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Critically Appraised Topic: Evidence for the Effectiveness of Implementing Home Modifications to Age in Place

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Feyi Adewoye, OTS, Michaela Gerving, OTS & Ashley Osbjornson, OTS, 2020

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Clinical Scenario:

“More than 1 in 4 adults aged sixty-five and older experience a fall each year” (Stevens et al., 2012, p. 1), “and an estimated 2.8 million older adults are treated in the emergency room annually as the result of a fall” (Centers for Disease Control and Prevention [CDC], 2016). Falls among community-dwelling older adults are oftentimes preventable but decreases the ability for older adults to successfully age in place. Evidence has shown that the majority of falls among community-dwelling older adults involve several contributing factors such as decreased mobility skills, side effects from medication, decreased vision, inappropriate shoes, and hazards within the environment (Bloch et al., 2010; Deandrea et al., 2010; Elliott & Leland, 2018). When looking at older adults, there are different factors that impact participation, and different aspects that can impact falls. For example, participation in meaningful occupations can bring increased strength and confidence. However, when looking at the impact of falls, this can bring a decrease in hydration and nutrition due to weakness and the fear of falling (Esquivel, 2017). According to Esquivel (2017, p. 107), “Approximately 5% to 10% of falls result in major injury such as traumatic brain injury and hip fracture with mortality rates of 46% and 25%, respectively. These severe injuries contribute to significant declines in mobility and ability of individuals to perform activities of daily living.”

Many studies report it is extremely important for older adults to stay living in their own personal homes.

Aging in place was seen as an advantage in terms of a sense of attachment or connection and feelings of security and familiarity in relation to both homes and communities. Aging in place related to a sense of identity both through independence and autonomy and through caring relationships and roles in the places people live (Wiles et al., 2012, p. 357).

Occupational therapy practitioners can assist older adults in improving their quality of life in meaningful occupations by staying in their homes longer with fall prevention interventions such as home modifications. “Falls are often the result of the interaction of behavior, intrinsic risk factors (e.g., poor balance), and environmental risk factors (slippery floors)” (Stark et al., 2018, p. 1). The population most focused on is older adults who are 55 years and older who have had a recurrence of falls. They include both men and women who are looking to maintain their independence and live in their homes. An occupational therapist might work with an individual in the hospital to help with education or in the individual’s home with the implementation of a fall prevention program. Falls can lead to secondary complications such as dehydration, rhabdomyolysis, pressure sores, and pneumonia. “Accidental falls that result in even minor injury are associated with a heightened fear of falling which can lead to self-imposed limitations, loss of self-confidence, avoidance of activity, and diminished quality of life” (Esquivel, 2017, p. 107). There are many risk factors that correlate with falling, including malnutrition and dehydration. Fallers are more often malnourished than non-fallers, one study finding that fallers are almost twice as likely to be malnourished (Esquivel, 2017). This is often due to the recurring cycle that the impact of falls can make. Older adults may fear falling, which can have an impact on their motivation to cook, eat, or perform other activities of daily living. This may lead to decreased strength, socialization, and increases their risk of falling. Another risk factor that can increase the risk of falls is medication side effects. Factors that can lead to issues would be drug



interactions, improper dosage, or having adverse drug reactions. “Between 1988 and 2010 the median number of prescription medications used among adults aged 65 and older doubled from 2 to 4, and the proportion taking ≥ 5 medications tripled from 12.8% (95% confidence interval: 11.1, 14.8) to 39.0% (35.8, 42.3)” (Charlesworth, 2015, p. 989). There are home modifications that can be added to assist older adults from falling and enable them to stay in the comfort of their own homes longer. Consultation would be completed as indicated by each individuals’ needs.

Home modifications are adjustments to the home environment designed to help prevent injury such as falls and promote independence in community-dwelling adults (Maggi et al., 2018). When home modifications were implemented by an occupational therapist, falls decreased by 41% (Campbell et al., 2005). In a study done by Stark et al. (2018, p. 7), “The home modification intervention of six 90-min sessions improved ADL performance.” The fear of falling can inhibit participation in activities of daily living such as toileting, bathing, cooking, and other activities due to the fear of injury. Implementing home modifications will help prevent older adults from falling and enable them to participate in their ADLs and other meaningful occupations while staying in the comfort of their own home.

Purpose Statement:

Older adults are at an increased risk of falling due to several factors. This is an important topic for occupational therapy practitioners. The purpose of the CAT is to provide evidence to build occupation-based interventions such as home modifications that support the improvement of community-dwelling older adults’ quality of life through engagement in activities of daily living.

Focused Question:

What is the state of evidence linked to malnutrition, dehydration, and medication side effects that compromise the ability to successfully complete activities of daily living, allowing the individual to age in place based on the prevalence of falls in community-dwelling older adults, age 55 and older, and how do home modifications impact this?

Synthesis of Evidence Review

Initially, we reviewed a total of 30 articles containing information about fall prevention, home modifications, medication side effects, and malnutrition in relation to how this affects community-dwelling older adults. Upon further review, we narrowed our results to include 16 articles that were more centered around our focused question. The databases that were used were CINAHL and PubMed. Search terms used were occupational therapy, falls, fall prevention, older community-dwelling adults, malnutrition, dehydration, aging in place, and medication side effects. To keep our searches focused, we used these search terms in Boolean phrases such as, “(fall prevention) AND (occupational therapy).” Inclusion criteria was community-dwelling older adults that were 55 years or older. Articles were excluded if they were published more than ten years ago, with the exception of primary sources. Articles that were included were systematic reviews, descriptive studies, randomized control trials, and others. Some articles were also located through ancestry searches.



Table 1.1 - Articles Critiqued

| Study Design/Level of Evidence | Population | Sampling/ Setting | Intervention | Relevant Outcomes | Author (Year) |
|--------------------------------|---|---------------------------|--|---|----------------------|
| Narrative Review/ NA | Number of subjects: Age: ≥ 65 Gender: NA | NA | NA | Adverse drug reactions (ADR) are a common cause of cognitive or functional decline, falls, gastrointestinal bleeding, heart failure and orthostatic hypertension. Standardized tools for risk prediction are useful adjuncts but should not replace clinical judgement. | Lavan (2016) |
| Systematic Review/ Level 1 | Number of subjects: 35,058 Age: ≥ 65 Gender: NA | Randomized control trials | Interventions to prevents falls in community dwelling adults 65+ | It was shown the multifactorial (customized interventions) and exercise were correlated with fall-related benefit, most consistent with exercise. One trial of showed that Vitamin D supplementation was associated with an increase of falls | Guirguis-Blake(2018) |
| Systematic Review/ Level 1 | Number of articles: 584 \rightarrow read 31 in full \rightarrow excluded 24 \rightarrow 1 additional study from a reference was included. 8 observational studies that met inclusion criteria Age: ≥ 65 Gender: NA | Observational studies | NA | Results show that a large amount of adults experience medical related health harm (MRH) within 30 days of being discharged. 167-500 events per 1,000 individuals (17-51%). Of those that were preventable were ‘errors that could have been avoided or severity reduced with different actions’ “due to error and preventable by any means possible” ‘prescribing, monitoring, dispensing and adherence errors’ While MRH is common, there are several methodological inconsistencies between studies that limit a clear understanding of its epidemiology. | Parekh (2018) |
| Cross sectional analysis | Number of subjects: 100 | Random selection | NA | Recognizing that medication side effects are not solely attributed to increased age. | Thomson (2010) |



| | | | | | |
|--|---|--|---|---|-----------------|
| | Age: ≥ 65 Gender: NA | | | Increased awareness and consideration is required. Prevention may include use of strategies by patients and health professionals to address potential sensory, physical and cognitive deficits with aging. In the future, developing education programs and policies that will increase awareness and prevention for medication SE will provide greater opportunity for older people living independently. | |
| Descriptive study/ Level 4 | Number of subjects: 240 Age: ≥ 65 Gender: M & F | Computerized list of patients meeting inclusion criteria | Home health care management and practice | When the patients were asked how they preferred learning about medications SE the most highest chosen answer was “speak to my physician” (n=24), followed by “speak to my pharmacist” (n=18) followed by “use written instruction” (n=15); “Given that more than ½ of the older adult population in the United States use the internet and more than 70% of those use it daily” (160). It is important that future health care professionals are aware of population of growing tech-savvy older adults so that they can be referred to credible sites for medication SE education to increase patient outcomes | Mager (2015) |
| Longitudinal study using a quasi-experimental design | Adults ages 65 and older | Convenience sampling | Home modifications | Older adults experienced less falls when home modifications were implemented. | Maggi (2018) |
| Randomized Control Trial / Level 1 | 391 community dwelling adults ages 75 and older. | Convenience sampling | Home modifications and home safety assessment | Home modifications reduced falls in older adults. | Campbell (2005) |



| | | | | | |
|-----------------------------------|---|---|---|--|---------------------|
| Randomized Control / Level 1 | 65+ community-dwelling older adults | Convenience sampling | Home modifications | Home modifications improved ability to engage in daily activities. | Stark (2018) |
| Systematic Review / Level 1 | Older adults 65+ | Randomized | Individualized home modifications | Home modifications significantly decreased risk of falls and improved performance in daily activities. | Stark (2017) |
| Systematic review / Level 1 | Community-dwelling older adults | Randomized | Fall prevention or home modification intervention | Significant reduction in falls with home modifications and increase in ADL engagement. | Chase (2012) |
| Longitudinal Research/ Level 3 | Number of Subjects: 2804 Age: 55+ Gender: NA | Population-based cohort study | No intervention used, but interventions could be created based on findings. | Prefrail/frail older persons with poor nutrition might be targeted for interventions to prevent or delay adverse functional and mortality outcomes. | Wei (2018) |
| Descriptive Research/ Level 4 | Number of Subjects: 477 (407 reported race, 219 were african american and 171 were white) Age: 65+ Gender: NA | 24 randomly selected congregate nutrition sites | No intervention used, but interventions could be created based on findings. | Rural older adults who attend congregate nutrition sites, especially African Americans, could be at risk for malnutrition due to health status and food preparation-related factors. | Getty (2016) |
| Randomized Control Trial/ Level 1 | Number of Subjects: NA Age: 65+ Gender: NA | Randomized Cluster Sampling | Nutrition coordinators and supported by a dietician, multidisciplinary project group meetings, multidisciplinary plan of action in the municipality care register system, exercise supported by a physiotherapist, and dysphagia and eating problems supported by an occupational therapist | No other studies has assessed this ad hence the study will contribute to important research. If the expected higher costs are negligible compared with increased quality of life and the cost-savings this can potentially generate, the results might influence common practice positively. | Beck (2014) |
| Phenomenological/ | Number of Subjects: 13,869 | Convenience sampling | NA | Between 1988 and 2010 the median number of prescription | Charlesworth (2015) |



| | | | | | |
|-----------------------|---|----------------------|----|--|--------------|
| Level NA | Age: 65+ Gender: NA | | | medications used among adults aged 65 and older doubled from 2 to 4, and the proportion taking ≥ 5 medications tripled from 12.8%. Higher medication use was associated with a higher prevalence of functional limitation, activities of daily living limitation, and confusion/memory problems in 2009–2010. | |
| Ethnography/ Level NA | Number of Subjects: 121 Age: 56-92 Gender: Male (44); Female (77) | Convenience sampling | NA | Older adults want choices about where and how they age in place. “Aging in place” was seen as a sense of attachment or connection and feelings of security and familiarity in relation to both homes and communities. | Wiles (2011) |

Older adults want the choice of where they grow old and where they end up toward the end of their lives (Wiles, 2011). However, there are many different factors that play into this situation. Those things could include how good their nutrition is, how they are managing their medications or how much access they have to certain services (Getty, 2016). All of these factors have an influence on frequency of falls and impacts older community-dwelling adults’ ability to age in place. When looking at older adults, we often find that things that impact their lives most often is the inability to complete certain occupations, more specifically ADLs.

Falls/Fall Prevention

A level I systematic review by Chase, Mann, Wasek, & Arbesman (2012) examined thirty-three articles and found strong supporting evidence of multifactorial programs including home modifications, reduced falls in older community-dwelling adults, and increased ADL independence. Fall reduction interventions such as home modifications improve older community-dwelling adults’ ability to safely age in place in the comfort of their own home. In a level I randomized control trial (RCT), Gitlin et al. (2006) found that these multifactorial interventions including home modifications improved participants' ability to engage in ADLs and older community-dwelling adults felt less likely to fall in their home. Findings from nine level I RCTs examining home modification interventions within the Stepping on program indicated a 31% decrease in falls and improvement in older adults ability to complete ADLs (Clemson et al., 2004; Close et al., 1999; Davison, Bond, Dawson, Steen, & Kenny, 2005; Day et al., 2002; Gitlin et al., 2006; Hornbrook et al., 1994; Logan et al., 2010; Nikolaus & Bach, 2003; Shumway-Cook et al., 2007; Chase et al., 2012). The articles examined were all level 1 and are the most rigorous, thus reducing the risk of bias. These level I studies included large sample sizes and increased generalizability.



Findings from a level I RCT indicated that falls were reduced by 41% when home modifications, such as grab bars and railings, were to help with daily activities (Campbell et al., 2005). This study was not blinded, thus increasing the risk of bias (Campbell et al., 2005). Gitlin, Miller, & Boyce (1999) found similar results in a level III study which demonstrated a significant increase in ability of older adults to complete ADLs and transfers successfully when home modifications were implemented. This level III study has increased risk of bias as the researchers used convenience sampling to recruit their participants. Ability to safely complete ADLs such as toileting, bathing, and cooking can allow older adults to remain in the comfort of their own home for as long as possible. Home modifications can also increase safety and reduce the risk of falls, enabling older community-dwelling adults to age in place.

Malnutrition

There were two qualitative studies and three quantitative studies included in this review that reported on malnutrition and dehydration in older adults and how they feel about aging in place. The two qualitative studies were level NA and used convenience sampling (Charlesworth, Smit, Lee, Alramadhan, & Odden., 2015; Wiles, Leibing, Gubeerman, Reeve, & Ruth., 2011), while the quantitative studies were level 1, 3, and 4 respectively, and used a type of randomization for their sampling (Beck et al., 2014; Getty, Mueller, Amella, & Fraser., 2016; Wei et al., 2018). There were no interventions used in any of the studies, which could be a limitation. Another limitation is that not a wide variety of people participated. It was usually just older adults in a certain community or area. There is also a lack of data on how malnutrition directly correlates with aging in place and the impacts that may have on the performance of ADLs.

Wiles et al. (2011), found that older adults wanted a choice about where and how they age in place. They found it as a sense of attachment or connection and feelings of security and familiarity in relation to their homes and communities. According to Getty et al. (2016), the high percentage of older adults found to be taking three or more prescription drugs each day might be one reason for the decreased food intake and weight loss that many older adults reported. The side effects of many prescription drugs can cause involuntary weight loss, which is dangerous for older adults. “Between 1988 and 2010 the median number of prescription medications used among adults aged 65 and older doubled from 2 to 4” (Charlesworth et al. 2015, p. 989). Higher medication use was associated with a higher prevalence of functional limitation, activities of daily living limitation, and confusion/memory problems in 2009–2010 (Charlesworth et al. 2015)

Medication Management

A qualitative level NA narrative study (Lavan & Gallagher, 2016) found that adverse drug reactions (ADRs) are a contributing factor to morbidity and mortality. A common clinical issue, not having concise therapeutic goals when starting patients on new medications can result in ADRs which affect the ability for older adults to successfully age in place (Lavan & Gallagher, 2016). Clear information should always be given to older adults regarding their dose alterations, new medications and potential side effects (Lavan & Gallagher, 2016). Parekh, Ali, Page, Roper & Rajkumar (2018) screened 584 articles, leaving eight that were used in a level 1 systematic review that investigated the commonalities between community dwelling older adults who face medical related harm (MRH) after discharge. Eight studies were reviewed, and it was found that between 35% and 59% of MRH was preventable (Parekh et al., 2018). Poor



use of prescribing and monitoring were contributing factors to those numbers. “Given the high risk around hospital discharge of medication discrepancies, poor communication of medication changes and possible adverse effects and deficiencies in information transfer to primary care, the high proportion of preventable MRH we found is not a surprise” (Parekh et al. 2018, p. 1819).

Mager (2015), conducted a level IV descriptive study that surveyed older adults over the age of 65 to gauge their self-perception of medication side effects and education. While multiple methods were addressed, it was found that regardless of their patients preference there was a strong emphasis of healthcare professionals to address medication education for preventative measures of MRH and to improve patient care outcomes. Limitations of this study consisted of a small sample size which affects generalizability.

Summary

The evidence showed that home modifications and education programs help minimize the risk of falling for community-dwelling older adults, ages 55 and older. The evidence also showed a link between the increased risk of falls when malnutrition, and medication side effects were factors for community-dwelling older adults.

Clinical Bottom Line

The purpose of the CAT is to provide evidence to build occupation-based interventions such as home modifications that support the improvement of community-dwelling older adults’ quality of life through engagement in activities of daily living. Based on the review above, ages 55 and older, there is strong evidence linking malnutrition, dehydration, falls, and medication side effects compromising the ability of older adults to successfully complete activities of daily living (ADLs), allowing the individual to age in place based on the prevalence of falls in community-dwelling older adults, aged 55 and older. Research also showed that home modifications have a significant impact on fall prevention and increase the ability for the completion of activities of daily living. Research has demonstrated that most falls among older adults are multifactorial in nature, resulting from the interaction of fall risk factors (Deandrea et al., 2010) such as impaired mobility skills, medication side effects, impaired vision, improper footwear, and environmental hazards (Bloch et al., 2010; Elliott & Leland, 2018). When looking at older adults, there are different factors that impact participation, and different aspects that can impact falls. For example, participation in meaningful occupations can bring increased strength and confidence. However, when looking at the impact of falls, this can bring a decrease in hydration and nutrition due to weakness and the fear of falling (Esquivel, 2017).

The evidence was looked at through the lens of the Person-Environment-Occupation (PEO) model (Law, 1996). This model emphasizes occupational performance that is shaped by the interaction between person, environment, and occupation (Law, 1996). These three domains are dependent and affected by each other (Law, 1996). Persons influence contexts, and contexts influence persons. The person-context transaction is dynamic (Law, 1996). The transaction is how the domains of person (P), occupation (O), and environment (E) interact with each other through engagement. Community dwelling older adults who are 55 years old or older have the ability to actively participate in ADLs (PxO). Appropriate home modifications allow community-dwelling older adults to successfully age in place and decrease the likelihood of falling which in return will help to prevent hospitalization (PxE). Preventative measures such as home modification and proper use of medication management will positively impact their ability



to engage in their ADLs from the comfort of their own home (OxE). The performance of ADLs is dependent on the goodness of fit between the person, occupation, and environment. The fit between the PEO interaction is defined by the quality of a person's experience with regard to their level of satisfaction and functioning (Strong et al., 1999).

Collectively more research can be done when looking at the intervention of home modification regarding falls, medication management, and malnutrition in community-dwelling older adults. Lack of evidence was found, connecting all three categories leaving room for more research to be conducted supporting the process of aging in place. As stated by Chase et al. (2012) p. 289, "more research is needed that explores the impact of home modifications on fall prevention and performance in all areas of occupation." This is also true in the areas of medication management and malnutrition in regard to community-dwelling older adults.



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