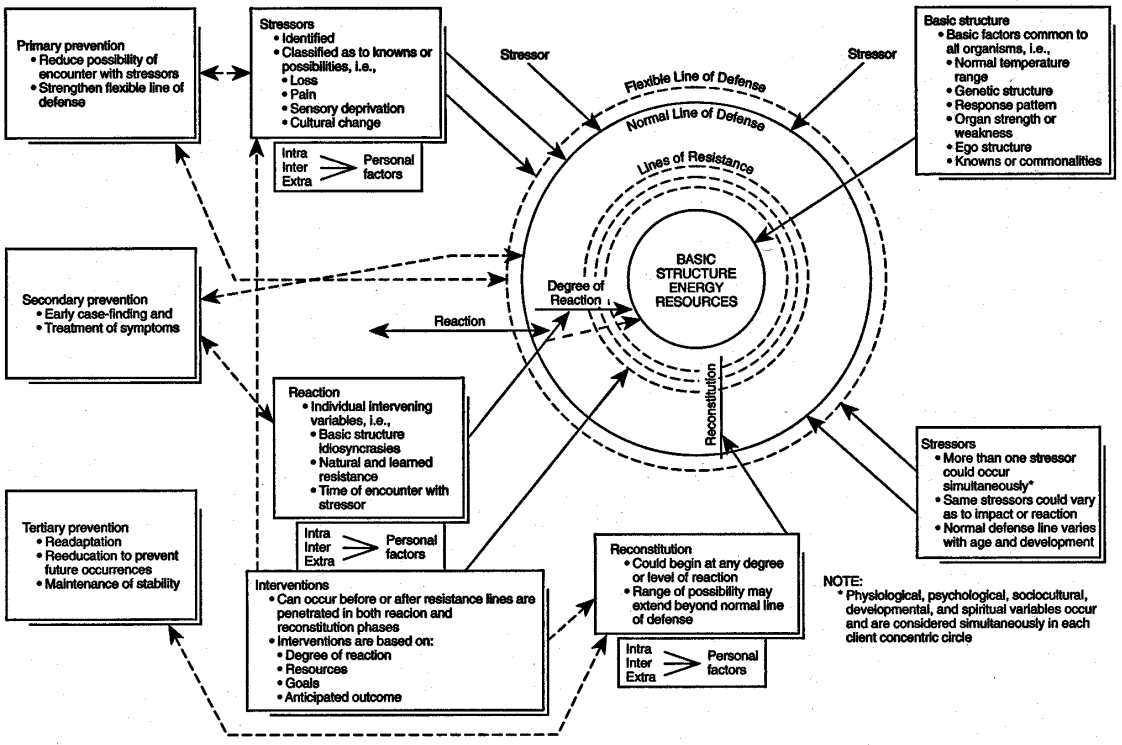
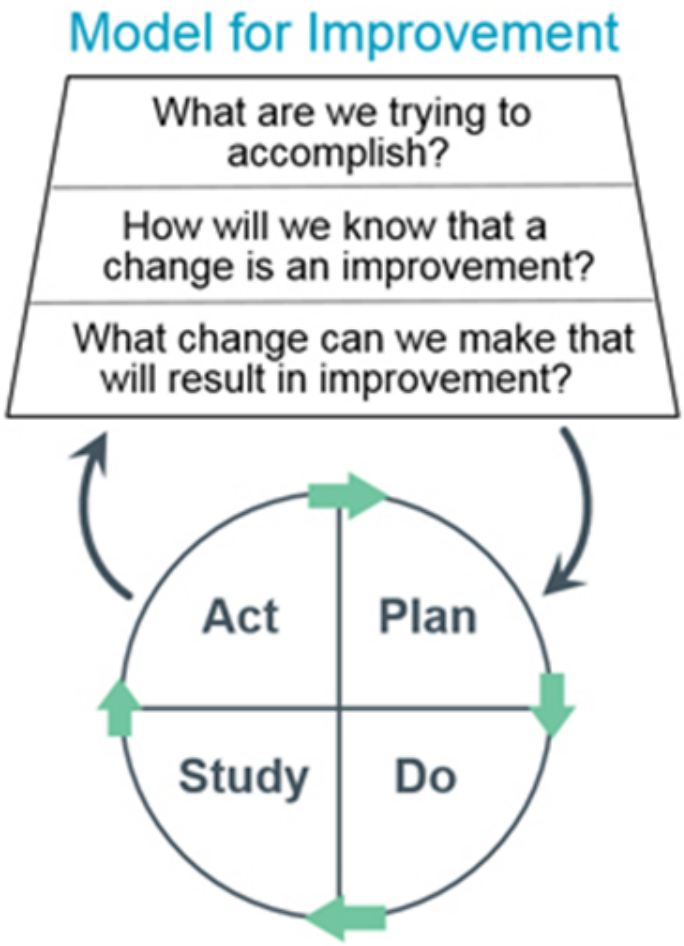


Figure 16–1. The Neuman Systems Model. *(From Neuman, B. (1995).* The Neuman Systems Model *(3rd ed) (p. 17). Norwalk, CT: Appleton & Lange.)*

Neuman, B. (1995). *The Neuman systems model* (3rd ed.). Appleton and Lange.

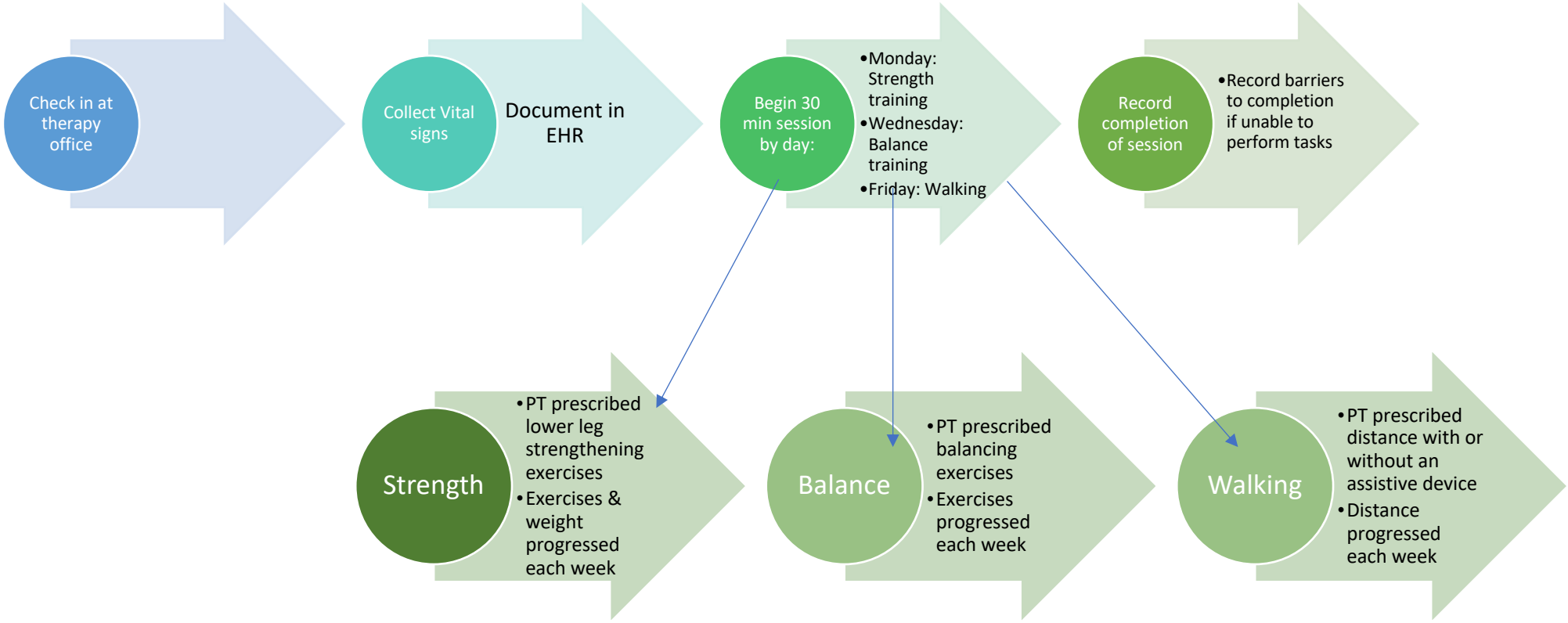
Translation Model



Institute for Healthcare Improvement. (2022). Plan-do-study-act (PDSA) worksheet. https://www.ihi.org/resources/Pages/Tools/PlanDoStudyActWorksheet.aspx

Appendix F

Process Map



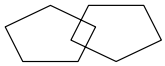
Appendix G

Tools

Mini-Mental State Examination (MMSE)

Patient's Name: _____ Date: _____

Instructions: ***Ask the questions in the order listed. Score one point for each correct response within each question or activity.***

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day of the week? Month?"
5		"Where are we now: State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible. Number of trials: _____
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, …) Stop after five answers. Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 
30		TOTAL

(Adapted from Rovner & Folstein, 1987)

1

Source: www.medicine.uiowa.edu/igec/tools/cognitive/MMSE.pdf Provided by NHCQF, 0106-410

Larner, A. J. (2018). Mini-mental state examination: Diagnostic test accuracy study in primary care referrals. *Neurodegenerative Disease Management, 8*(5), 301-305. http://doi.org/10.2217/nmt-2018-0018

Tinetti Performance Oriented Mobility Assessment (POMA)*

Description:
The Tinetti assessment tool is an easily administered task-oriented test that measures an older adult's gait and balance abilities.

Equipment needed: Hard armless chair
Stopwatch or wristwatch
15 ft walkway

Completion:

Time: 10-15 minutes

Scoring: A three-point ordinal scale, ranging from 0-2. "0" indicates the highest level of impairment and "2" the individuals independence.
Total Balance Score = 16
Total Gait Score = 12
Total Test Score = 28

Interpretation:
25-28 = low fall risk
19-24 = medium fall risk
< 19 = high fall risk

* Tinetti ME. Performance-oriented assessment of mobility problems in elderly patients. *JAGS* 1986; 34: 119-126. (Scoring description: PT Bulletin Feb. 10, 1993)

Tinetti Performance Oriented Mobility Assessment (POMA)

- Balance Tests -

Initial instructions: Subject is seated in hard, armless chair. The following maneuvers are tested.

1. **Sitting Balance** — Leans or slides in chair =0; Steady, safe =1 _____

2. **Arises** — Unable without help =0; Able, uses arms to help =1; Able without using arms =2 _____

3. **Attempts to Arise** — Unable without help =0; Able, requires > 1 attempt =1; Able to rise, 1 attempt =2 _____

4. **Immediate Standing Balance** (first 5 seconds)

Unsteady (swaggers, moves feet, trunk sway) =0
Steady but uses walker or other support =1
Steady without walker or other support =2 _____

5. **Standing Balance**

Unsteady =0
Steady but wide stance(medial heals > 4 inches apart) and uses cane or other support =1
Narrow stance without support =2 _____

6. **Nudged** (subject at maximum position with feet as close together as possible, examiner pushes lightly on subject's sternum with palm of hand 3 times)

Begins to fall =0
Staggers, grabs, catches self =1
Steady =2 _____

7. **Eyes Closed** (at maximum position of item 6)

Unsteady =0
Steady =1 _____

8. **Turing 360 Degrees** — Discontinuous steps =0; Continuous steps =1 _____; Unsteady (grabs, staggers) =0; Steady =1 _____

9. **Sitting Down**

Unsafe (misjudged distance, falls into chair) =0
Uses arms or not a smooth motion =1
Safe, smooth motion =2 _____

BALANCE SCORE: _____/16

Tinetti Performance Oriented Mobility Assessment (POMA)

- Gait Tests -

Initial Instructions: Subject stands with examiner, walks down hallway or across room, first at "usual" pace, then back at "rapid, but safe" pace (using usual walking aids)

10. **Initiation of Gait** (immediately after told to "go"

Any hesitancy or multiple attempts to start =0
No hesitancy =1 _____

11. **Step Length and Height**

Right swing foot
- Does not pass left stance foot with step =0
- Passes left stance foot =1 _____
- Right foot does not clear floor completely
  - With step =0
- Right foot completely clears floor =1 _____

Left swing foot

Does not pass right stance foot with step =0
Passes right stance foot =1 _____
Left foot does not clear floor completely
- With step =0

Left foot completely clears floor =1 _____

12. **Step Symmetry**

Right and left step length not equal (estimate) =0
Right and left step length appear equal =1 _____

13. **Step Continuity**
- Stopping or discontinuity between steps =0
- Steps appear continuous =1 _____

14. **Path** (estimated in relation to floor tiles, 12-inch diameter; observe excursion of 1 foot over about 10 ft. of the course)
- Marked deviation =0
- Mild/moderate deviation or uses walking aid =1
- Straight without walking aid =2 _____

15. **Trunk**
- Marked sway or uses walking aid =0
- No sway but flexion of knees or back or
  - Spreads arms out while walking =1
- No sway, no flexion, no use of arms, and no
  - Use of walking aid =2 _____

16. **Walking Stance**
- Heels apart =0
- Heels almost touching while walking =1 _____

GAIT SCORE = _____/12

BALANCE SCORE = _____/16

TOTAL SCORE (Gait + Balance) = _____/28

{< 19 high fall risk, 19-24 medium fall risk, 25-28 low fall risk}

Tinetti, M. E. (1986). Performance-oriented assessment of mobility problems in elderly patients. *Journal of the American Geriatrics Society, 34*(2), 119-126. http://doi.org/10.1111.j.1532-5415.1986.tb05480.x

Pre-implementation Falls Log

Falls Log – Pre-implementation of Project						
Resident	**Date of fall**	**Fall injury**	**Fall no injury**	**Death**	**CIC**	**Transfer to hospital**

Post-implementation Falls Log

Falls Log – Post-implementation of Project						
Resident	**Date of fall**	**Fall injury**	**Fall no injury**	**Death**	**CIC**	**Transfer to hospital**

Exercise Log

Log Sheet

Participant Name:

Exercises - 10 each leg/direction	**Wk 1**	**Notes**	**Wk 2**	**Notes**	**Wk 3**	**Notes**	**Wk 4**	**Notes**	**Wk 5**	**Notes**	**Wk 6**	**Notes**	**Wk 7**	**Notes**	**Wk 8**	**Notes**
Balance: (check when completed)																
Knee-high marching																
Hip Abduction																
Hip Extension																
Balance on 1 leg (R)																
Balance on 1 leg (L)																
Slide foot forward in line (R)																
Slide foot forward in line (L)																
Heal-to-toe walk																
Twist to touch chair																
Notes																

Exercises - 10 each leg/direction	**Week 1**	**Notes**	**Week 2**	**Notes**	**Week 3**	**Notes**	**Week 4**	**Notes**	**Week 5**	**Notes**	**Week 6**	**Notes**	**Week 7**	**Notes**	**Week 8**	**Notes**
Strength: (check when completed)																
Sit to Stand																
Up on toes, back on heels																
Knee Extension (R)																
Knee Extension (L)																
Knee Curl (R)																
Knee Curl (L)																
Seated clam shells w/band																
Steated ball squeezes																
Step ups/Stair climb																
Notes																
Exercises - 20-30 minutes	**Week 1**	**Notes**	**Week 2**	**Notes**	**Week 3**	**Notes**	**Week 4**	**Notes**	**Week 5**	**Notes**	**Week 6**	**Notes**	**Week 7**	**Notes**	**Week 8**	**Notes**
Ambulation: (check when completed)																
Notes																

Exercises

Strength Exercises (with or without chair)

1. Sit to stand – 10 each leg
2. Up on toes, back on heels – 10x
3. Knee extension – 10 each leg
4. Knee curl – 10 each leg
5. Seated clam shells with band – 10x
6. Seated ball squeezes – 10x
7. Step-ups – 10 steps

Repeat 3 rounds

Balance exercises (with or without chair)

1. Knee-high marching – 10 each leg
2. Hip abduction – 10 each leg
3. Hip extension – 10 each leg
4. Balance on 1 leg – 10-15 seconds
5. Slide foot in front of other in a line – 10x
6. Heal to toe walk – 10
7. Twist and touch the chair – 10 each side

Repeat 3 rounds

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Appendix H

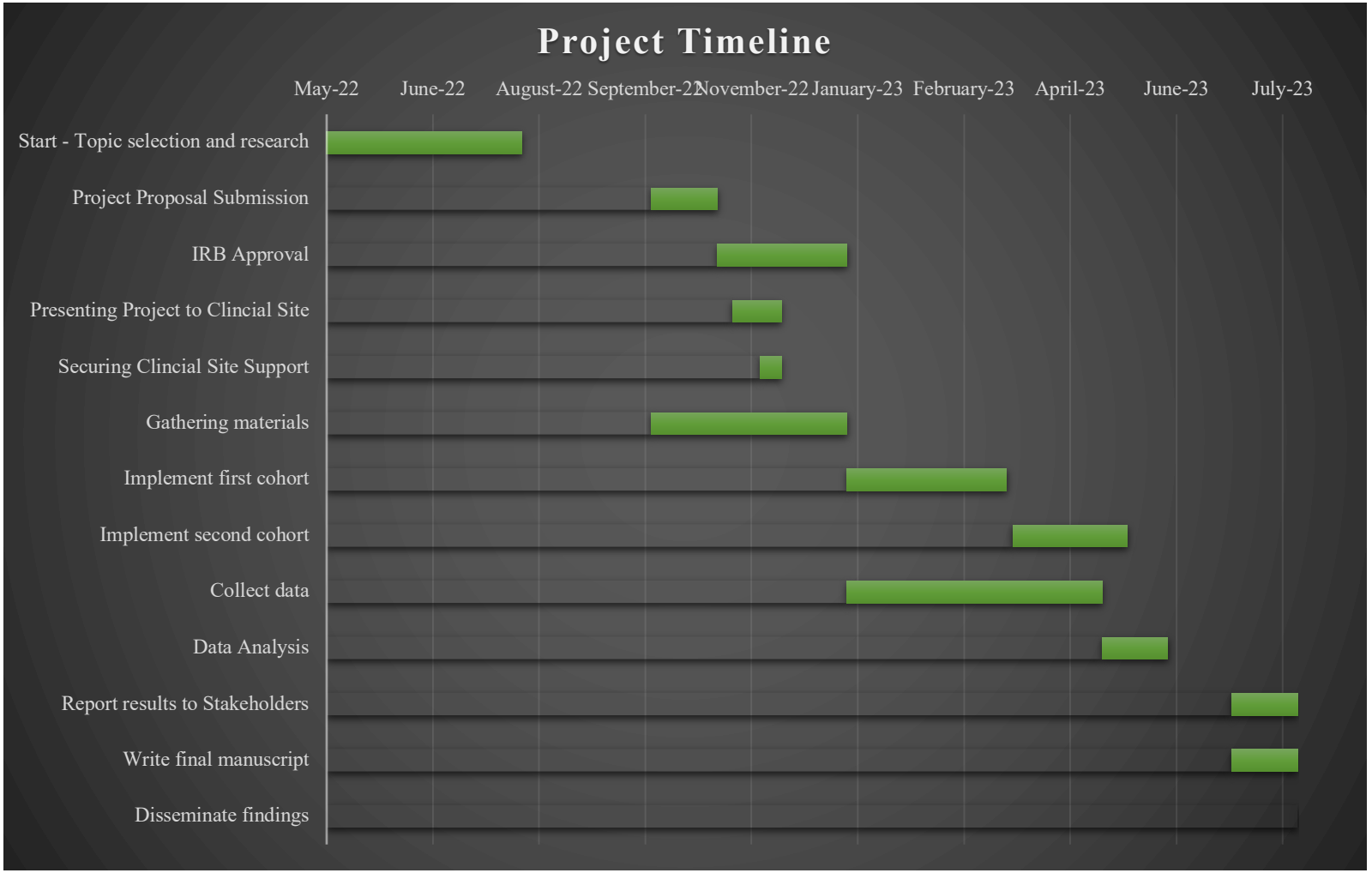
Budget Analysis

Project Expenses (over 4 months)		
Salaries/Wages	Monthly	Total
Administrative Support	$ 4,358.00	$ 17,432.00
Prime Fitness Instructor	$ 263.16	$ 1,052.64
Project Leader	$ 0.00 (donated by DNP Student)	$ 0.00
Total Salary Costs	$ 4,621.16	$ 18,484.64
Startup Costs	Monthly	Total
Paper for assessment bundle	$ 20.00	$ 80.00
Copier/Printer Ink	$ 20.00	$ 80.00
Pens	$ 0.00 (one time expense)	$ 15.00
Total Startup Costs	$ 40.00	$ 175.00
Capital Costs	Monthly	Total
Computer access	$ 0.00 (donated by DNP Student)	$ 0.00
Equipment	$ 0.00 (donated by DNP Student)	$ 0.00
Other		
Total Capital Costs	$ 0.00	$ 0.00
Operational Costs		
Electricity	$ 0.00	$ 0.00
Heat/Cooling	$ 0.00	$ 0.00
Internet Access	$ 0.00	$ 0.00
Office space	$ 0.00	$ 0.00
Total Project Expenses		
Total Project Revenue	$ 4,829.00 (per ED visit in 2015)	
Less Expenses		
Total Project Benefit/Loss		

Total project revenue will be based on number of participants.

Appendix I

GANTT Chart



Appendix J

Quality Improvement Project

Hello, my name is Laurissa Ash and I am here to tell you about a project we are doing at the Landing of Collegeville.

Title of Project: Reducing Falls and Hospital Transfers in an Assisted Living Facility

This project has met the requirements as quality improvement (QI) by the Messiah University Institutional Review Board (IRB). Because this QI project does not meet the requirements as research, an informed consent is not required.

The purpose of this project is to lower the risk of falling in residents living in assisted living. As a resident of an assisted living facility, you will be asked to join the project by taking two tests to measure the level of risk you have for falling. If you score a medium or high risk of falling and no or mild cognitive impairment, you will be asked if you want to participate in the project. If you score low risk of falling or severe cognitive impairment on the second test, we appreciate your interest, but we won't be able to include you in our project. If you are included, you will be given strength, balance, and walking exercises 3 times a week. You will continue these exercises for a total of 8 weeks.

25 minutes will be required to complete two tests. Then 30 minutes 3 times a week will be required to participate in exercises to build strength, balance, and walking longer distances. The project will last 8 weeks.

Doing exercise might give you sore muscles. If sore muscles should happen, you will tell your exercise teacher right away. There is a risk of falling, but the intern will be always with you during the exercises to help avoid falls.

The benefits to you may be to grow stronger with better balance, along with better walking skills and less fear of falling.

There is no risk beyond what is experienced in everyday life.
Your participation is voluntary.
Any personal information collected will be protected and kept confidential.
Results of the project will be reported in summary form with no personally identifiable information.

Please ask the QI project leader, Laurissa Ash, 717-319-8528 if you have any questions.

Appendix K

Statistical analysis

Demographic Data

		Age	# Medications	# Comorbidities	MMSE Score
N	Valid	4	4	4	4
	Missing	0	0	0	0
Mean		82.25	9.50	6.25	24.00
Median		82.00	9.50	6.00	23.50
Mode		79[a]	7[a]	6	19
Std. Deviation		2.986	2.082	.500	5.831
Skewness		.423	.000	2.000	.101
Std. Error of Skewness		1.014	1.014	1.014	1.014
Kurtosis		-.416	.391	4.000	-5.420
Std. Error of Kurtosis		2.619	2.619	2.619	2.619
Minimum		79	7	6	19
Maximum		86	12	7	30

a. Multiple modes exist. The smallest value is shown

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	2	50.0	50.0	50.0
	Female	2	50.0	50.0	100.0
	Total	4	100.0	100.0	

Hx of falls

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	100.0	100.0	100.0

Asst Device Admit

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	100.0	100.0	100.0

MMSE category

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No impairment: 26-30	2	50.0	50.0	50.0
	Mild impairment: 13-25	2	50.0	50.0	100.0
	Total	4	100.0	100.0	

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
prePOMA Balance	4	11.50	1.000	10	12
prePOMA Gait	4	10.00	.816	9	11
prePOMA Total	4	21.50	1.291	20	23
postPOMA Balance	4	13.50	1.915	12	16
postPOMA Gait	4	10.75	1.258	9	12
postPOMA Total	4	24.50	3.109	21	28

Tinetti POMA preimplementation and postimplementation scores.

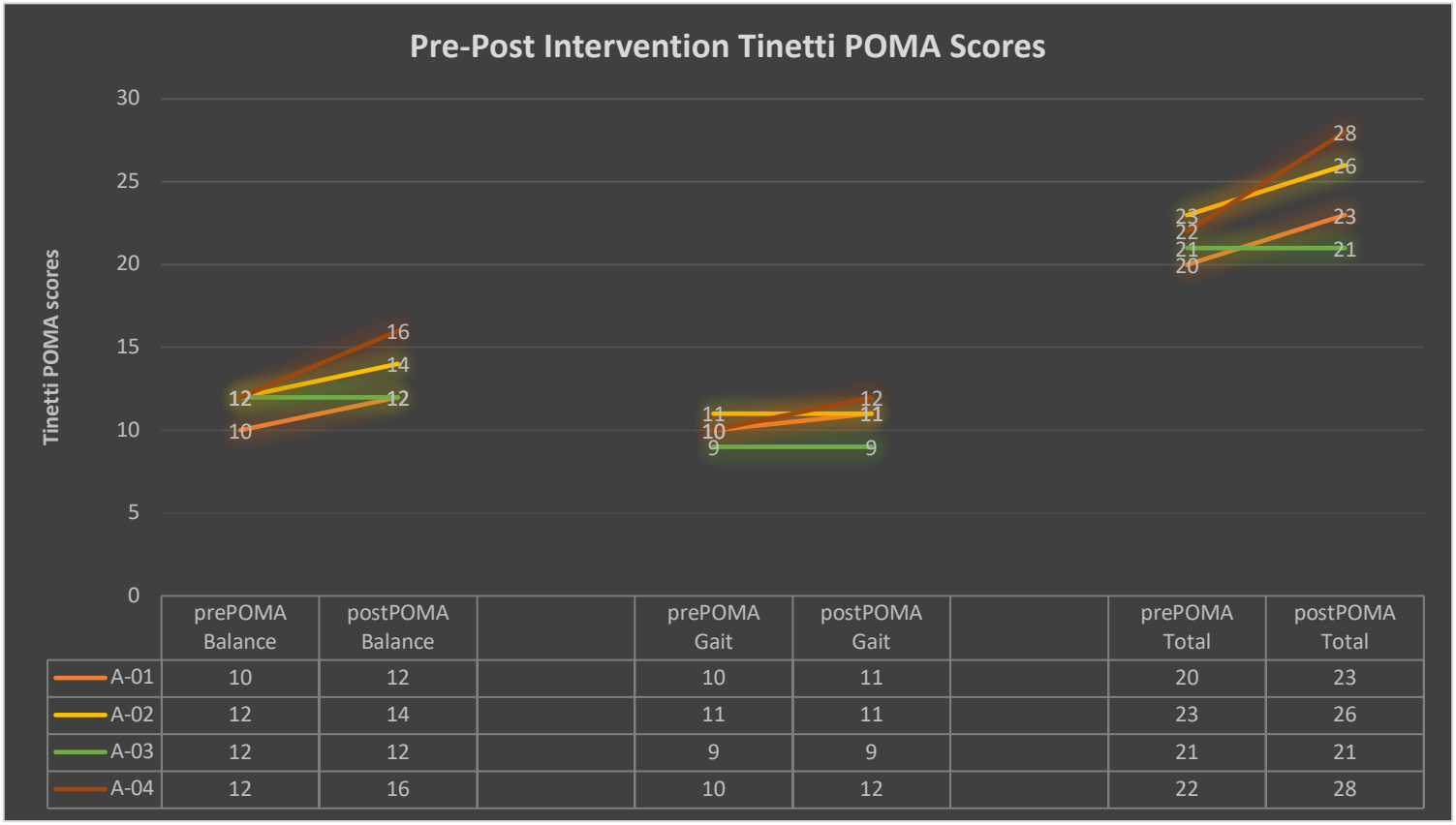
ID	prePOMA Balance	prePOMA Gait	prePOMA Total		postPOMA Balance	postPOMA Gait	postPOMA Total
A-01	10	10	20		12	11	23
A-02	12	11	23		14	11	26
A-03	12	9	21		12	9	21
A-04	12	10	22		16	12	28

Wilcoxon Signed-Ranked Test Statistics

	postPOMA Balance - prePOMA Balance	postPOMA Gait - prePOMA Gait	postPOMA Total - prePOMA Total
Z	-1.633[b]	-1.342[b]	-1.633[b]
Asymp. Sig. (2-tailed)	.102	.180	.102

b. Based on negative ranks.

Tinetti POMA pre-post implementation results



	prePOMA Balance	postPOMA Balance		prePOMA Gait	postPOMA Gait		prePOMA Total	postPOMA Total
A-01	10	12		10	11		20	23
A-02	12	14		11	11		23	26
A-03	12	12		9	9		21	21
A-04	12	16		10	12		22	28