Determining Effectiveness of Evidence-Based Education and Interventions for Fall Prevention in Long-Term Care

Lauren B. Adams-Sanantonio, BSN, RN, DNP student

Chelsea L. Richard, BSN, RN, DNP student

Michigan State University, College of Nursing

Linda J. Keilman, DNP, MSN, RN, GNP-BC, FAANP

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Abstract

Background

Falls are a significant concern for older adults as they can result in hospitalization, disability, death, and increased health care costs. Evidence-based interventions and validated screening tools are available to aid in reducing falls among older adults in long-term care. However, falls continue to be a major health concern for older adults in nursing homes.

Purpose

The purpose of this evidence-based quality improvement project was to impact the knowledge and skills of direct care workers regarding falls in older adults residing in Holt Senior Care and Rehabilitation Center in Holt, Michigan. The main goal of the project was to provide education to direct care workers and to reduce falls and fall-related injuries of the older adult population at the Holt facility.

Methods

A pre- and post-test design was distributed to direct care workers to assess their knowledge of fall prevention before and after an in-person educational PowerPoint presentation. Educational handouts were also provided to all direct care workers. Scores were analyzed after the education session to determine whether any changes occurred.

Implications/Conclusion

Primary outcomes were that direct care workers demonstrated improvement in post-knowledge and attitudes scores post-intervention. Secondary outcomes were that Minimal Data Set statistics on falls improved in subsequent quarters of survey assessment at the facility.

Keywords: Falls, fall prevention, older adults, education, nursing, long-term care

As human life expectancy increases, the global older adult (OA) population continues to grow. In 2022 there were more than 46 million adults aged 65 and older in the United States (US) with a prediction of 90 million by 2050 (Arigoni, 2022). The last of the Baby Boom cohort will reach the age of 65 by 2030 and that event will result in approximately 18 million more OA over 65 in the US (Fry, 2020). Considering the increasing numbers of OA, it is interesting to note that in 2034 there will be more individuals 65 and older in the US than those under 18 years of age (U.S. Census Bureau [USCB], 2021). A visual representation of this demographic change is offered in Figure 1.

Figure 1

An Aging Nation: Projected Number of Children and Older Adults

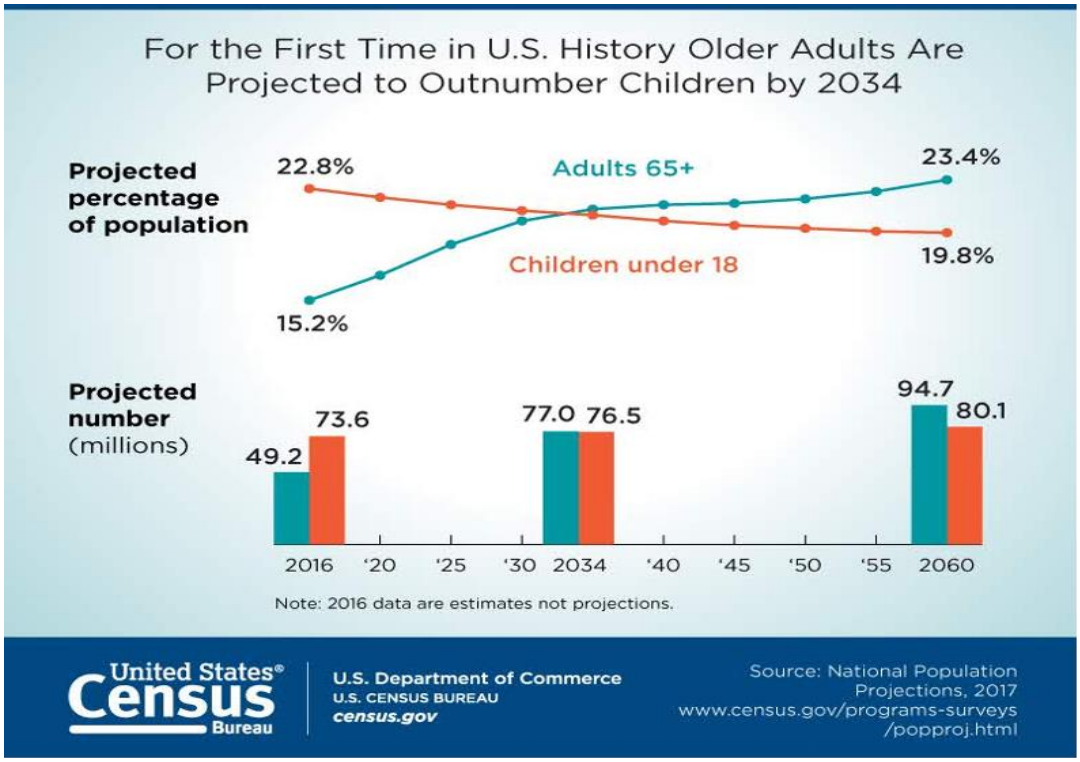

Figure from a US government public domain diagram by the U.S. Census Bureau available at https://www.census.gov/library/stories/2018/03/graying-america.html

Within this aging population, maintaining independence through mobility and daily functioning becomes an essential part of quality of life (QoL). However, functional independence often becomes hindered due to age-related physiological changes, co-morbidities, polypharmacy, or most notably, falls and injuries related to falls. Falls can lead to disability, death, and increased health care costs and are a leading cause of hospitalization and long-term care (LTC) placement in the US (Hoffman et al., 2017). Falls within the OA population have been an ongoing issue worldwide. Falls occur when an individual unintentionally collapses or descends to the ground with or without injury (Khow & Visvanathan, 2017; Meimandi et al., 2021). Fall prevention interventions and protocols were created to better assess risks associated with falls. Unfortunately, falls continue to be an ongoing issue regardless of the setting. More innovative and proactive strategies need to be implemented to educate OA, their families, direct care workers (DCWs), health care professionals and providers to gain in-depth understanding of fall risk and to provide resources to improve fall prevention and management. For this project, DCWs are those who work directly with residents in LTC. DCWs include registered nurses (RNs), licensed professional nurses (LPNs), certified nursing assistants (CNAs), physical therapists (PTs), occupational therapists (OTs), speech therapists (STs), and activity rehabilitation staff.

Background

Falls are a leading cause of death among OA globally and in many cases, can be prevented (Centers for Disease Control and Prevention [CDC], 2021). Among OA, one out of five individuals who fall develop a serious injury such as a fracture (National Council on Aging [NCOA], 2022). Fractures in the OA population can lead to more severe complications than they would for a child or younger adult including increased morbidity, mortality, loss of

independence, reduced QoL, and increased healthcare expenditures. The risk factors that contribute to falls are categorized as either intrinsic (physical and psychological) or extrinsic (environment). See Appendix A for a definition and list of specific fall risk factors.

In addition to the information in Appendix A, acute and chronic diseases such as Alzheimer's, arthritis, cancer, depression, osteoporosis, Parkinson's, and stroke are also considered intrinsic risk factors. These intrinsic and extrinsic factors can often be modified through the implementation of evidence-based (EB) interventions and screening measures. Common interventions that are implemented in LTC facilities include call lights, bed alarms, fall risk mats, beds in the lowest position, and frequent and on-going medication reviews.

With all the available EB resources and screening tools, why are falls still an issue for OA? It is important to note there are special circumstances and challenges surrounding every fall. One example is there were less falls occurrences during the coronavirus disease (COVID-19) pandemic at Holt Senior Care and Rehabilitation Center (HSC&RC). During this time, OAs were quarantined in their room to prevent the spread of infection and may have become weaker due to lack of strength activity exercises conducted by the activity department. Following the pandemic, the facility saw a rise in falls among OAs as they were able to move about the facility and might have become more deconditioned due to decrease in activity level during quarantine. In addition, the pandemic led to staffing shortages and travel DCWs who may not have been as familiar with the OAs. Inadequate staffing leads to unsafe care and has been associated with increased falls in multiple healthcare settings (Abusalem et al., 2021). Adequate staffing, proactive prevention efforts, and reinforced education on the importance of fall prevention can help in achieving lower fall rates among OA (Abusalem et al., 2021; Gulka et al., 2020). Anticipated benefits of quality improvement (QI) changes include:

- an EB proactive education (knowledge, skills) fall prevention program, and
- post-fall assessment interventions,

implemented among residents at the facility in Holt, Michigan (MI). The outcomes of the QI project include maintaining function and independence in activities of daily living (ADL) and instrumental activities of daily living (IADL) for as long as possible, increased QoL, a decrease in transitions of care, and a reduction in healthcare costs. See Table 1 for an explanation of ADL and IADL function.

Table 1

Functional Ability: ADL and IADL Components

FUNCTIONAL ABILITY	
ADLs **Activities related to personal care**	**IADLs** **More complex set of skills needed to live independently**
• Ambulating • Bathing or showering • Dressing • Eating • Toileting • Transferring *(in & out of bed or a chair)*	• Doing laundry • Food preparation • Housekeeping • Managing finances • Managing medications • Using the telephone • Using or arranging transportation

Clinical Question

In OAs residing in LTC, will education of DCWs on innovative, proactive, EB interventions for fall prevention, compared to the current facility standards, decrease the number of falls thus improving QoL and functional status? The QI team collaborated with HSC&RC

staff to review data on the number of falls, types of fall-related injuries, ratio of DCWs to residents, and interventions implemented by the facility before and during the COVID-19 pandemic which was declared by the World Health Organization (WHO) on March 11, 2020 (Cucinotta & Vanelli, 2020). It is important interventions are proactive rather than reactive to prevent falls and the complications that can potentially occur with falls. Implementation of collaborative and proactive EB interventions include:

- The importance of safe, frequent ambulation to maintain function
- An increase in routine ambulation during resident group activities and while performing ADLs
- Hourly rounding using the 4 Ps: pain, position, possessions, and personal needs (Centre for Effective Practice, 2016)
- Increased strength and balance-related exercises led by activity department staff
- Education for DCWs on the pathophysiology of normal aging
- Appropriate steps to complete root-cause-analysis and post-fall assessment

Clinical Site Description

HSC&RC is a for profit short-term rehabilitation and LTC facility in Holt, MI, that is owned and managed by the NexCare Health Systems Corporation. HSC&RC aims to provide personalized care in a hospitable environment that is welcoming to residents and rehab patients while promoting QoL and providing high quality care. Additionally, HSC&RC has been recognized for years as a 5-star facility by Medicare after careful review of their staffing, health inspections, and quality measures (Centers for Medicare & Medicaid Services [CMS], 2022). A facility rating of 5-stars overall is evaluated at above average quality and considered the best in

the industry; facilities with 1-star have quality below average and considered providing poor quality care (CMS, 2022).

Residents/Care Setting

Of NexCare's 18 senior care and rehab centers across the state, HSC&RC is their only facility in Holt, MI. With a population of 25,888, Holt is located within Delhi Charter Township in the state of MI (USCB, 2020). HSC&RC participates in Medicare and Medicaid; they currently have 101 dually certified beds to account for both the rehabilitation and LTC population. On average, in 2019 there were 92 residents living at the facility, 79 residents in 2020, and 80 residents in 2021. During this QI project in 2022, census was 75.

Staffing

A variety of professionals with diverse skills are employed at this facility to provide optimal care. Leaders of HSC&RC include the facility administrator, medical director, director of nursing, assistant director of nursing, and director of education. The facility externally contracts with professional agencies representing therapists (OT, PT, ST) to provide qualified CMS covered residents with personalized rehabilitation activities/exercise. Spiritual support services are provided through personal contacts with clergy or per resident or family request.

Before COVID-19, HSC&RC staffed 16 DCWs for day shift which was from 0630 until 1500. For second shift they staffed 15 DCWs from 1400 until 2300. Night shift was staffed with 9 DCWs from 2230 until 0700. From 2020 through 2022, HSC&RC experienced a decrease in staffing to 9 CNAs for day and second shift, and only 5 CNAs for night shift. During COVID-19 there has been fluctuations of 4 to 5 nurses for day shift and second shift but staffing has stayed consistent with 3 nurses for night shift from 2020 to the present. A comprehensive breakdown of the DCW staff shift patterns can be found in Table 2.

Table 2

DCW Staff Shift Patterns

SHIFT			CNA	LPN	RN
Pre-pandemic	Day	0630 – 1500	11	5	6
	2nd	1400 – 2300	10	5	2
	Night	2230 - 0700	6	3	1
Pandemic	Day	0630 - 1500	9	4-5	5
	2nd	1400 - 2300	9	4-5	2
	Night	2230 – 0700	5	3	1

Policy & Processes

HSC&RC does not currently utilize any specific fall risk assessment tool. However, they do have a fall reduction program policy that is accessible to anyone in the form of an informational book at each of the four (4) nurses' stations. The most recent fall reduction policy was originally published in 2008 and revised in 2016. This current policy details the procedures that nursing staff should follow to reduce resident falls. The current Fall Reduction Program (FRP) policy includes an outline for the nursing staff that includes:

- Identifying a resident's fall risk,
- Implementing individualized interventions into the care plan,
- Determining the need for ongoing assessments/interventions based on Minimum Date Set (MDS) reviews, fall risk history, and interdisciplinary team (IDT) member recommendation, and

- Evaluating trends/patterns to establish new facility strategies towards improvement in the FRP.

The LTC MDS is a standardized, primary screening and assessment tool of health status done initially on admission to LTC. The MDS provides a baseline comprehensive assessment for all residents in CMS certified facilities. Data is collected quarterly or with any change of condition (Healthy People Data, 2022).

The policy also includes steps for the charge nurse to take in the event of a resident fall. The steps include initial incident report/assessment, updating the plan of care with interventions, documenting a physical and neurological exam, and completion of a root cause analysis with the interdisciplinary team (IDT). Notifying the physician and pharmacist through the Request for Medication Regime Review (MRR) form must also be completed. The full FRP policy description can be found in Appendix B.

The HSC&RC administrative team provides fall education for all DCWs twice a year via in-service and online module training. Although there is not a formal fall risk assessment tool, the facility does utilize fall prevention items such as fall mats, hipsters, touch pad call lights, silent call alarms, non-slip footwear, low beds, and perimeter mattresses as EB interventions for residents. There is also a section in the EHR to document fall occurrences as electronic occurrence reports. Additionally, as detailed in the NexCare FRP, the unit nurse must document a corresponding fall assessment review, intervention, and root cause analysis within the EHR 24-48 hours post fall.

Patterns

Both nurses and CNAs provide direct care to the residents of HSC&RC. However, there are less nurses (LPNs and RNs) staffed despite their increased responsibilities and larger resident

ratios. The typical nurse resident ratio based on staffing is 1:25; CNA resident ratio is 1:10. With fluctuations in acuity and staffing due to COVID-19, these numbers can lead to longer call-light response times and preventable resident falls and injuries. During the pandemic, the staff to resident ratio was much more disproportionate due to inadequate staffing as well as utilization of new and unfamiliar agency staff. Staff retention has been an arduous task since the genesis of the pandemic, which has made routine management and resident care for available staff more challenging.

Strengths, Weaknesses, Opportunities, Threats

To create a QI project that focuses on education and the implementation of new EB interventions for the HSC&RC facility, the team needed to understand and outline HSC&RC's strengths and weaknesses, as well as potential opportunities and threats that could improve or impede interventions. Strengths, weaknesses, opportunities, and threats (SWOT) are further analyzed in Appendix C. SWOT analyses are tools that can be utilized in various domains, including health care. SWOT analyses in health care help provide insight of potential improvements that can be made to provide higher quality of care and better outcomes for both the facility and the individual (Stonehouse, 2018).

Strengths of the facility include a policy on fall risk assessment for all residents, OT/PT/ST on contract every day, and regular activities for residents held by the Activities Department. Although there are regular resident activities, they lack incorporating more exercise-based activities to help with strength and balance. During the pandemic, residents were limited with their activities by being quarantined to their rooms to prevent the spread of the virus. During this time, OT/PT/ST ceased their services because the therapists were contracted employees from an agency rather than hired employees of HSC&RC. The therapists were

therefore considered non-essential and were not allowed to enter the facility. Besides the residential and therapy restrictions, other weaknesses became more prevalent due to the pandemic, such as longer call light response times due to short staffing and the increased time needed to don personal protective equipment (PPE). In addition, the fall policy in place for the facility applies to the NexCare System as a whole and is not customized to the residents' needs at this facility.

Potential challenges to the implementation of effective interventions within the facility included short staffing, reluctance of residents to adhere to safe practices, and the use of agency staff who were unfamiliar with the residents and their needs. However, there are many opportunities within the facility for successful implementation of interventions to reduce the number of falls, including motivated and compassionate staff and the facility being highly rated for their care and quality measures.

Fishbone

The fishbone analysis in Appendix D displays the contributing factors related to falls in LTC facilities. The analysis examines the domains of people, methods for pre- and post-fall interventions, and environment which addresses how the barriers to falls can be overcome. This illustration can help guide interventions to be implemented in practice by DCWs to help with fall prevention.

Literature Review

The literature review utilized for the QI project was centered around the clinical question, *In OAs residing in LTC, would education of DCWs on innovative, proactive EB interventions for fall prevention, compared to the current facility standards, decrease the number of falls thus improving QoL and functional status?* The literature review was obtained by using the

Cumulative Index of Nursing and Allied Health Literature (CINAHL) and PubMed databases. Search terms and applicable Boolean operators included “elderly” or “older adult” and “fall prevention” and “long-term care.” Additional search terms consisted of “falls” and “safety” and “long-term care.” Also included were the terms “older adults” or “elderly” or “seniors” or “geriatrics” and “falls prevention” or “preventing falls” or “prevent.” Search results were limited to the years 2017-2022, free full text, and English and Spanish language. After removing duplicates and studies inapplicable to answering the clinical question, 27 articles remained. The final selected articles are listed in the literature review in Appendix E. These articles were further evaluated for their applicable EB interventions to help explore the answer to the problem statement.

Summary of Evidence

Despite finding thousands of articles related to fall prevention, falls remain an ongoing issue in healthcare. As of 2018, the state of MI alone accounts for 28.8% of falls and 54 per 100,000 fall-related deaths in OAs (CDC, 2020). Considering that some of the most vulnerable and frail OAs reside in LTC, it is essential for these facilities to have interventions in place for fall prevention. Currently, HSC&RC’s interventions for falls and fall related injuries include fall mats, touch pad call lights, silent call alarms, low beds, and perimeter mattresses. There is not a current screening tool being used to assess fall risk among the residents; staff gauge fall risk based on the resident’s personal history of falls. Luckily, there are many validated tools and EB interventions for fall prevention that are summarized in the findings below.

Identifying Fall Risk Factors

Fall prevalence is highest in the first days after admission, therefore, team practices related to assessing the risk of falls should be reinforced by the facility and be assessed using a

validated tool or via recognition of residents at risk for falls (Baixinho & Dixe, 2020; Ferguson & Mason, 2020). Early identification of fall risk factors could possibly prevent falls. With a thorough fall-risk assessment, DCWs can identify residents in need of special call lights, assistive devices, motion-activated lights, needing a room near the nurses' station, or those that need assistance with toileting (Baixinho & Dixe, 2020). During admission, education should also be provided to the residents so they are aware of their new surroundings, which could minimize potential environmental causes of falls (Baixinho & Dixe, 2020).

Another essential component of identifying fall risk factors is finding out about the resident's fall history as well as their fear of falling (FOF). One study found that FOF was reported in 48.8% of those who experienced a fall within the previous year and 46.8% of those who had a fall in the previous month (Chen et al., 2021). DCWs should be aware that the FOF can last for at least one-year post-fall, and it can increase the risk of future falls (Chen et al., 2021). FOF can be assessed via the Falls Efficacy Scale (FES) which has proven to be a valid and sensitive tool to identify FOF in OAs (Meimandi et al., 2021).

If a resident expresses concerns for FOF, DCWs should inquire about potential visual impairment, as visual impairments may prompt further assessment. A study by Kim et al. (2021b) revealed that mild visual impairments may be due to the resident's perception of inadequate lighting. If this is the FOF source, lighting should be adjusted according to the residents' preferences. Without adequate fall-risk identification, OAs can fall and consequently may need trauma-related hospitalization for their injuries (Holt & Testerman, 2022). When OAs are hospitalized their QoL declines as well as their functionality, therefore prevention is crucial.

Physical Activity/Exercise: Single and Multifactorial Interventions

After further reviewing the literature, organized multifactorial interventions with intentional rounding and an exercise component tailored to individual resident needs have been supported and linked to reducing falls and fall related injuries among OAs. Azkia et al. (2021) found in their quasi-experimental study that balance strategy exercises (BSE) (p=0.001) and lower limb-range of motion (ROM) exercises (p=0.001) reduced the risk of falls among LTC residents. More notably, they found the limb-ROM group demonstrated a much higher reduction in Timed Up and Go (TUG) scores than the BSE group after the intervention (p=0.008); lower limb-ROM exercises were shown to be better in reducing the risk of OA falls in LTC (Azkia et al., 2021). The TUG test is a reliable and valid performance-based measure of functional mobility. The OA is asked to get up from an armchair, walk to a marker approximately 10 feet away, turn around, walk back, and sit down again (Kear, 2017). The simplicity of lower limb-ROM exercises can be applied and taught to any DCW and be utilized as part of a fall prevention program in LTC.

A systematic review of randomized control trials (RCTs) found that multifactorial interventions including exercise, environmental assessment and modifications, and fall risk assessment helped reduce the rate of falls (risk ratio [RR] 0.87; 95% confidence interval [CI]) (Dautzenberg et al., 2021). A study by Gulka et al. (2020) found that single interventions reduced falls among OAs with exercise being the most effective single intervention (RR 0.79, 95% CI = 0.60-0.81); however, the study suggested that exercise interventions were less effective for individuals with cognitive impairment. Dautzenberg et al. (2021) also found that single exercise interventions were associated with fall reduction when compared to usual care (RR 0.79; 95% CI 0.73–0.86); likewise, Ožić et al. (2020) supported custom exercise interventions due to findings of halted frailty progression. When exercise interventions involve a

balance component, fall reduction appears to be most effective (Azkia et al., 2021; Schroberer & Breimaier, 2020; Senderovich et al., 2021). Overall, the commonality among the studies emphasized the importance of OA ambulation to encourage bone strength and balance maintenance.

Fall Prevention Programs

Patient-centered fall prevention programs, such as A Matter of Balance Program (MOB), and the Fall Tailoring Interventions for Patient Safety (TIPS) Program, were also found to be effective in reducing falls among OAs (Hood & Sharrah, 2022; Tzeng et al., 2021; Valatka, Krizo, & Mallat, 2021). The MOB Program involves the functional reach test and gait speed (measured by the TUG test); it is also EB and promotes physical activity while reducing FOF (Hood & Sharrah, 2022). This program is gaining popularity across the country because of its train-the-trainer philosophy. After paying for certification, any DCW can be a certified trainer for the MOB classes. Similarly, TIPs is a staff-based training program that involves residential engagement including a 3-step fall prevention process, Morse Fall Scale (MFS) risk assessment, as well as interactive case studies (Tzeng et al., 2021). The MFS identifies an individual's risk factors for falling (Kim et al., 2021a).

There is also the Vivifrail multicomponent individualized exercise program targeted towards frail OAs based on their functional abilities. This intervention was highly effective in 4 weeks at increasing functional and strength performance and reversed frailty status in 36% of participants, with 59% achieving high self-autonomy (Courel-Ibáñez et al., 2022). This intervention would likely involve the participation of PT and other members of the IDT to assess residential progress.

Extrinsic Modifications

In addition to programs focused on increasing strength and balance, a few studies also noted the importance of proper footwear to aid in fall prevention of OAs. Footwear is considered an environmental factor in fall prevention and has been shown to help with maintaining balance and preventing falls when compared to those without proper footwear (Pavana et al., 2020; Prevettoni et al., 2021). Increasing dietary forms of calcium and vitamin D were also identified as extrinsic modifications that can be used to reduce the risk of not only falls, but also fractures. One RCT used dietary supplements of foods rich in calcium as an intervention for OAs in LTC; the outcomes were associated with risk reductions of 33% for all fractures (121 v 203; hazard ratio 0.67, 95% CI 0.48 to 0.93; p=0.02) (Iuliano et al., 2021). Similarly, an RCT by Ling et al. (2021), that used vitamin D alone and vitamin D with calcium supplementation, revealed that combined daily supplementation of vitamin D and calcium showed a 12% reduction in fall risks (RR 0.88, 95% CI 0.80 to 0.97). Increasing dietary regimens and supplementations would require a collaborative approach to properly identify residents with deficiencies, but the outcomes have shown to be somewhat beneficial for OAs in LTC.

Additional extrinsic modifications were detailed in a cross-sectional study by Lytras et al. (2022) which revealed 40% of OAs expressed that poor lighting conditions or vision problems contributed to their fall. This study also revealed 60% of falls occurred at night, in the bedroom, or bathroom (Lytras et al., 2022). DCWs should therefore ensure properly lighted and decluttered environments as well as intentional rounding and safety checks to further prevent extrinsic related falls.

Education

Besides exercise-related strategies, there are many other effective interventions that were identified in reducing fall related injuries including intentional hourly rounding, staff education,

and post fall huddles (p=0.005) (Acosta et al., 2022; Zubkoff, 2019). Education became a recurring theme in many of the articles. Educational programs for DCWs are not only cost-effective, but also directly associated with increased knowledge regarding falls and increased recognition of fall-risk residents which can in turn improve fall prevention strategies (Baixinho & Dixe, 2020). Educational interventions are more successful when used with other multifactorial interventions (Gulka et al., 2020; Prevettoni et al., 2021; Tricco et al., 2019).

Team-Based Approach to Care

The literature findings emphasized the importance of team-based approaches to care. One study linked higher residential fall rates to low levels of teamwork, poor handoff communication, and insufficient organizational education sessions (Abusalem et al., 2021). With these concerns in mind, a quantitative study involving a fall simulation was developed to create a team-based approach to falls. This simulation engaged the entire IDT and emphasized the importance of group post-fall huddles and fall risk assessments (Acosta et al., 2022). Post-fall huddles are brief meetings that occur after falls to determine the root cause of the incident and make changes as needed to prevent future falls. The results of the post-survey findings revealed an overwhelming amount of support for simulation-based learning with greater than 80% of participants expressing the ability to apply skills they learned in future interactions with OAs (Acosta et al., 2022). Another team-based approach was found in a systematic review of 126 RCTs which revealed case management and patient reminders, or combined case management, patient reminders and staff education were both statistically superior compared to usual care in preventing falls in OAs (Tricco et al., 2019). As with any team-based approach to care, clear roles and communication are required among team members to yield high quality outcomes.

Medication reviews were also heavily emphasized, and if done properly. this process can prevent avoidable hospitalizations and fall related fractures (Wang et al., 2021; Yu Ming et al., 2021). Medication reviews alone had a positive impact on decreasing the risk of fall-related fractures (RD = -0.02, 95% CI: [-0.04, -0.01], I2 = 0%, p = 0.01) (Yu Ming et al., 2021). However, if medication reviews are utilized in conjunction with multifactorial intervention approaches including caregiver education, exercise, environmental safety assessments, and fall risk assessments, they will be more effective at preventing falls in OAs (Gulka et al., 2020; Prevettoni et al., 2021). In fact, this approach, with the addition of organized patient care, providing adequate feeding and hydration, and the use of appropriate footwear and gait support instruments, showed an impressive reduction of falls in frail OAs of 41.7%, with a fall reduction rate of 78% (Prevettoni et al., 2021). Although there are various EB fall prevention strategies and interventions in circulation, there are no concrete recommendations for standardized interventions for use in LTC. The lack of guidance surrounding this topic contributes to the global fall issues, as well as the evident fall issues seen in HSC&RC.

Goals, Objectives, and Expected Outcomes

The overall goal of this QI project was to improve fall risk education and fall-related outcomes for the OA residents of HSC&RC. With the implementation of EB interdisciplinary fall risk education and post-fall assessment tools, the objective was to increase DCW's awareness and knowledge of falls in order to help decrease the number of resident falls. There was an expected outcome of ongoing utilization of the provided tools to improve fall rates as well as the QoL and functional status of HSC&RC's OAs. These goals were achieved as evidenced by the improvement of post-test scores and the DCW's willingness to implement the provided fall reduction practices. The long-term expected outcome is for HSC&RC's DCWs to

continue to provide fall risk education and implement a standardized EB fall risk prevention strategy or tool to improve their resident and fall related MDS data for HSC&RC.

Methods

The methodology of the QI project was constructed in the form of a pre- and post-test questionnaire for HSC&RC DCWs. DCWs were instructed to complete a pre-test questionnaire prior to the fall prevention educational session to assess their baseline knowledge of falls and fall prevention. After the educational session for DCWs on general fall information and pathophysiology of the aging process, a post-test questionnaire was completed to assess whether knowledge of falls increased. The test was constructed via Qualtrics XM, a web-based survey tool, and consisted of ten true/false and multiple-choice questions which can be found in Appendix F.

In addition, DCWs would complete hourly rounding in the charting system on the residents using the **4Ps:** pain, position, possessions, and personal needs. Resident charts were audited every two weeks for two months to see if the hourly rounding was being completed. These two months were compared with the prior two months to see if this intervention helped prevent falls among residents. Another preventative intervention the team implemented was coordinating with the Activities Department to implement more strength and balance related exercises.

If a fall were to occur, the team helped the facility to complete a root cause analysis and post-fall assessment. The **5 Why's** root cause analysis was used by DCWs after a fall. The reason for this implementation was to realize the problem and why the problem occurred for a specific resident. Implementing necessary changes can help prevent future falls for the resident. The 5 Why's are explained in Appendix G.

Ethical Considerations/Protection of Human Subjects

Ethical considerations were obtained and reviewed prior to sending the QI project to Michigan State University's Internal Review Board (IRB) for approval. The project was deemed not research. Mandatory educational sessions for DCWs were scheduled between two days and were held in a group setting to facilitate interdisciplinary engagement.

Setting Facilitators, Stakeholders, and Barriers

Ongoing communication was facilitated between HSC&RC's nursing administrator and nursing educator to obtain site data and to coordinate implementation of the QI project. The official facility agreement letter is presented in Appendix H. The QI educational intervention was implemented over two consecutive days as to accommodate all DCWs' shifts. The dates were mutually agreed upon with HSC&RC's nursing administration. The stakeholders for the project included all DCWs, residents, HSC&RC leaders and professionals. A primary barrier of the project was the limited intervention time and outcome measurement period. Another barrier for HSC&RC regarding fall prevention was related to the shortage of DCWs at the facility.

The Intervention and Data Collection Procedure

The multimodal intervention included a pre-/post-test knowledge assessment, educational presentation via PowerPoint (PPT) with video, fall prevention handout (see Appendix I), post-fall assessment template, and hourly rounding template. The educational intervention of the QI project utilized a pre-/post-test format, measuring DCWs knowledge and viewpoints pertaining to fall prevention in HSC&RC residents. The survey was written in true/false and multiple-choice answer format.

The QI project included implementation of an educational based PPT presentation which included an informational video for the DCWs to view and engage in discussion. The

presentation included education on OA pathophysiology and fall related injuries, the definition and importance of falls, a review of a post-fall assessment, as well as several multifactorial interventions. Fall risk assessments, post-fall huddles, routine physical exercise, and purposeful hourly rounding using the 4 Ps were some of the numerous interventions that were discussed. A purposeful hourly rounding template and a post-fall assessment adapted from National Health Services (2015) was also provided to the HSC&RC nursing administration to review for implementation. In addition to the provided tools, the facility also planned to implement the idea of post-fall huddles. All the interventions were implemented to increase the knowledge of fall prevention among staff and improve viewpoints and confidence of preventing falls among the residents.

Timeline

The data collection process and analysis began in May 2022. Interventions were determined by collaborating with HSC&RC's nursing administration after reviewing current practices and analyzing potential areas of improvement. The final proposal was submitted in August 2022 to the Michigan State University (MSU) College of Nursing (CON) board for review. After approval from the CON, the proposal was then submitted to the MSU Institutional Review Board for official determination and approval.

The project was implemented over two days at HSC&RC. All DCWs were mandated to attend one session over the course of two days in October. The educational sessions took one hour to review the material, and answer DCWs questions. After implementation, data was collected from October 2022 – February 2023 to see if the interventions helped reduce falls among OAs at HSC&RC. The full timeline for the QI project can be found in Appendix J.

Analysis

HSC&RC provided MDS fall data from the years 2019 to 2023 for further analysis, see Appendix K. The data collected included the number of falls, location of falls, time of falls, predisposing risk factors, and the number of residents sent to the hospital. Based on the reported fall data from Appendix K, less falls occurred during the height of the COVID-19 pandemic. In fact, falls were significantly lower during the pandemic when compared to pre- and post-pandemic, see Appendix L. A major factor that may have contributed to this finding is that during the pandemic residents were quarantined in their rooms, which helped eliminate additional areas of unsupervised ambulation. From 2019-2022, there were 527 falls occurrences and 7 of those falls required hospitalization. The most common location for a fall to occur was in the resident's room. Many predisposing factors were identified from 2020 through 2022. The most common predisposing physiological factors related to the incidence of falls included gait imbalance, confusion, and incontinence. As noted in Appendix K, some falls were multifactorial in origin. The data also revealed the most common predisposing situational factors associated with falls was linked to the lack of call light usage, falls during transfers, and ambulating without assistance.

In addition, reported fall data was collected and analyzed monthly from June 2022 – February 2023, see Appendix M. The data was analyzed to determine the effectiveness and longevity of the QI intervention that was completed in October of 2022. Fall rates drastically decreased the month after the intervention was completed in at HSC&RC but began to steadily rise from December 2022 – February 2023.

Data was also compared pre-/post-intervention, including DCW fall knowledge, as well as the number of resident falls at HSC&RC. Fall knowledge of DCWs was assessed during an hour-long educational session in October 2022 using a multiple-choice questionnaire (see

Appendix F). Attending an educational session was mandatory for the DCWs. There were 49 participants, but one participant was excluded from the data for entering the presentation 15 minutes late (n=48). The pre-intervention scores averaged 8.645 out of 10 or 86.4% and the post-intervention scores averaged 9.48 out of 10 or 94.8%. Therefore, the knowledge of DCWs increased by approximately 8% following the educational intervention. The *p*-value was 0.0025, meaning there was a significant relationship between fall knowledge scores and educational sessions for DCWs. The standard deviation for the pre-intervention was 1.49 and the post-intervention standard deviation was 1.08.

Conceptual Framework

The conceptual framework for the QI project was based on the Plan, Do, Study, and Act (PDSA) method (see Appendix N), which is broken down into four (4) stages (Agency for Healthcare Research and Quality [AHRQ], 2020). This model helps carry out change through continuous process improvement. The PDSA cycle is ongoing, and the interventions should be re-evaluated frequently to see if changes need to be made to create more effective outcomes for the residents and facility. This model highlights the importance of intrinsic and extrinsic factors to provide feedback on ways in which to accomplish the goal. The intrinsic and extrinsic highlights for HSC&RC can be found in the SWOT Analysis in Appendix C.

Plan

Stage 1 of the PDSA framework is plan (see Appendix N). Three main questions were asked during the planning stage of this project:

1. What is the QI team trying to accomplish?
2. How will the QI team know that a change is an improvement for the facility?

3. What changes could the QI team make that would result in an improvement in fall prevention (AHRQ, 2020)?

One way that helped with brainstorming for the QI project was developing a SWOT analysis (Box 2) that identified what was being done well at the facility and what could be done better.

Do

Stage 2 is Do. This is the implementation of the action plan which involves taking notes during observations. For example, it was important for the IDT to make note of how the residents reacted to the change, as well as the reactions by the DCWs. Once unexpected outcomes are recognized and data is gathered, stage 3, Study can begin.

Study

Study is the third stage. The main purpose of this stage is to determine if the intervention resulted in improvement for the facility (AHRQ, 2020). To determine if the intervention was successful, it was important to identify unintended effects and associated trends. During this stage, identifying what the team learned and acknowledging whether the goal was met or not are also important components.

Act

The fourth and final stage is when the project is determined if it was successful or not. If a project happens to be a success, this plan should be standardized and used on a regular basis at the facility to help prevent falls (AHRQ, 2020). If not successful at this stage, the intervention should be re-examined and then begin again at stage 1: Plan again for process improvement (Figure 9).

Sustainability Plan/Next Steps

Falls in the OA population has been an ongoing issue for LTC facilities nationwide, including HSC&RC. Despite HSC&RC's current FRP and biannual fall education training for DCWs, they continue to have issues with their fall rates. While evaluating the facility's current processes, it was discovered they lacked a standardized fall risk assessment tool, fall policy, and post-fall protocol. With that knowledge, the QI project's educational materials and presentation were given to HSC&RC's nursing administration for their biannual DCW fall prevention education sessions. The post-fall protocol and hourly rounding template was also distributed to administration to use as their official rounding and post-fall protocol. The handouts and PPT presentation will be utilized by the nursing educator for ongoing education of DCWs, and MDS fall data will continue to be monitored by the regional clinical director.

Nursing Implications

Fall prevention in LTC facilities needs to be a priority to help reduce morbidity and mortality rates among OAs. As discussed, falls also lead to astronomical health care costs. Although there has been numerous research on fall prevention, falls remain a leading cause of death among OAs. It is apparent that not one single intervention will prevent falls, instead a multifactorial intervention is more effective in reducing falls. Also, the interventions should be tailored to each OA. Post-fall huddles are able to identify areas for improvement and ways to prevent a future fall.

The post-knowledge assessment on the evidence-based fall prevention PPT presentation showed a significant improvement in knowledge scores compared to the pre-knowledge assessment. Based on the data gathered, it would be more beneficial to have frequent education sessions for DCWs to help with knowledge retention. Fall rates decreased during the month of the QI intervention, but steadily increased in the following months. Based on these findings,

long-term recommendations would include having more routine fall prevention education sessions for staff. In doing so, it would ensure that new DCWs have proper knowledge about the fall interventions and fall protocols in place at the facility, while providing a beneficial refresher for tenured DCWs.

Cost-Benefit Analysis/Budget

Cost was a minimal concern when coordinating and conducting the QI project. Financial burdens were distributed amongst the two project team members, HSC&RC's nursing administration, and one Michigan State University faculty project advisor. Organizing the educational intervention was not accounted for in the final budget. The direct costs of the printed informational handouts and the knowledge surveys were included. The overall QI project was centered on DCW participation and engagement, thus, there were no major financial burdens for the facility.

Conclusion

Fall prevention in LTC is a vital part of ensuring the maximum QoL for OAs residing in LTC. However, due to various extrinsic and intrinsic factors, falls and fall-related injuries occur. Currently, HSC&RC does not have a standardized fall prevention tool or post-fall tool in practice. Consequently, falls have been an ongoing issue within this facility. The suspicion that the COVID-19 pandemic contributed to these rates was refuted, with a surprising influx in fall rates noted both pre and post pandemic. Although the pandemic was not a direct contributor to the fall data, inadequate staffing ratios, use of contract workers without adequate training, and lack of multifactorial fall prevention interventions were notable risk factors for the facility. The goal of the QI project was to utilize the implementation of in-person education sessions to actively engage DCW participation, as well as distribute fall prevention handouts, hourly

rounding templates, and post-fall protocol resources to help improve their fall data long-term. As seen in the months following the educational sessions and use of new fall prevention materials, DCW's fall prevention knowledge improved as well as the MDS data. With ongoing fall education of DCWs, and implementation of root-cause analyses via fall prevention and post-fall tools, fall rates could vastly improve. The hope is that with continued efforts, fall MDS measures will eventually be improved, as well as residents' QoL. More studies are needed to determine the long-term efficacy of such interventions to combat this issue on a larger scale.

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Appendix A

Box 1

Risk factors for falls

Intrinsic Fall Risk Factors	Extrinsic Fall Risk Factors
• Agitation • Changes in gait & balance *(effects of normal aging: reduced arm swing, decreased step length, slowed reaction time, slower movements)* • Confusion • Cognitive impairment • Contractures • Decreased strength • Disorientation • Dizziness • Drug interactions • Fainting • Frailty • Hearing *(effects of normal aging: decreased sensitivity)* • Imbalance • Impaired judgment • Incontinence *(bowel or urine)* • Loss of joint mobility • Lower extremity weakness • Orthostatic hypotension • Paralysis • Sedation • Tremors • Urologic *(effects of normal aging: feelings of urgent need to urinate, frequent urination)* • Visual impairment *(effects of normal aging: decrease in acuity, contrast sensitivity, peripheral vision, night vision; increase increased sensitivity to glare)* • Weakness & overall fatigue	• Environment *(clutter, inadequate lighting, glare, uneven or wet floor, raised thresholds, missing tiles or linoleum, scatter rugs, worn carpeting, unstable or lightweight furniture, furniture without arms, insecure toilet seat or handrail, unstable wheels)* • Equipment *(inappropriate type & height of cane or walker; missing wheelchair [WC] parts or incorrect WC fit, inadequate WC seating, broken parts, walker without wheels)* • Hard-to-reach personal items *(lack of an assistive-reacher)* • Lack of assistive equipment in the bathroom *(low toilet seat, lack of handrail support)* • Personal safety *(unsafe shoes or slippers, untied shoelaces, clothing with zippers and buttons or hard-to-manage)* • Physical restraints *(increase the likelihood of serious injury)* • Polypharmacy • Side effects of medications *(antidepressants, sedatives/hypnotics, antipsychotics)* Agency for Healthcare Research and Quality (HRQ), 2017; Lytras et al., 2022

Appendix B

Figure 2

NexCare's Falls Reduction Program

Title:	FALLS REDUCTION PROGRAM
Scope of Practice:	NEXCARE HEALTH SYSTEMS-NURSING
Policy Number: NRS-248E Origination Date: July 1, 2008 Revision Date: 9/25/2016	Approved by: Kamran Sheikh, MD Medical Director Approved By: QA Committee

PURPOSE:
To provide a safe environment for residents, modify risk factors, and reduce risk of fall related injury.

FORMS APPLICABLE TO THIS POLICY:

ADMISSION ASSESSMENT
RESIDENT CAREPLAN/KARDEX
INCIDENT REPORT
PAIN ASSESSMENT
NEUROLOGICAL ASSESSMENT
REQUEST FOR MEDICATION REGIMEN REVIEW
REHAB SERVICES SCREENING
FALL ASSESSMENT

PROCEDURE:

1. Identify/analyze resident risk for fall.
   1.1. Review the following:
   - Admission Assessment
   - RAI process
   - Observation of resident's mobility and/or behavior
   - Communication from family and/or others
2. Implement and indicate individualized interventions on Care Plan/Kardex.
3. If fall occurs Charge Nurse to complete the following:
   - Physical assessment of resident and observation of environment
   - Immediate interventions as identified by physical assessment and environmental observation
   - Incident Report
     - Notify physician
     - Notify resident responsible party/family member
     - Pain Assessment as applicable with new onset of pain
   - Neurological Assessment, as applicable with any known or suspected head trauma.
   - Therapy screen, as applicable

3.1. Initiate safety interventions and update care plan as applicable
3.2. Charge nurse to monitor for delayed consequences of incident utilizing the following.
   - Physical assessment and documentation
   - Neurological Assessment per directions, as applicable
3.3. IDT to review each incident to complete root cause analysis
   3.4.1. Complete physical review of environment
   3.4.2. Complete/review Fall Assessment.
      - Discuss and determine root cause
      - Summarize IDT analysis in the incident report
   3.4.3. Identify any additional interventions in the Care Plan/Kardex:
   3.4.4. Notify pharmacist via Request for Medication Regime Review (MRR) form, as applicable.
   3.4.5. Notify physician for follow-up requests without immediate need.

4. Determine the need for ongoing assessments/interventions based on MDS reviews, fall risk history, and IDT member recommendation.

5. Trends/patterns will be evaluated by the QAPI committee to establish new facility strategies towards improvement in the Falls Reduction Program.

Appendix C

Box 2

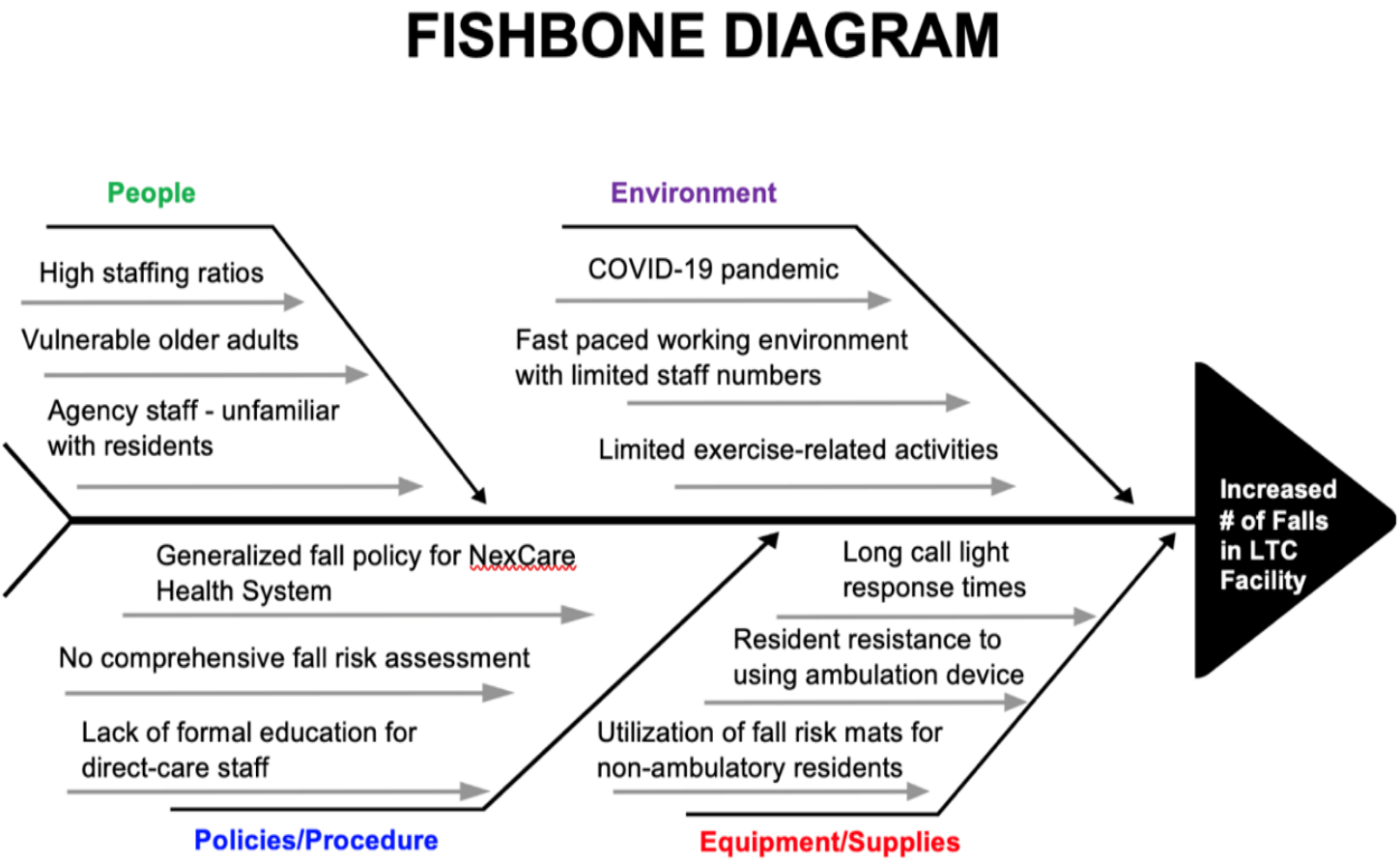
SWOT Analysis of Fall Prevention in LTC Facility

Internal	External
Strengths • Policy for pre-assessment of falls in place • Policy for post-falls currently in place • Interventions to prevent falls currently in place • Activities Department engages residents on a regular basis • PT/OT/ST on staff	**Opportunities** • Highly rated facility • Motivated, compassionate staff • Providing current staff with fall education could help improve understanding of falls & help with the implementation of proactive interventions to decrease the number of falls within the facility
Weaknesses • Policies regarding falls are generalized for NexCare System • Longer response times for call lights • Lack of staff training/education related to falls • No official post-fall assessment tool in place for HSC&RC • No official fall prevention interventions in place specifically for HSC&RC staff • Limited residential exercise-related activities • No screening tool being used to assess for fall risk, based on patient's history of falls	**Threats** • Short staffing • Agency staff new to the facility & residents • Resistant resident behaviors to using ambulation devices or seeking assistance when needed

Appendix D

Figure 3

Fishbone Diagram



Appendix E

Table 3

Literature Review

Citation & Search Terms	Design, Level of Evidence & Purpose	Sample	Team Based Intervention	Measurement: Variables & Instruments	Findings	Strengths/Limitations
Abusalem, S., Polivka, B., Coty, M. B., Crawford, T. N., Furman, C. D., & Alaradi, M. (2021). The relationship between culture of safety and rate of adverse events in long-term care facilities. *Journal of Patient Safety, 17*(4), 299–304. https://doi.org/10.1097/PTS.0000000000000587 Search terms: Falls AND safety AND long-term care	IV	Cross-sectional survey used data from 13 dimensions of culture of safety from five long term care facilities (LTCFs) in Louisville, Kentucky. Nursing staff, administration, management, and rehabilitation staff support were surveyed, N=252. Secondary data related to falls from the selected facilities during quarters 1-3 in 2014 were obtained by CMS in February 2015.		CMSs' Nursing Home data sets were used for the 5 LTCFs for four previous quarters in February 2015. The AHRQ's Nursing Home Survey on Patient/Resident Safety Culture assessed the LTCFs' Cronbach's α values as well as their safety culture.	High falls rates were due to lower level of teamwork, handoffs, and education. Fall risks increased as the number of residents per facility increased (rate ratio [RR] = 1.02; 95% confidence interval [CI] = 1.01–1.02) and as the number of LPN hours per resident increased (RR = 37.7, 95% CI = 18.5–76.50). Increased culture of safety scores were associated with decreased fall risks, extended stay UTIs, and short stay ulcers. A higher number of RNs and LPN staffed per resident/day,	Strengths: This study highlighted the background/practical experience of RNs versus LPNs is a critical factor that contributes to increased risk of falls in LTC. Data revealed the importance of relationships between person-centered culture of safety measurement, quality improvement, and workforce issues. Limitations: The study did not contain information about families, visitors, or residents. Generalizability was limited because data

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					decreased the rate of falls.	was only obtained in Louisville, KY. Only data from five urban LTCFs were used.
Acosta, D. J., Rinfret, A. R., Plant, J., & Hsu, A. T. (2022). Using patient simulation to promote best practices in fall prevention and post-fall assessment in nursing homes. *Journal of Nursing Care Quality*, *37*(2), 117–122. https://doi-org.proxy1.cl.msu.edu/10.1097/NCQ.0000000000000599 Simulation based learning Search terms: older adults or elderly or seniors or geriatrics AND falls prevention or preventing falls or prevent	VI	From July-December 2019, 27 simulations were conducted in 13 different nursing home units in Ontario, Canada. N=94, but only 69 of 94 participants responded for the post-simulation survey.	Patient simulation of a resident falling (falling simulation program)	Quantitative study using mixed-methods to evaluate participants' experiences using the falling simulation program in an interprofessional setting. Survey captured data from open-ended responses and applied Analysis of Likert. Internal audits were also conducted found differences in practice regarding staff's response to a resident fall and how they identified contributing factors related to the fall. The simulation-based education activity included a pre-brief, fall simulation, and a debrief.	Participants supported simulation-based learning. > 80% of participants stated they would utilize the learning. High value was placed on post-fall huddles and fall risk assessments. 69 survey responses were gathered, and 98.5% had a good (20.6%) or very good (77.9%) opinion of the simulation.	Strengths: reinforced the importance of interdisciplinary team approach to post fall huddles and fall risk assessments. A prior audit also helped identify staff responses to falls in the nursing home. Limitations: quantitative audits limit the details needed to enhance fall interventions.

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Azkia, Z., Setiyani, R., & Kusumawardani, L. H. (2021). Balance strategy exercise versus lower limb-ROM exercise for reducing the risk of falls among older people. *Nurse Media Journal of Nursing*, *11*(1), 114–123. https://doi-org.proxy1.cl.msu.edu/10.14710/nmjn.v11i1.33229	III	N= 30 OAs Sample included two LTC facilities in Central Java Province, Indonesia from January-March 2019.	Assessing whether Balance Strategy Exercise (BSE) or Lower Limb-Range of Motion (ROM) exercises have better fall reduction outcomes for OAs.	Quasi-experimental study that used a pre-post design and no control group. Cluster randomization strategies assigned OAs into either BSE or Lower-Limb ROM groups. Interventions were implemented three days per week over a three-week period, in 30 minute intervals. Timed Up and Go (TUG) test measured fall risk. Data analysis was performed using paired t-test, Wilcoxon and Mann-Whitney U-test.	Major improvements were noted in TUG scores pre/post intervention, BSE (p=0.001) and Lower Limb-ROM groups (p=0.001). OAs that participated in Lower Limb-ROM had an even larger decrease in TUG scores compared to the BSE group (p=0.008).	OAs in LTC could benefit from exercise related interventions, such as BSE and Lower Limb-ROM to decrease their risk, but Lower Limb-ROM was preferred. Limitations: the interventions were in groups, so the overseeing researchers were unable to see if every resident did the interventions properly. Small sample size was used because of various recruitment barriers during the COVID-19. Also, two treatment groups were used.
Baixinho, C. L., & Dixe, M. (2020). Practices of caregivers when evaluating the risk of falls in the admission of older	III	Sample was comprised of only female caregivers from six different nursing homes, with an average age of 47.02±10.3, and a work	Evaluating the Scale for Practices of Identification of Fall Risk Factors	Data included pretests, reformulation, application, and validation.	Fall risks due to altered gait and balance had higher significance when	Highlighted the usefulness of the validated scale in the first days after admission.

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adults to nursing homes. *Dementia & Neuropsychologia, 14*(4), 379–386. https://doi.org/10.1590/1980-57642020dn14-040008		history of 12.1±8.35 years caring for OAs in LTC facilities. Methodological study & literature review. N=152.	during admission process for OAs in LTC.	21 indicators analyzed using the 5-point Likert scale with 5 options per question. Reliability was tested to determine the Cronbach's alpha coefficient.	compared to cognition. Response rate was 65.52% which represented good properties (α=0.913) to determine fall risks during the admission process of OAs. Caregivers that had more education and training had better outcomes as well.	Limitations: the selected sample did not allow generalized results. How the instrument was administered, its type, and duration of use could have led to socially desirable responses.
Chen, W. C., Li, Y. T., Tung, T. H., Chen, C., & Tsai, C. Y. (2021). The relationship between falling and fear of falling among community-dwelling elderly. *Medicine, 100*(26), e26492. https://doi.org/10.1097/MD.0000000000026492 Search terms: elderly OR older adult AND fall prevention AND long-term care	IV	Sample included the United States' National Health and Aging Trends Study's (NHATS) data on 5559 OAs in 2017. n=5559.	Regression analyses were used to identify causes of fear of falling via NHATS responses.	Chi-Squared tests analyzed bivariate correlations. Model 1 was centered on demographics and Model 2 encompassed medical conditions, depression and memory impairments, as well as ability to perform ADLs. Statistical Package for Social Sciences was used to determine significance.	48.8% of OAs that had a fall in the past 12 months had a FOF and 46.8% had a recent fall in the past 30 days. In Model 1, FOF was linked to history of falls within the last 30 days (OR = 2.29, 95% CI: 1.78–2.95) or during the previous year (OR = 2.60, 95% CI: 2.16–3.14). Additional factors: advanced age, high ADL/IADL scores,	Results are applicable to any OA with history of falls within the past year. Caregivers should note that FOF can continue 12 months post-falling. Limitations: No data was provided for environmental factors that contribute to FOF. Data did not explicitly link falling and FOF.

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					female sex, and chronic conditions. Model 2 showed how the correlation of age, gender, chronic disease, and fall history as contributing factors to FOF.	Data did not include OAs in hospitals or nursing homes. Survey had only one question to assess outcomes. NHATS data is susceptible to error and bias.
Courel-Ibáñez, J., Buendía-Romero, Á., Pallarés, J. G., García-Conesa, S., Martínez-Cava, A., & Izquierdo, M. (2022). Impact of tailored multicomponent exercise for preventing weakness and falls on nursing home residents' functional capacity. *Journal of the American Medical Directors Association, 23*(1), 98–104.e3. https://doi.org/10.1016/j.jamda.2021.05.037	II	Multicenter RCT conducted in Spain. Sample included 24 institutionalized OAs (87.1 ± 7.1 years, 58.3% women) with history of sarcopenia.	Vivifrail-multicomponent exercise program for OAs. Group 1: Long Training-Short Detraining group consisting of 24 weeks of Vivifrail training then 6 weeks of detraining Group 2: Short Training-Long Detraining group consisting of 4 weeks of training then 14 weeks of detraining.	functional capacity and strength were assessed pre and post intervention. Initial screening: X-ray, to determine bone mineral density as well as Mini Nutritional Assessment (MNA). Disability was assessed using Barthel index and IADLs were assessed using Lawton index. FOF was assessed with the Falls Efficacy Scale International.	After 4 weeks, Vivifrail significantly helped improve function and strength performance (effect size = 0.32-1.44, P < .044) without hand grip strength. Training for 24 weeks yielded 10% -20% additional effectiveness (P < .036). 36% of OAs had reversal in frailty, with 59% reporting high self-autonomy. Detraining led to a 10% -25% decline in strength and	Vivifrail training had ongoing positive impacts on those involved. The studied duration and frequency were recommended to safeguard OAs from further functional deterioration caused by sedentary lifestyle. Limitations: Did not evaluate 8–12-week intervention and detraining groups. Did not evaluate 4 week Vivifrail training with 14-week detraining in OAs with or without augmenting protein..

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				Cognitive impairment was assessed with Folstein's Mini Mental State Examination. Screening of sarcopenia was done with the SARC-F scale. Functional capacity was assessed using 5-sit-to-stand test, balance test, and TUG test. Isometric handgrip strength was measured with a digital dynamometer. Sit-to-stand speed was measured using a transducer.	functional capacity despite training for 24 weeks (effects size = 0.24-0.92, P < .039).	
Dautzenberg, L., Beglinger, S., Tsokani, S., Zevgiti, S., Raijmann, R. C. M. A., Rodondi, N., Scholten, R. J. P. M., Rutjes, A. W. S., Di Nisio, M., Emmelot, V. M., Tricco, A. C., Straus, S. E., Thomas, S., Bretagne, L., Knol, W., Mavridis, D., & Koek, H. L. (2021). Interventions	I	Systematic review & network meta-analysis of 220 RCTs. n = 104,638. 128 of the studies (58.2%), had an average age of 75-84 years. 11 studies (5.0%) had an average age of ≥85 years.	Comparison of single, multiple, and multifactorial fall prevention interventions in OAs.	Review of RCTs and quasi-RCTs from various databases until February 27, 2019, to evaluate fall prevention interventions for OAs. A post hoc analysis was completed in 2020 to include two	192 studies concluded that single interventions compared to standard care practices led to decreased falls: exercise (risk ratio [RR] 0.83; 95% confidence interval [CI] 0.77–0.89) and QI techniques including education	Limitations: Majority of studies had risk for bias due to blinding or incomplete outcomes. Authors could not distinguish between different intervention dosages, treatment duration,

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for preventing falls and fall related fractures in community-dwelling older adults: A systematic review and network meta-analysis. *Journal of the American Geriatrics Society*, *69*(10), 2973–2984. https://doi-org.proxy1.cl.msu.edu/10.1111/jgs.17375				RCTs published post data collection. Pairwise meta-analysis and network meta-analysis were completed.	of OAs (RR 0.90; 95% CI 0.83–0.98). Exercise alone decreased falls (RR 0.79; 95% CI 0.73–0.86). Multifactorial interventions including exercise, use of assistive technology, environmental modifications, QIs, and falls risk assessments were all linked to decreased fall rates (RR 0.87; 95% CI 0.80–0.95).	or lengths of follow-up durations. Software had limited ability to draw indirect comparisons.
Ferguson, C., & Mason, L. (2020). Inpatient falls prevention: state-wide survey to identify variability in Western Australian hospitals. *Australian Journal of Advanced Nursing*, *38*(1), 53–59. https://doi-org.proxy1.cl.msu.edu/10.37464/2020.381.296	VI	2,720 patients that had multi-day stays from acute and subacute floors from hospitals in Washington. A 17 day fall survey consisting of 20 hospitals that had ~40 acute/ subacute beds and if they provided care for public patients.	A survey was used to evaluate verbal instructions provided to patients, as well as determining completion of falls risk screening, and appropriate cognitive testing.	Qualitative and quantitative data was used. Prior admissions, diagnoses, and socio-economic status was gathered by the Australian Bureau of Statistics and hospital accessibility.	Data was collected from 2,720 patients. Verbal recall of fall prevention was recalled by 60% of responsive patients. 82% of patients had a completed falls risk screening.	Fall risk assessments were not conducted for every patient. A criteria review is needed to determine if changes need to be made to improve standard practice.

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				Multiple regression analysis was completed as well as odds ratios to compare outcomes against the reference hospital.	37% had proper cognitive testing. OAs and short stay patients did not have proper fall risk screening.	
Gulka, H. J., Patel, V., Arora, T., McArthur, C., & Iaboni, A. (2020). Efficacy and generalizability of falls prevention interventions in nursing homes: A systematic review and meta-analysis. *Journal of the American Medical Directors Association, 21*(8), 1024–1035.e4. https://doi.org/10.1016/j.jamda.2019.11.012	I	n = 30,057. Participants resided in nursing homes (NH) that provided 24-hour monitoring, and care for OAs over the age of 65.	Single, multiple, or multifactorial fall prevention interventions were used.	Systematic review & meta-analysis to evaluate fall prevention interventions was completed using several databases from September 2013 to April 11, 2019. 36 RCTs or cluster RCTs that were 6-months in duration, had an intervention and follow-up, and monitored of falls for the duration of intervention or post-intervention with z scores, p-values, and CIs.	Fall prevention interventions decreased fall numbers (RR) = 0.73, 95% CI= 0.60-0.88], fallers (RR = 0.80, 95% CI = 0.72-0.89), and repeat fallers (RR = 0.70, 95% CI = 0.60-0.81). Single interventions drastically decreased falls as well (RR = 0.78, 95% CI = 0.69-0.89) and repeat fallers (RR = 0.60, 95% CI = 0.52-0.70), while multifactorial interventions decreased falls (RR = 0.69, 95% CI = 0.39-0.97) and multifactorial interventions reduced number of falls (RR =	Limitations: Variability between studies detailing OAs' cognitive status led to estimates without prevalence for dementia. Studies were completed in 12 different countries so there is variability in care and resources.

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					0.65, 95% CI = 0.45-0.94). Exercise decreased falls by 36% and repeat falls by 41%. Education of staff was also shown to be effective.	
Holt, M. F., & Testerman, G. M. (2022). Midlevel providers focusing on geriatrics improve care and outcomes of fall-related injuries among the elderly. *American Surgeon*, *88*(3), 360–363. https://doi-org.proxy1.cl.msu.edu/10.1177/00031348211050821	VI	IRB-approved rural trauma registry reviewed OAs admitted with fall-related injuries from 2018 through 2020. N=327 patients.	None	Trauma registry review of 327 fall injuries at a rural trauma facility 1 year pre and post trauma to assess the role of demographics, chronic disease, and medication impact on outcomes. T-test and regression analysis were used.	Advanced age and use of anticoagulants led to longer visits and increased mortality (both P < .05). Mortality rates (P = .01) and OAs' functional level of independence on discharge improved when hospital length of stay decreased (both with P < .05).	Limitations: small sample size.
Hood, J., & Sharrah, M. L. (2022). Functional reach and gait speed improvement in a matter of balance participants. *Journal of Trauma Nursing*, *29*(1), 5–11. https://doi-	III	N=120 OAs. Average age of 78; mostly Caucasian (116/120; 96.7%).	A Matter of Balance program was implemented to evaluate functional reach and gait speed of OAs.	Functional Reach test and TUG test were utilized for measurement. Home visits were conducted, and participants were	Average functional reach improved by 0.6 inches (SD = 2.21, p = .002; d = 0.2). Falls decreased in the initial three months (p=0.002).	Study supported use of MOB to improve physical outcomes. Limitations: limited diversity across all demographics which

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org.proxy1.cl.msu.edu/10.1097/jtn.0000000000000625				tracked for 6 months. Comparisons of the pre- and post-intervention were measured using the one-tailed paired t test. Comparisons of OAs who improved versus OAs that did not was measured using two-tailed independent-samples t tests and two-tailed Pearson's $\chi 2$.	Median gait speed was reduced by 1.25 seconds. Median TUG speed was 11.9 seconds pre-intervention and10.65 seconds post-intervention. A -10.5% mean change in TUG scores was noted from pre- to post intervention.	limited generalizability. Convenience sampling was used, eliminating a control group. Also, OAs volunteered for the study.
Huey-Ming Tzeng, Jansen, L. S., Okpalauwaekwe, U., Khasnabish, S., Andreas, B., & Dykes, P. C. (2021). Adopting the fall tailoring interventions for patient safety (TIPS) program to engage older adults in fall prevention in a nursing home. *Journal of Nursing Care Quality*, *36*(4), 327–332. https://doi-org.proxy1.cl.msu.edu/10.1097/NCQ.0000000000000547	VI	Sample site was a government funded NH with 15-beds on a subacute care unit.	The Fall TIPS 3-step program was used to evaluate its efficacy for fall prevention. Staff members were trained on engaging patients in their care, conducting a proper fall risk assessment using and followed interactive case studies.	Qualitative data was gathered from the focus group discussions and one-on-one interviews with OAs and their families. Data was entered into a Word file, for thorough content analysis. Quantitative data was placed in the Statistical Package for the Social Sciences file for descriptive analyses.	Average fall rates and fall related injuries per 1000 resident days decreased post-intervention.	High staff turnover created difficulties in completing the study results. Limitations: small sample size, narrow focus on fall rates, and limited statistics.

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Iuliano, S., Poon, S., Robbins, J., Bui, M., Wang, X., De Groot, L., Van Loan, M., Zadeh, A. G., Nguyen, T., & Seeman, E. (2021). Effect of dietary sources of calcium and protein on hip fractures and falls in older adults in residential care: cluster randomised controlled trial. *BMJ (Clinical research ed.), 375,* n2364. https://doi.org/10.1136/bmj.n2364	II	N=7195 Sample was composed of permanent residents in 60 LTC facilities in Australia (4920 (68%) female; mean age 86.0).	OAs in LTC facilities were supplemented with 562mg of calcium found in various dairy products as well as 12g of protein. Daily intake of calcium increased to 1142 (353) mg and protein increased to 69 (15) g. Control group: were facilities that kept using their standard menus which included 700 (247) mg of daily calcium and 58 (14) g of daily protein.	Results were expressed using a hazard ratio with 95% CI. "Coxme" package helped estimate parameters and Fine-Gray sub-distribution estimated mortality risk analysis. All analytical tools used R Statistical Environment.	Analysis of data came from 27 facilities that participated as the intervention group and 29 facilities that represented the control group. 324 fractures (135 hip fractures), 4302 falls, and 1974 deaths occurred during the study. Supplementation was linked to RR of 33% for fractures (121 v 203; hazard ratio 0.67, 95% confidence interval 0.48 to 0.93; P=0.02), 46% for hip fractures (42 v 93; 0.54, 0.35 to 0.83; P=0.005), and 11% for falls (1879 v 2423; 0.89, 0.78 to 0.98; P=0.04).	Limitations: Poor follow up; <50% of OAs had long-term follow-up sessions. 716 participants consented to being analyzed for causes of secondary osteoporosis, rather than the entire sample size. Intervention only used whole dairy products; therefore, benefits of other dairy products cannot be generalized.

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					There was a significant RR at five months for hip fractures and falls (P=0.02) as well as at 3-months (P=0.004). Mortality remained the same (900 v 1074; hazard ratio 1.01, 0.43 to 3.08).	
Kim, D., Chang, C., & Margrett, J. (2021). Understanding older adults' perception and usage of indoor lighting in independent senior living. HERD, 14(3), 215–228. https://doi.org/10.1177/1937586720988616	VI	Sample included 57 OA residents living independently in the Midwest	Evaluate lighting and OAs' perception of lighting.	Independent t tests were used to differentiate between FOF and lighting satisfaction. Paired-sample t tests helped identify differences in normal light levels and maximum lighting. T tests were also used to identify differences in FOF in OAs with visual impairments (n = 32) and OAs without impairments (n = 25).	T test showed noticeable changes in overall FOF when comparing the visual impairment group to OAs without impairment (t = 2.81, df = 1, p = .007), for the visually impaired OAs (M = 3.31, SD = 1.33) voicing more concerns (M = 2.32, SD = 1.31).	Small sample size.

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Ling, Y., Xu, F., Xia, X., Dai, D., Xiong, A., Sun, R., Qiu, L., & Xie, Z. (2021). Vitamin D supplementation reduces the risk of fall in the vitamin D deficient elderly: An updated meta-analysis. *Clinical Nutrition*, *40*(11), 5531–5537. https://doi-org.proxy1.cl.msu.edu/10.1016/j.clnu.2021.09.031	V	31 studies including 57, 867 OA participants. 17, 623 falls were added in the meta-analysis. 21 RCTs on vitamin D supplementation as monotherapy and 10 RCTs on vitamin D plus calcium were also a part of the meta-analysis.	Vitamin D Supplementation vs. Vitamin D with calcium supplementation	Systematic review of using multiple databases from inception through September 2020 along with a meta-analysis using PROSPERO were used to determine the interventions' efficacy on falls in OAs. I^2 test assessed statistical heterogeneity. A qualitative visual estimate using funnel plot, Begg's test, and Egger's tests helped to identify potential bias.	Meta-analysis showed that vitamin D as monotherapy did not decrease fall risks [RR] 1.00, 95% confidence intervals [CI] 0.95 to 1.05) when compared to no treatment in 21 of the RCTs. The other 10 RCTs using vitamin D with calcium showed 12% decrease in fall risks (RR 0.88, 95% CI 0.80 to 0.97).	Limitations: Bias may have been introduced in data obtained differently for falls in different studies. Studies used different methods to measure 25(OH)D levels in OAs.
Lytras, D., Sykaras, E., Iakovidis, P., Kasimis, K., Myrogiannis, I., & Kottaras, A. (2022). Recording of falls in elderly fallers in Northern Greece and evaluation of aging health-related factors and environmental safety associated with	IV	N= 150 OA fallers. 15 selected Open Care Centers for the Elderly in 5 different cities throughout Central Macedonia, Greece.	To identify intrinsic and extrinsic fall risk factors in OAs.	Cross-sectional study	Majority of the falls happened at home, notably in the bedroom and bathroom. >60% occurred at night	Study took place during the COVID-19 pandemic so there were long closures in the country.

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falls: A cross-sectional study. *Occupational Therapy International, 2022 (1),* 1–11. https://doi-org.proxy1.cl.msu.edu/10.1155/2022/9292673					~40% of OAs reported improper lighting or visual impairments as contributing factors. Decreased functional performance in the FICSIT-4 test and TUG test, with noted increases in scores for provided questionnaires and abbreviated FES-1 showed a direct correlation with higher falls.	
Meimandi, M., Fadavi-Ghaffari, M., Taghizadeh, G., Azad, A., & Lajevardi, L. (2021). Falls efficacy scale and single item question: Screening accuracy for older adults residing in nursing homes. *Clinical gerontologist, 44*(5), 544–551. https://doi.org/10.1080/07317115.2020.1858467	IV	100 OA residents (aged 60-87) of two nursing homes in Tehran, Iran (males: N = 63 and female N=37) were analyzed from July to December 2017.	Comparison of falls efficacy scale-international (FES-I), Falls efficacy scale (FES), and Single item question (SIQ) in identifying FOF.	Cross-sectional study observed the correlation between FES-I, FES, and SIQ questionnaires in determining FOF. Area Under the Curve measured efficiency of FES and SIQ by using their FOF score. A logistic regression analysis measured FOF using FES-I scores as an outcome	FES is a better at identifying FOF in OAs when compared to SIQ.	Only OAs that could walk 10 meters and stand for 90 seconds were included; therefore, data is nor generalizable to less functional OAs. Also, participants of this study had no cognitive impairments.

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				along with FES and SIQ scores.		
Ožić, S., Vasiljev, V., Ivković, V., Bilajac, L., & Rukavina, T. (2020). Interventions aimed at loneliness and fall prevention reduce frailty in elderly urban population. *Medicine*, *99*(8), 1–8. https://doi-org.proxy1.cl.msu.edu/10.1097/MD.0000000000019145	III	410 OAs aged 75 to 95.	Study used 2 interventions: (1) determining fall risks in OAs and eliminating them, and (2) twice weekly exercise.	Frailty was measured using Tilburg Frailty Indicator (TFI) survey and ADL-related questionnaires.	There was a drastic increase in frailty noted in the control group after a year ($r = -0.11$), but the intervention group's frailty did not (both $P > .05$).	Small sample size.
Pavana, Smrithi A., Pruthviraj. R., & Ngilyang Mica. (2020). Effect of footwear on balance and fall risk of elderly individuals in selected old age homes. *Indian Journal of Physiotherapy & Occupational Therapy*, *14*(3), 164–170. https://doi-		n= 80 recruited OAs. Functional reach test =40 OAs Berg balance test = 40 OAs	To measure the impact of footwear in relation to balance and fall risk in OAs.	Scores from the two tests were analyzed including mean and standard deviation. Whitney test was used for further analysis.	Asymptotic Z-value was 7.852 with P value of $p<0.001$ revealing that OAs with proper footwear were better equipped to remain balance compared to OAs with improper footwear.	Limitations: small sample size and unequal distribution of genders.

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org.proxy1.cl.msu.edu/10.37506/ijpot.v14i3.9688						
Prevettoni, M. A., Guenzelovich, T., Zozaya, M. E., Giardini, G., Hornstein, L., Schapira, M., Giber, F., Quintar, E., & Perman, G. (2021). Decreased falls through multifactorial intervention in frail older adults. Journal of the Faculty of Medical Sciences of Cordoba, 78(2), 166–170. https://doi.org/10.31053/1853.0605.v78.n2.27832	III	N=108 frail OAs residing in Buenos Aires, Argentina aged ≥65 years. Mean age of 85.2 years, with women accounting for 79.6%. Severe/total dependence of the sample was 56.8% and increased fall risk made of 79.6% of the total sample. Dementia accounted for 29.6%, 30.5% were institutionalized, and 82.4% had polypharmacy.	Multifactorial intervention: organization of patient care, caregiver education, medication reconciliation, risk detection, interventions for adequate feeding and hydration, environmental safety, counseling on appropriate footwear and assistive devices, and strengthening exercises.	Quasi-experimental study. Data was collected through an in-depth interview and validated questionnaires, which were recorded in the EHR. Data was compared using the McNemar test.	Pre-intervention: 33.3% fell within the past 30 days (95% CI 25.2-42.7); post-intervention was 13.9%. Pre-intervention fall rates were 50/100 OAs (SD 87); post-intervention it was 11/100 OAs (SD 34), $p < 0.001$. Findings revealed a notable reduction of OAs falls of 41.7%, and fall rate decrease of 78% using the multifactorial approach.	Criteria of frailty can be subjective.
Schoberer, D., & Breimaier, H. E. (2020). Meta-analysis and GRADE profiles of exercise interventions for falls prevention in long-term care facilities. *Journal of Advanced*	I	Systematic literature & meta-analysis of RCTS.	Review of exercise interventions that can be used for fall prevention.	Data was analyzed from 2007-2018 to identify exercise-related interventions to decrease falls for OAs residing in LTC.	Exercises centered around balance or utilizing technical devices helped decrease falls in OAs, especially when the interventions were utilized >6 months in	Frailty was likely underreported in some studies.

Citation & Search Terms	Design, Level of Evidence & Purpose	Sample	Team Based Intervention	Measurement: Variables & Instruments	Findings	Strengths/Limitations
Nursing, 76(1), 121–134. https://doi-org.proxy1.cl.msu.edu/10.1111/jan.14238					duration. These interventions had the opposite effect on frail OAs.	
Senderovich, H., Bayeva, N., Montagnese, B., & Yendamuri, A. (2021). Managing fall prevention through exercise in older adults afflicted by cognitive and strength impairment. *Dementia and geriatric cognitive disorders, 50(6)*, 507–518. https://doi.org/10.1159/000521140	I	Systematic review & meta-analysis included 19 RCT studies comprised of OAs OAs in high-risk communities/nursing homes.	Exercises	Multiple databases were used between 1990-2018 to identify the 19 RCTs involving exercise-related fall prevention strategies for OAs.	Balance exercise training improved balance and falls by month 6 and 12 of the study. Balance improved ($p < 0.0001$) as well as gait by the 12th month of the study ($p < 0.0001$) specifically in OAs with cognitive impairments.	Sample included cognitively impaired OAs; therefore, it cannot be generalized.
Tricco, A. C., Thomas, S. M., Veroniki, A. A., Hamid, J. S., Cogo, E., Strifler, L., Khan, P. A., Sibley, K. M., Robson, R., MacDonald, H., Riva, J. J., Thavorn, K., Wilson, C., Holroyd-Leduc, J., Kerr, G. D., Feldman, F., Majumdar, S. R., Jaglal, S. B., Hui, W., & Straus, S. E. (2019). Quality improvement strategies to prevent falls in older	I	Systematic review and network meta-analysis of 126 RCTs involving 84,307 OAs.	Modifying the structure of the primary health care team.	Multiple databases were used to determine the most efficacious fall prevention approaches. Two investigators analyzed available data and appraised risk of bias independently.	Team changes were significant in decreasing fall related injuries compared to standard care (odds ratio [OR] 0.57 [0.33 to 0.99]; absolute risk difference [ARD] -0.11 [95% CI, -0.18 to -0.002]). Data from 61 RCTs including 40,128 OAs supported case	Two investigators screened studies.

Citation & Search Terms	Design, Level of Evidence & Purpose	Sample	Team Based Intervention	Measurement: Variables & Instruments	Findings	Strengths/Limitations
adults: A systematic review and network meta-analysis. *Age and ageing,* 48(3), 337–346. https://doi.org/10.1093/ageing/afy219					management, patient reminders, and staff education (OR 0.18 [0.07 to 0.47]; ARD -0.27 [95% CI, -0.33 to -0.15]) as successful interventions compared to usual care.	
Valatka, R., Krizo, J., & Mallat, A. (2021). A survey-based assessment of "Matter of Balance" participant fall-related experience. *Journal of Trauma Nursing*, *28*(5), 304–309. https://doi-org.proxy1.cl.msu.edu/10.1097/jtn.0000000000000602	VI	N=40 40 OAs attending the Matter of Balance Program between March 2019- March 2020.	A Matter of Balance program	Single group pre/post test questionnaires were distributed amongst OA attendees of the program to assess their opinions of the program as well as how it impacted their fall history, and personal habits. Wilcoxon test was used for data comparison.	29 participants (73%) finished the pre-/post-survey. Of OAs that experienced falls before the course, 75% noted a decrease in falls. 71% of those who initially reported FOF, reported a reduction in FOF after the course.	Small sample size with OA volunteers.
Wang, K. N., Tan, E. C. K., Ilomäki, J., Gilmartin-Thomas, J. F. M., Sluggett, J. K., Cooper, T., Robson, L., & Bell, J. S. (2021). What is the best definition of	IV	383 OAs across 6 different Australian nursing home/LTC facilities.	Medication review	A 2 year prospective cohort study.	77.5% of OAs were female, with average age of 87.5 (standard deviation = 6.2). The average total of medications per OA	Took place in Australia, cannot be generalized to other countries.

Citation & Search Terms	Design, Level of Evidence & Purpose	Sample	Team Based Intervention	Measurement: Variables & Instruments	Findings	Strengths/Limitations
polypharmacy for predicting falls, hospitalizations, and mortality in long-term care facilities? *Journal of the American Medical Directors Association*, *22*(2), 470–471. https://doi-org.proxy1.cl.msu.edu/10.1016/j.jamda.2020.10.040					was 10.0 (standard deviation = 4.1). Mean rates of all-cause hospitalizations = 2.6 per 1000 resident-days, fall-related hospitalizations = 0.4, and falls per resident 4.7. Mortality rate was 38.4% or n=147. Cut points for all hospitalizations were 11.5 medications while fall-related hospitalization, had 9.5 regular medications.	
Yu Ming, Zecevic, A. A., Hunter, S. W., Wenxin Miao, & Tirona, R. G. (2021). Medication review in preventing older adults' fall-related injury: A systematic review & meta-analysis. *Canadian Geriatrics Journal*, *24*(3), 237–250. https://doi-	I	Fourteen RCTs	Medication reviews	Two reviewers analyzed RCTs found in PubMed, EMBASE, Scopus, and CINAHL. Meta-analyses was used for data similarities.	Using medication reviews as a single intervention helped prevent fall-related injuries in OAs (Risk Difference [RD] = -0.06, 95% CI: [-0.11, -0.00], I2 = 61%, p = .04).	Only two reviewers conducted the search.

Citation & Search Terms	Design, Level of Evidence & Purpose	Sample	Team Based Intervention	Measurement: Variables & Instruments	Findings	Strengths/Limitations
org.proxy1.cl.msu.edu/10.5770/cgj.24.478					Additionally, medication reviews helped decrease fall-related fractures (RD = -0.02, 95% CI: [-0.04, -0.01], I2 = 0%, p = .01).	
Zubkoff, L., Neily, J., Delanko, V., Young-Xu, Y., Boar, S., Bulat, T., & Mills, P. D. (2019). How to prevent falls and fall-related injuries: A virtual breakthrough series collaborative in long term care. *Physical & Occupational Therapy in Geriatrics*, *37*(4), 234–246. https://doi-org.proxy1.cl.msu.edu/10.1080/02703181.2019.1636923	III	27 state veteran homes.	Post-fall huddles, education of staff members, and utilization of intentional rounding.	Data was gathered for 6 months to account for outcomes pre-, intra-, and post-intervention using a Poisson regression model.	Fall related injury rates decreased from 7.4 (pre-) to 6.6 intra, (p = 0.009) and 5.6 post-intervention (p = 0.005). Minor injury rate decreased from 6.4 throughout the intervention to 5.8 (p = 0.000) post-intervention. There was no statistically significant decrease in total fall rates or major injury rates.	Participants volunteered, so selection bias is possible.

Appendix F

Pre/Post-Intervention Knowledge Assessment

Correct answers marked with *

Q1 Which of the following are risk factors for falls in the older adult?

A) Fear of falling

B) Confusion/cognitive impairment

C) Poor coordination/balance

D) All of the above *

Q2 What are interventions that can help decrease falls in older adults?

A) Assisting with frequent ambulation and exercise to maintain function *

B) Ignore call lights

C) Assisting with toileting only in the morning

D) Keeping all personal belongings away from the bedside

Q3 True or false. If a resident has a fall, they are at a lower risk of having another fall.

A) True

B) False *

Q4 True or false. Fall risk assessments should only be done after a resident falls.

A) True

B) False *

Q5 True or false. Pain medications, mental health medications, and seizure medications can cause a resident to fall.

A) True *

B) False

Q6 Do you know where Holt's fall policy is located?

A) No

B) Yes *

Q7 Where do the majority of falls take place at this facility?

A) In the resident's bathroom
B) In the dining room
C) In the resident's bedroom *
D) In the hallway

Q8 What is the definition of a fall?

A) When someone loses consciousness and comes to rest on the ground
B) When someone suddenly and involuntarily comes to rest on the ground with or without loss of consciousness *
C) When someone loses balance and almost hits the ground
D) When someone voluntarily comes to rest on the ground

Q9 True or false. As the body ages, muscles become stiffer and bones become more brittle, which increases the risk of fall related injuries.

A) True *
B) False

Q10 Which of the following is one of the first steps that should be taken in the event of a residential fall?

A) Leave the resident and call nursing administration
B) Call 911 immediately
C) Assess the resident *
D) Help the resident off the ground

Appendix G

Figure 4

5 Whys

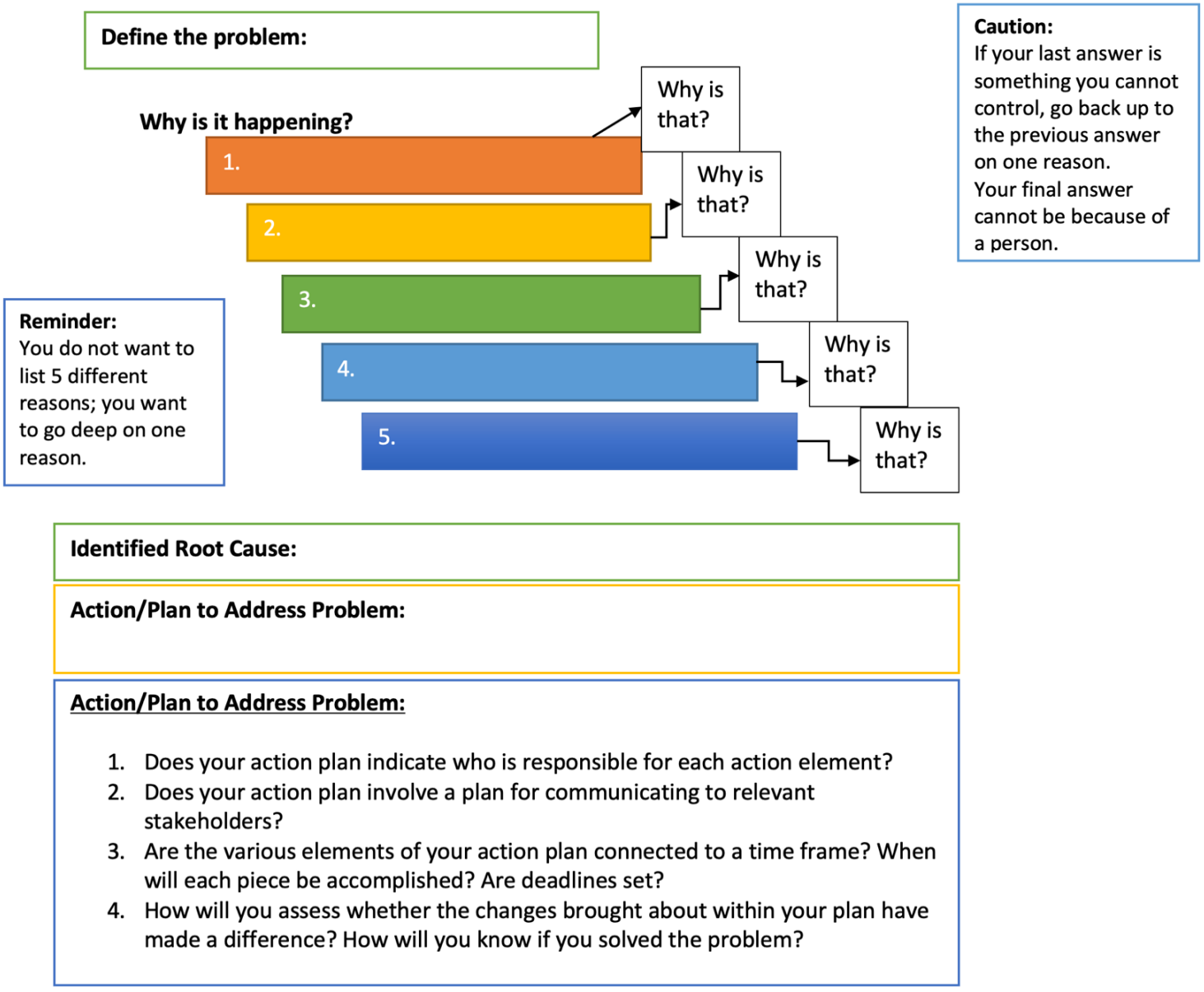


Figure adapted from the State of Michigan. (n.d.) 5-Whys Guide & Template. https://www.michigan.gov/-media/Project/Websites/mde/Year/2020/04/02/5_Whys_Worksheet.pdf?rev=1b003b15440b4394acc0936df7970f4d

Appendix H

Figure 5

Facility Agreement Letter

HOLT
Senior Care & Rehab Center

Date: August 8, 2022

To the Michigan State University College of Nursing:

I am familiar with the quality improvement project being conducted by Lauren Adams and Chelsea Richard entitled "*Evaluating Utilization and Effectiveness of Evidence-Based Interventions for Fall Prevention in Long-Term Care*", I understand that Holt Senior Care & Rehab Center involvement will include the mentorship of the above-named students and will require the application of the proposed process including: reviewing our current processes and/or practice, accessing records for review, protocols and practices related to the project, participation in improvement team meetings, educating staff, access to benchmark and performance data, revising current policy/procedures related to this can add additional information here as pertinent and education of staff or providers impacted by the development of the project.

I have read the project's proposal and am comfortable with the project as describe being conducted at our institution. I understand that this project will be carried out following sound, ethical principles. As they nursing home administrator, I give permission for the students to disseminate project data and outcomes at Michigan State University College of Nursing for the purpose of academic course completion and any other place they would approve of dissemination such as department meetings etc. Therefore, as a representative of the Holt Senior Care & Rehab Center, I agree that Lauren and Chelsea evidence-based project may be conducted at our institution.

Sincerely,

Marie Patrick

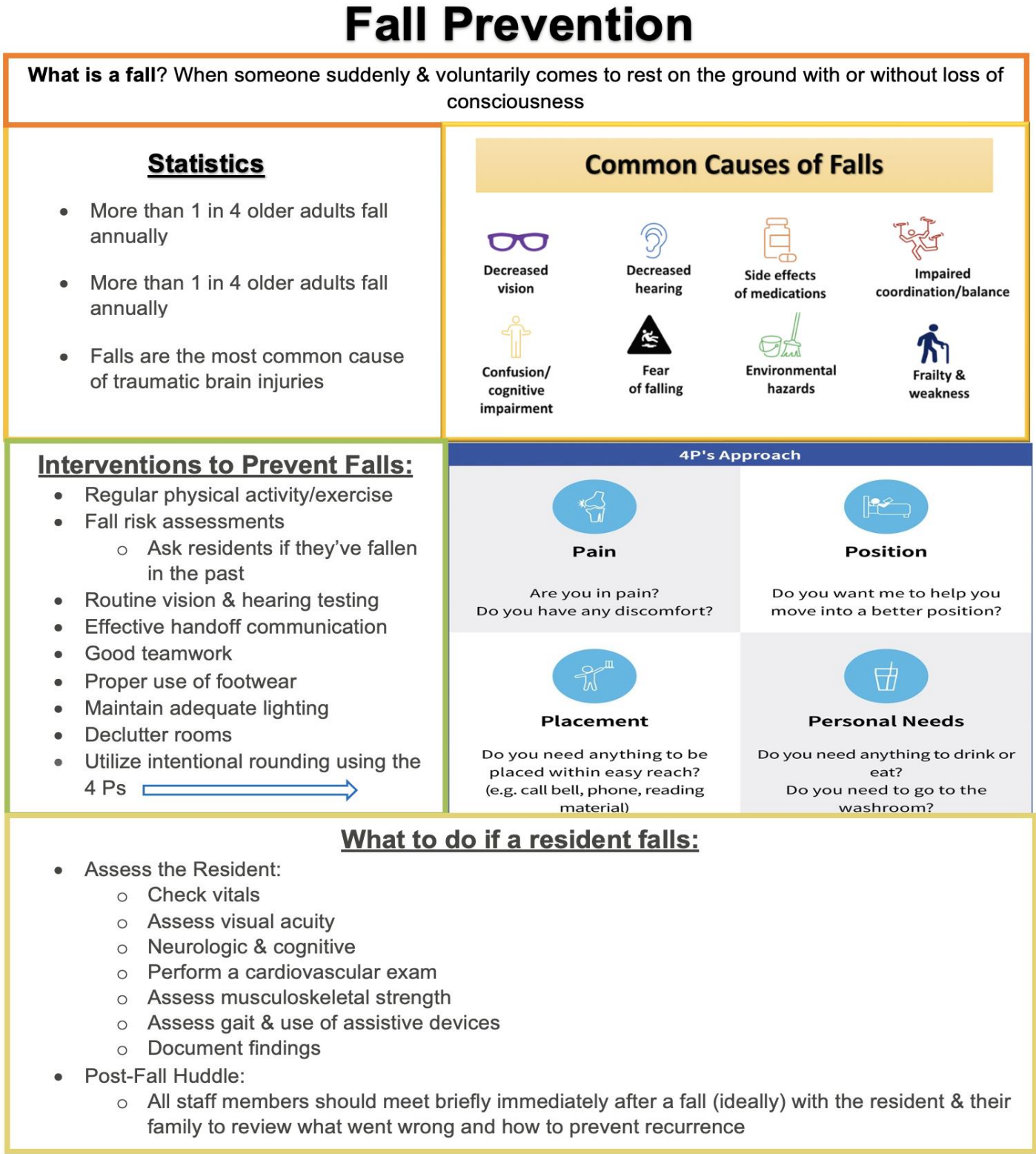
Marie Patrick, RN, Administrator

5091 Willoughby Road • Holt, Michigan 48842 • 517-694-2144 • Fax: 517-694-7469

Appendix I

Figure 6

Fall Prevention Han



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Centers for Disease Control and Prevention. (2021, August 6). *Facts about falls.* https://www.cdc.gov/falls/facts.html
Centers for Disease Control and Prevention. (2020, July 9). *Older adult falls data.* https://www.cdc.gov/falls/data/index.html
Centre for Effective Practice. (2016). *Falls prevention supplementation for care staff.* https://cep.health/media/uploaded/CEP_Falls_Prevention_Discussion_Guide_2016.pdf

Appendix J

Table 4

Timeline of QI Project Using GANNT Format

Project Task	5/22	6/22	7/22	8/22	9/22	10/22	11/22	12/22	1/23	2/23	3/23	4/23
Communication with community partner												
Advisor Meeting												
Problem Statement Development												
Project Proposal Draft 1-2 (problem statement)												
Project Proposal Draft 3-4 (Literature Review, Gap Analysis)												
Project Proposal 5-6 (Fishbone Analysis, Conceptual Framework, Outcome Measures/methods)												
Project Proposal 7-8 (GANNT, Budget, Conclusions)												
IRB Application												
Intervention development												
Education and survey implementation												
Data Analysis												
Finalization of Proposal												
Proposal Defense/Dissemination												

Appendix K

Table 5

Fall Data Report by Year

CATEGORY		DATES			
		2019	**2020**	**2021**	**2022**
# of fall incidents		173	39	47	268
# of residents sent to hospital		3	1	1	2
Location of fall	**Resident's room**	121	28	28	204
	Resident's bathroom	14	3	9	27
	Hallway	15	7	3	11
	Outside	2	0	0	2
	Dining Room	5	0	3	7
	While on LOA	3	0	0	3
	Nursing station	8	0	1	3
	Lounge	1	0	0	0
	Activity room	1	0	0	0
	Shower	1	1	0	3
	Reception/ Lobby	1	0	1	3
	Therapy Room	0	0	2	0
	Transport vehicle	0	0	0	1
	Common bathroom	0	0	0	2
	Therapy	0	0	0	1
	Unknown	1	0	0	1
Predisposing environmental factors **	**Poor lighting**	NA*	1	NA*	18
	Rugs/carpeting	NA*	0	NA*	3
	Furniture	NA*	0	NA*	6
	Noise	NA*	0	NA*	3
	Crowding	NA*	0	NA*	5
	Clutter	NA*	0	NA*	6
	Wet floor	NA*	0	NA*	2
	Other	NA*	5	NA*	53
	None listed	NA*	33	NA*	190
	Gait imbalance	NA*	15	NA*	161

Predisposing physiological factors **	**Recent illness**	NA*	2	NA*	12
	Impaired memory	NA*	23	NA*	105
	Confused	NA*	17	NA*	100
	Recent change in cognition	NA*	1	NA*	5
	Recent change in medication/ new medications	NA*	2	NA*	9
	Weakness/ fainted	NA*	3	NA*	31
	Fluctuating blood sugar	NA*	0	NA*	7
	Fluctuating blood pressure	NA*	0	NA*	7
	Oxygenation changes	NA*	0	NA*	2
	Drowsy	NA*	1	NA*	12
	Incontinent	NA*	2	NA*	56
	Current UTI	NA*	0	NA*	5
	Other	NA*	0	NA*	24
	None listed	NA*	5	NA*	31
Predisposing situation factors **	**During transfer**	NA*	8	NA*	36
	Call light not used	NA*	23	NA*	148
	Footwear not in place	NA*	1	NA*	19
	Using cane	NA*	1	NA*	2
	Using walker	NA*	2	NA*	17
	Ambulating without assistance	NA*	11	NA*	110
	Wanderer	NA*	2	NA*	9
	Active Exit Seeker	NA*	1	NA*	3
	Admitted within last 72 hours	NA*	1	NA*	10
	Recent room change	NA*	1	NA*	19
	Staff alerting devices not in use	NA*	0	NA*	8

	Gait belt not used	NA*	0	NA*	9
	Other	NA*	3	NA*	41
	None listed	NA*	4	NA*	28

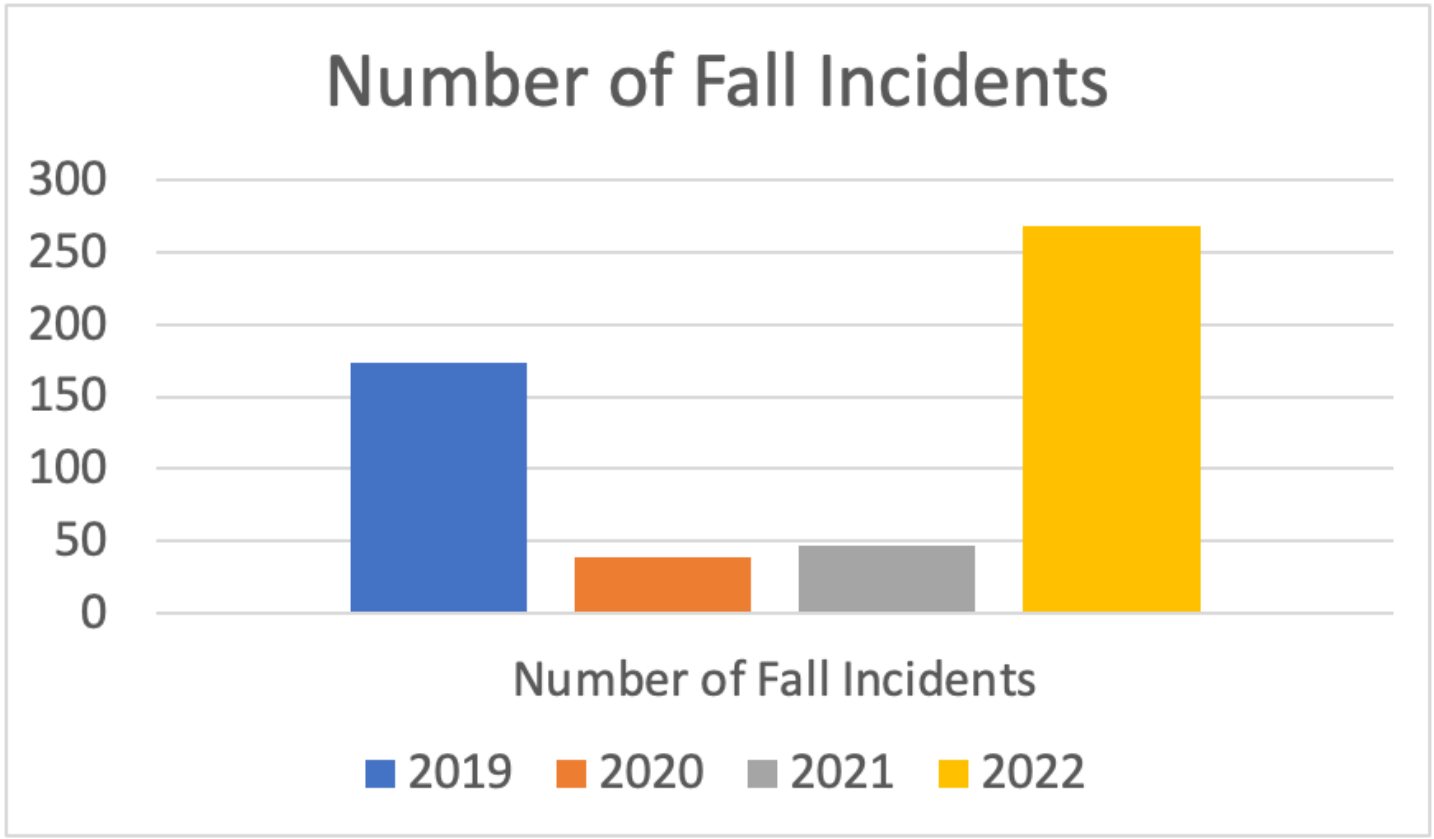
*NA = Not Available

** Each fall could have had more than 1 predisposing factors

Appendix L

Figure 7

Number of Fall Incidents 2019 - 2023



Appendix M

Figure 8

Monthly Data Comparison, Four Months Pre- and Post- Intervention

Reported Falls, June 2022 – February 2023								
June 2022	July 2022	August 2022	Sept. 2022	Oct. 2022	Nov. 2022	Dec. 2022	Jan. 2023	Feb. 2023
23	24	24	22	31	6	18	22	29

Key:
Green = pre-intervention
Orange = intervention
Blue = post-intervention

Appendix N

Figure 9

PDSA Cycle

Act: What changes are we going to make based on our findings?

- Implement post-fall assessment validated tool
- Reinforce education to DCWs biannually

Plan: What is the team trying to accomplish?

- Fall prevention education, reduction in falls and fall-related injuries
- Increase QoL in residents

- How will the team know that a change is an improvement for the facility?
  - Pre-/post- fall knowledge assessment of DCWs
  - Evaluation of MDS measures
- What changes could the team make?
  - DCW fall education, post-fall assessment implementation, hourly rounding

Study: What were the results?

- From data gathered from HSC&RC, more falls occurred during 2019 and 2022 thus far
- Goal of intervention was met → reduction in falls and improvement in DCWs fall knowledge

Do: When and how did we do it?

- HSC&RC OA fall data was gathered from 2019-present
- HSC&RC fall prevention protocols were evaluated
- Extensive literature was reviewed for current evidence-based fall prevention interventions
  - Exercise as a single and multifactorial intervention
  - Fall prevention programs
  - Education
  - Hourly rounding
  - Post-fall huddles
  - Identify and modify fall risk factors