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A Retrospective Chart Review Pilot Study of Fall Prevention through a New and Innovative Care Model

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A Retrospective Chart Review

Pilot Study of Fall Prevention through a new and innovative care model

By

Lydia Smith

A project

Submitted in partial

Fulfillment of the requirements for the degree of

Doctor of Nursing Practice

California State University, Northern Consortium

Doctor of Nursing Practice

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A RETROSPECTIVE CHART REVIEW IN FALL PREVENTION

APPROVED

For the California State University, Northern Consortium
Doctor of Nursing Practice

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A RETROSPECTIVE CHART REVIEW IN FALL PREVENTION

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Abstract**A RETROSPECTIVE CHART REVIEW PILOT STUDY OF FALL PREVENTION THROUGH A NEW AND INNOVATIVE CARE MODEL**

According to the Centers for Disease Control and Prevention (CDC), falls are the leading cause of injury-related mortality in the geriatric population, and they are the most common cause of brain injury and hip fracture. The prevalence for falls is 30% in patients over 65 in the United States who experience a fall annually, and the prevalence in dementia patients can be up to 80% annually; the consequences of falls can include injury, reduction in mobility, depression and decreased socialization with peers (CDC, 2015). The purpose of this retrospective chart review pilot study is to examine the number of falls before and after patients come on service with Vivacitas Healthcare. Vivacitas Healthcare is a primary care service delivered in Brookdale Senior Communities, giving access to care for residents where they live. An extensive literature search was performed. The conceptual framework for this pilot study is the Chronic Care Model.

This pilot study will examine whether Vivacitas primary care services to geriatric patients through a specific set of interventions have any effect on the number of patient falls. Falls will be assessed six months after joining Vivacitas primary care service and compared with the number of falls from the previous six months with their last primary care provider.

CHAPTER ONE:INTRODUCTION

Background and Significance

The estimated direct cost of falls in 2015 the United States (US) according to the Centers for Disease Control and Prevention (CDC) was over 50 billion dollars. A meta-analysis by the Cochrane Collaboration revealed that "approximately 30% of adults aged 65 and over experience one or more falls each year, but up to 50-80% of patients living with dementia fall in a twelve-month period" (Gillespie, Robertson, Sherrington, Gates, Clemson & Lamb, 2012). The United States Preventative Task Force (2015), reported that "nearly 30% of adults over 65 in community settings, resulting in nearly 30 million falls, of which nearly half required medical treatment and resulted in an estimated 33,000 deaths in 2015" (Grossman, D., Curry, S., Owens, D., Barry, M., Caughery, A.,...Mangione, C., 2018, p. 1696).

Problem and Purpose

The population at Vivacitas Healthcare is composed of all elderly patients over 65 years of age living in Brookdale Senior Living communities in Sonoma County, California. Vivacitas Healthcare utilizes an innovative care model approach providing primary care on-site at five different Brookdale communities. On-site care makes access to care easier for patients who might otherwise rarely visit their primary care provider, based on personal conversations with residents. In particular, transportation is a problem with these Brookdale Senior Living communities because the bus at each community only takes residents to medical appointments in certain cities particular days of the week and only at certain times of the day. This results in residents avoiding going to medical appointments at all, and instead using the emergency room only when absolutely necessary for their health. Many elderly patients in the U.S. utilize

emergent care rather than regular primary care (Osborn, Doty, Moulds, Sarnak, & Shah, A., 2017). Seniors are less likely to complete advanced care planning, and are more likely to be subjected to ineffective and burdensome treatments in the hospital and then be forced to bear the cost depleting their already meager resources (Kangovi et al., 2013).

The patients on Vivacitas service are in three types of living situations; assisted living, independent living, and memory care. Falls are a common problem within all three types of living quarters as patients on Vivacitas Healthcare service living at Brookdale Senior communities are often alone or have limited assistance. The mission of Vivacitas Healthcare is to provide geriatric expertise using a multidisciplinary team approach, providing risk screening and cognitive assessment, care planning, referral coordination with specialists, and frequent follow up through a complex care management program that allows the providers to see the patients at least twice monthly due to incentives from Medicare (Vivacitas Brochure, 2018). There are many risk factors for falls in this population including gait impairments, psychotropic medication overuse, environmental factors such as poor lighting or poorly arranged furniture, vision impairment and neurological issues such as dementia (Burton et al., 2015). Luk, Chan & Chan, (2015) also agree that evidence based strategies for fall prevention in the elderly include exercise programs with a physical therapist, home modifications as suggested by an occupational therapist, medication review for polypharmacy reduction as well as reduction of psychotropic medication usage. These strategies will be evaluated in this retrospective chart review of Vivacitas' geriatric primary care practice.

Luk et al., (2015), also recommend referrals as appropriate to cardiology for patients with complex cardiovascular issues which is also done routinely with Vivacitas services but will not be formally evaluated in this pilot study.

According to the Centers for Disease Control and Prevention (CDC), “Falls are the leading cause of injury-related deaths among older adults, and they are the most common cause of traumatic brain injuries and hip fractures” (2018, para 3). Vivacitas Healthcare is committed to keeping patients safe through a fall risk assessment that looks at patients’ medications, gait and mobility and a mental status exam, the results of which lay the foundation for an effective care plan to reduce and prevent falls (Vivacitas, 2018).

Theoretical Framework

The conceptual and theoretical framework for this pilot study is the chronic care model which states that care provided should be based on the evidence in the literature, empowering patients, their caregivers and family members to manage their chronic health problems (Wagner, 2001).

Aim of this Research

Hypothesis and Relevance

This pilot research project is a retrospective chart review of patient falls before starting Vivacitas' services and six months after being on service to answer the question: does being on Vivacitas' primary care services make a difference in the number of falls for patients? The Chief Executive Officer (CEO) and Medical Doctor(MD), owners of the company, have been engaged stakeholders with this project, and the Brookdale Senior Living communities were also eager to be partners in preventing falls for residents of their communities. This is relevant because falls are the number one cause of death from injury among older Americans (CDC, 2018). Vivacitas primary care services are exclusively for geriatric patients in Brookdale Senior Living

communities and therefore it is essential to examine all factors that contribute to or decrease the number of falls for this patient population. This research project, if published may also help other geriatric primary care providers have more insight into how to prevent falls in their patients as well.

CHAPTER TWO: LITERATURE REVIEW

Burton et al., (2015), examined peer-reviewed randomized controlled trials (RCTs) and quasi-experimental trials from 2000 to 2014 from six electronic databases for a meta-analysis of various exercise programs for older adults with dementia living in the community. The authors revealed that the three RCT's and one group case study included were of high methodological quality but the set-up- including the time periods, interventions and outcome measurements-were different in all of the studies. After the interventions of the various studies, the combined mean number of falls were lower in the exercise versus the control group. The exercise interventions reduced fall risk by 32% (Burton et al., 2015, p. 424). The conclusion of this meta-analysis is that exercise programs can help prevent falls in elderly dementia patients in the community, but more research is needed with better power to create more generalizable recommendations.

Gillespie, Robertson, Sherrington, Gates, Clemson & Lamb, (2012), of the Cochrane Collaboration, also assessed articles that examined the effects of interventions to reduce the incidence of falls in the elderly population. The authors searched multiple databases looking for randomized controlled trials of interventions to reduce falls in the elderly. Two independent authors reviewed the risk of bias with a set 95% confidence interval to compare fall rate, the number of falls per person per year between the intervention and control groups. Overall the number of trials included was 159 with almost 80,000 participants. The vast majority of these

trials compared a fall prevention intervention with no intervention as the control group. Exercise was the most common intervention, with nearly 60 of the trials examining this as the only intervention, while 40 of the studies were multifaceted programs. The majority of the trials had a low bias risk for how they recruited their subjects. In 16 of the trials, Gillespie et al, (2012), discovered that (with over 3,000 participants) that group exercise resulted in a statistically significant reduction in the number of falls. Tai Chi was utilized as an intervention in six of the trials with over 1600 participants and was found to significantly reduce the risk of falling with a confidence interval of approximately 0.60 to 0.80.

The next set of 19 trials examined by Gillespie et al, (2012), revealed that results of multifaceted interventions including patient risk assessment, with almost 10,000 participants, showed a reduced rate of falls. Also, part of Gillespie et al, (2012), six trials with approximately 4,000 participants had interventions focused on patient home safety were found to be effective in reducing fall rate and were most effective when completed by an occupational therapist. These type of interventions were found to highly effective in patients with visual impairment at high risk for falls. This finding is consistent with the elderly population in Brookdale Senior Living Communities on Vivacitas service that often need room re-arrangement to avoid tripping and falling due to visual impairment and benefit from home health services with an occupational therapist and physical therapist. One trial of 93 participants that gradually withdrew psychotropic medicines reduced the rate of falls (Gillespie et al., 2012). One trial that examined and modified primary care doctors prescribing practices significantly reduced the risk of falling in a group of almost 700 participants. Three trials evaluated by Gillespie et al., (2012) had an economic evaluation that demonstrated that home-based exercise, home safety assessment and modification in patients with previous falls, and a multifaceted program targeting several risk

factors all resulted in cost savings.

The next meta-analysis that examined the evidence in the literature for fall prevention was done by the United States Preventative Task Force (USPSTF). The United States Preventative Task Force reviewed the benefits versus harms of relevant interventions for fall prevention and fall-related morbidity and mortality in the primary care setting for patients over the age of 65. The results revealed that exercise interventions have a moderate benefit in preventing falls and that multifactorial interventions also have a small benefit (Grossman, D., Curry, S., Owens, D., Barry, M., Caughery, A.,...Mangione, C., 2018). Grossman et al., of the USPSTF, (2018).

CHAPTER THREE: METHODOLOGY

Subjects, Methods, Setting, Confidentiality, Coding, Access to Data, Tool

This study was a quantitative retrospective chart review pilot study. A convenience sample of 20 patients' charts was examined by the Nurse Practitioner (NP) Doctor of Nursing Practice (DNP) student, who looked at their charts in-depth for the number of falls before and after signing onto Vivacitas' service. Inclusion criteria were that the patients had taken the Mini Mental Status Exam during one of their visits with one of the two providers for Vivacitas' geriatric primary care services either with the MD or the NP. The DNP student examined the charts for a specific set of interventions that have been performed for each of these patients by the two providers of the company to prevent falls according to the data collection tool as shown in Appendix A. Twenty patients charts were examined for fall data from their medical records

from six months prior to beginning service (while under a different primary care provider) and six months after joining Vivacitas' primary care services. The participants were all patients on Vivacitas Healthcare services. The owners of the company gave permission for this retrospective chart review. Patient confidentiality was protected as all data collected was coded and did not have any patient identifiers. Data from the charts was stored on a USB drive remains in a locked file in one of Vivacitas offices, and will be destroyed after six months. The only person with access to the data was the DNP student and principal investigator.

The data collection tool was made by gleaning key content areas from the evidence found in the literature review. The tool for the retrospective chart review for examining twenty patients charts included age, gender, number of falls prior to starting on Vivacitas' geriatric primary care service, whether or not each patient was referred to physical therapy, total number of medications utilized by the patient, the number of psychotropic or other medications reduced while on Vivacitas service, and the patients' Mini-Mental Status Exam Score. The tool is displayed in Appendix A. Statistics were analyzed in SPSS version 24 for this study and statistical significance for the regression analyses was set at p must be less than 0.05.

Potential Benefits

Potential benefits of this research project are identifying if there is a difference in fall rate before and after patients join Vivacitas Healthcare primary care services. Although the scope of this project is small this will also allow the Nurse Practitioner DNP student to examine factors related to falls and hopefully identify future interventions that Vivacitas' providers can do to help prevent falls in this geriatric patient population. If this project is published in a peer-reviewed journal, other geriatric providers may benefit from this knowledge about fall prevention as well.

Potential Risks

There is minimal risk to patients as this is a retrospective chart review and all patient fall data was coded so that there were no patient identifiers. There is potential for bias because both the researcher and the stakeholders involved work for Vivacitas, but that was minimized by doing a retrospective chart review.

CHAPTER FOUR: RESULTS

Statistical analysis was done to examine the effectiveness of the Vivacitas program in reducing the number of falls of elderly patients. We found that the percentage reduction in the number of falls over a six-month period is 89.3%, a statistically significant result with a 95% confidence interval of 82.5% to 96.1%. In the study population of twenty patients there were 54 falls while patients with their previous providers, versus five falls after six months of being on Vivacitas primary care services.

The results also revealed that the number of psychotropic medications had a statistically significant effect on the number of falls. Higher numbers of psychotropic meds led to greater numbers of falls.

The Mini Mental Status Exam (MMSE) scores were found not to be statistically significant in affecting the number of falls. In fact, those patients who had a fall, on the average had slightly higher average MMSEs than those who had no falls. This may be due to the fact that patients with lower MMSE scores and an official diagnosis of dementia are required to live on memory care units in the Brookdale communities, thus receiving a higher level of care and attention from the staff which may contribute to fewer falls in this population.

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The relevant patient data used in the analysis are summarized below in Table 1 on the next page.

Table 1. Patient Data

Patient	Psychotropic Meds	MMSE	Falls Pre-Vivacitas	Falls Post-Vivacitas
1	1	29/30	2	0
2	0	26/30	3	0
3	0	15/30	4	0
4	2	17/30	3	1
5	1	25/30	2	0
6	2	28/30	3	0
7	0	18/30	4	0
8	1	26/30	2	0
9	2	27/30	4	1
10	0	29/30	2	0
11	1	15/30	2	0
12	1	28/30	3	1
13	2	28/30	2	0
14	1	29/30	3	1
15	0	30/30	0	0
16	1	21/30	3	0
17	0	26/30	2	0
18	1	25/30	4	1
19	0	26/30	2	0
20	0	30/30	3	0

Analysis of Pre Versus Post Vivacitas Primary Care Services

A linear regression analysis was done in comparing the number of falls for pre and post-treatment. Both periods covered six months for each patient. The regression line assumes a zero intercept. That is, the regression line is fitted through the origin, which assumes that a patient

who had no falls before treatment has an expected number of falls of zero after treatment. The regression equation is

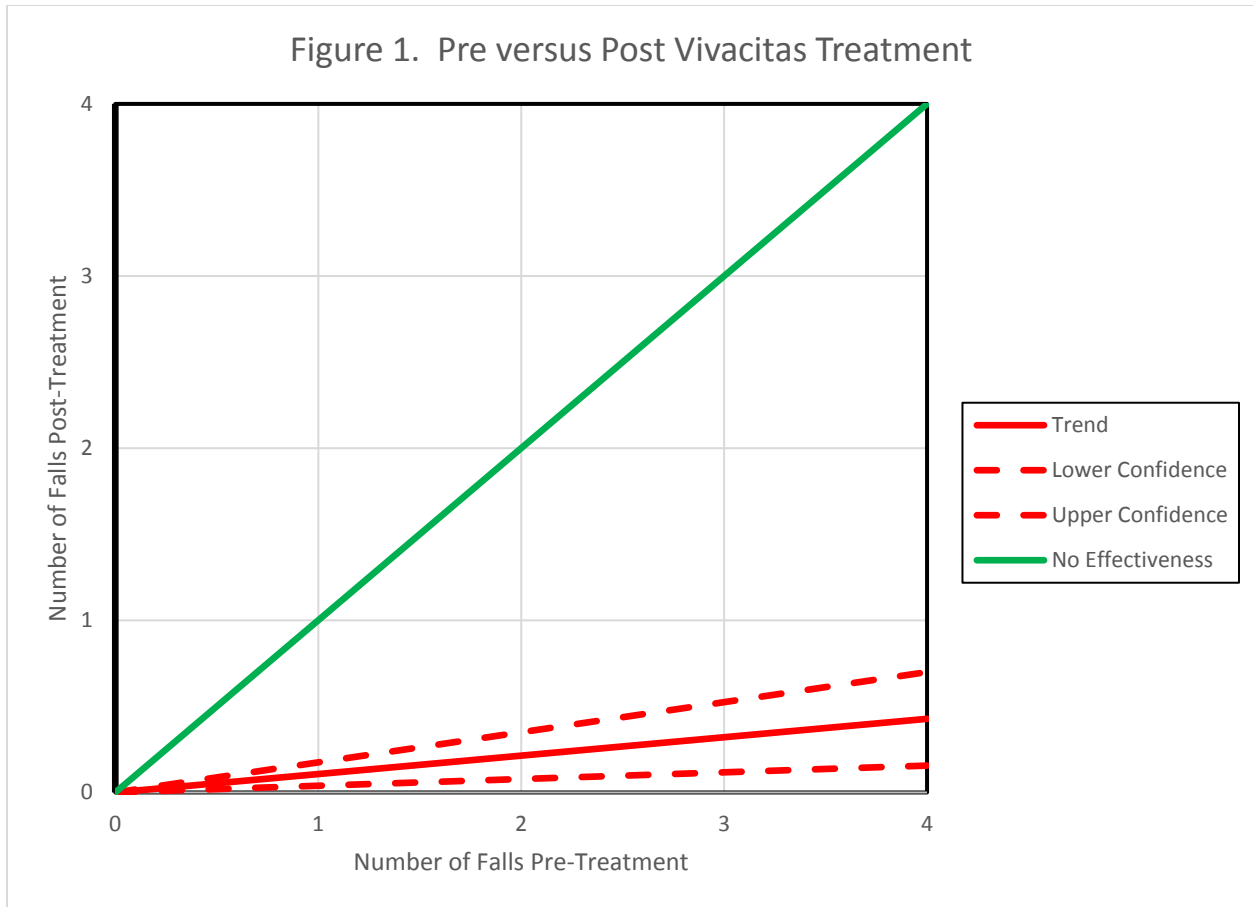
$$(1) \text{ Post} = 0.107 * \text{Pre}$$

The regression statistics are summarized in Table 2 below. The slope is 0.107 with a 95% confidence between 0.039 to 0.175. The effectiveness in reducing the number of falls can be interpreted as one minus the slope. Thus, the effectiveness is 0.893 with a 95% confidence interval between 0.825 to 0.925. Since the interval does not include zero, we conclude that the effect is statistically significant at the 5% significance level.

Table 2. Regression Statistics: Pre Versus Post Vivacitas Treatment

Slope	0.107
St. Dev.	0.409
St. Dev. (Slope)	0.032
Lower Confidence	0.039
Upper Confidence	0.175

Figure 1 on the next page is a plot of the regression of the number of falls pre and post-treatment. The estimated regression line is the solid red line. The red dash constitutes a 95% confidence band on the true regression. The green line is the line where the pre and post-treatment falls are equal, it represents a line of no effect. The table shows that the estimated line, as well as the 95% confidence interval bands, are far below the green line of no effect.



Analysis of Psychotropic Medications Versus Falls

A linear regression analysis was done to compare the effect of psychotropic drugs on the number of falls. The regression statistics are listed in Table 3.

The regression equation is

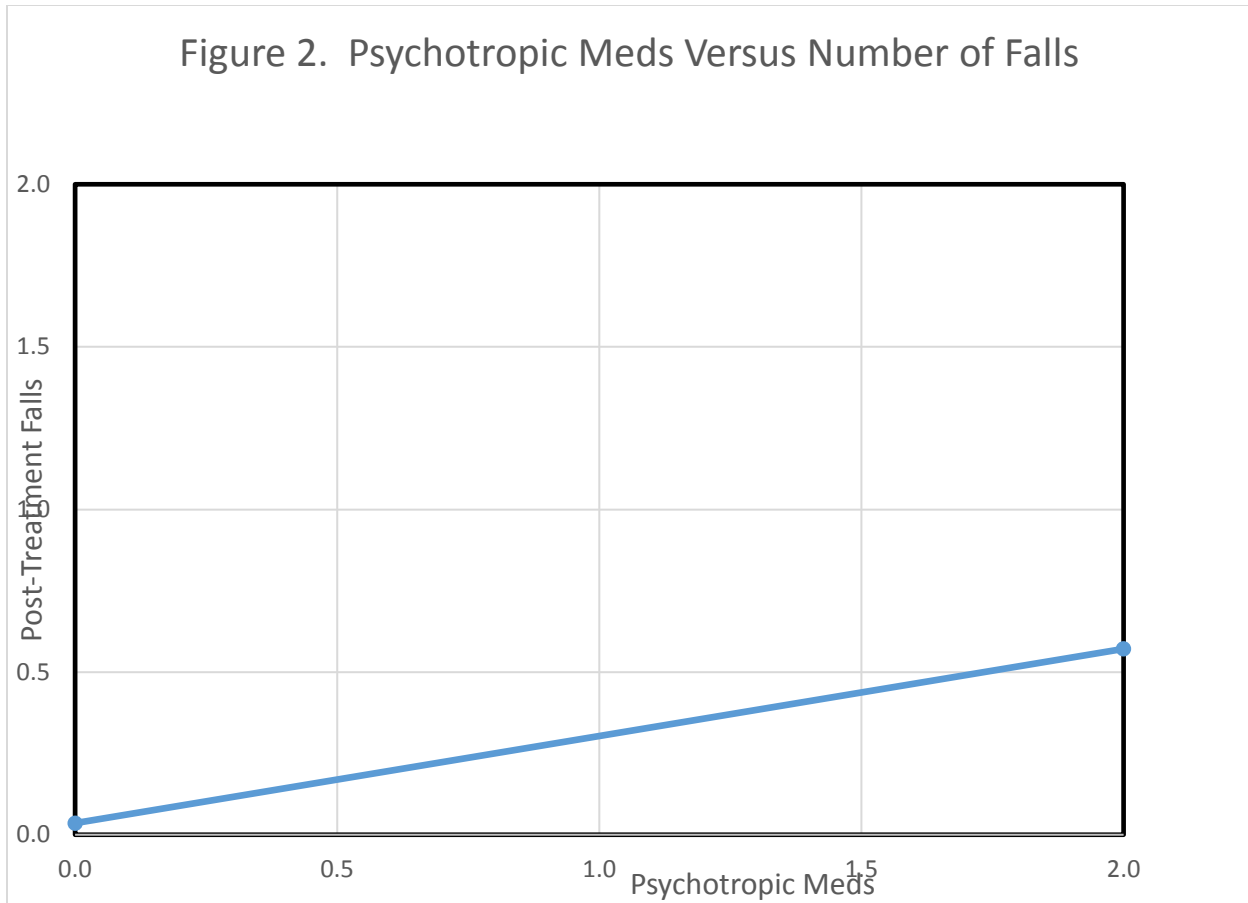
$$(2) \text{ Falls} = 0.036 + 0.268 * \text{Psychotropic Meds}$$

Table 3. Regression Statistics: Psychotropic Meds Versus Falls

Intercept	0.036
Slope	0.268
St. Err.(Slope)	0.121
t	2.16
p	0.040

Since the p-value of 0.040 is below the standard significance level of 0.05, we conclude that the regression slope is statistically different than zero at the 5% significance level. Since the slope estimate of 0.036 is positive, it means that the higher numbers of psychotropic medications relate to higher numbers of falls. This result is as expected according to the literature and also demonstrates the importance of the intervention of reducing patients' psychotropic medications and reducing overall polypharmacy as much as possible.

The regression is plotted in Figure 2 is displayed on the next page



Analysis of MMSE Scores on Falls

We next look at the effect of MMSE scores on the number of falls. With an MMSE of 21 as the cutoff point, Table 3 summarized the counts of the number of patients with and without falls for those with low and high MMSE scores. As can be seen, of those with low MMSE scores, one patient out of five (20%) had a fall. Those with high MMSE scores had four patients out of 15 (26.7%) with a fall. The score of 21 was utilized because this is the cutoff for the diagnosis of dementia.

Using Fisher's Exact test for these two by two table, based on the hypergeometric distribution, we get a p-value of 0.45. Since this is greater than 0.05, we find that the effect of MMSE scores is not statistically significant.

Table 4A. MMSE Scores Versus Falls

Falls	MMSE		Totals
	≤ 21	> 21	
1	1	4	5
0	4	11	15
Totals	5	15	20
p = 0.45			

Instead of using a cutoff point to define low and high MMSE scores, suppose we use the actual values. We find in Table 4 that the average MMSE scores for those that had a fall were actually higher than those who did not have any falls. This may be related to the fact that at Brookdale communities those with a diagnosis of dementia must live on memory care units with a higher number of staff per patient and have more precautions for walking with patients and assisting them with daily activities such as toileting or transferring to the bed or chair. Part of Vivacitas services include discussions with family and staff in authority at Brookdale to move patients from independent or assisted living to memory care once diagnosed with dementia.

Table 4B. Average MMSE Score for Falls

Falls	Average MMSE
1	25.2
0	24.8

The number of patients who had physical therapy according to the retrospective chart review ordered by Vivacitas providers was 19/20. However, because there was not an even split

of ten who had physical therapy and ten who did not, the data could not be statistically analyzed for the effect of physical therapy on falls. However, this was one of the main interventions that were examined by the Nurse Practitioner for this retrospective chart review in addition to reduction of polypharmacy and reduction of psychotropic medications.

CHAPTER FIVE: DISCUSSION

Conclusions and Recommendations

The results of this retrospective chart review pilot study are consistent with what we know from the literature, that reducing patients' psychotropic medications can help reduce their number of falls. The study also shows the overall effectiveness of the Vivacitas primary care program compared to patient's previous primary care providers, with an overall reduction in falls at an astounding 89.3% with a 95% confidence interval. The chart review pilot study also revealed that the providers at Vivacitas were consistently ordering physical therapy for patients (19/20 patients), which has been shown in the literature to help strengthen ambulation and prevent falls. However, this relationship could not be shown statistically because Vivacitas Healthcare providers had done their due diligence and ordered physical therapy for nineteen out of twenty of the patients included in the study, so there was no basis for comparison. For this reason, the data was not displayed in the data table but was part of the data collected during the study.

Future studies should examine the effect of physical therapy on patient fall rates in the geriatric primary care setting. The results did not show a statistically significant difference in fall rates for patients with a lower MMSE score in this study (patients with a diagnosis of dementia), this could possibly be explained by the fact that Brookdale senior living communities require anyone with a diagnosis of dementia to live on memory care units where they have increased

number of staff to patients, and also these staff monitor patients closely and assist with ambulation and transfers.

The results also revealed that with increasing numbers of psychotropic medications, fall rates increase. Those patients on Vivacitas geriatric primary care services who had their total number of medications reduced and no psychotropic medications had less falls. This is also consistent with the research literature.

The total number of falls in the twenty patients with their previous primary care providers in the last six months was fifty-four falls, versus just five total falls on Vivacitas services. Overall the great reduction in fall rate for patients on Vivacitas' primary care service is a testament to good primary care delivery with a new and innovative care model for geriatric patients, by accessing care directly in their own community falls risk can be mitigated.

The main interventions examined in this study benefitting patients on Vivacitas services were providers ordering physical and occupational therapy, reducing patients total number of medications, and reducing psychotropic medications. These interventions can be easily replicated by other geriatric primary care providers. The main limitation of this study was the small sample size and convenience sampling methodology utilized due to time constraints. One idea for further study is examining the effect of provider influence on elevating patients level of care from independent or assisted living to memory care when diagnosing dementia and any corresponding effects on falls. Future randomized controlled trials should also examine the direct benefits of provider reduction of polypharmacy, as well as primary care providers ordering physical and occupational therapy routinely in the geriatric population for fall prevention.

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Appendix A Data Collection Tool

Age
Gender
Referred to Physical Therapy?
Total number of medications
Total number of psychotropic medications
Total number of psychotropic medications/other medications reduced by Vivacitas Provider
MMSE score