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Testing the chronic care model for depression in homebound older adults.

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By

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DEDICATION

This dissertation is dedicated to my Grandmother who paved the way,

my Pa who taught me how to pedal,

and

my Mammaw who rode by my side the entire journey.

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First and foremost, I would like to thank my mentor, Dr. Suzanne Meeks, for her support, encouragement, kindness, insight, and quick responses throughout my graduate school experience. She has pushed me to grow in so many areas, and I am eternally grateful. I would also like to thank my committee members for their expertise and support on this dissertation as well as their wonderful supervision that has helped to mold me into the psychologist I am today. It has been a privilege to know and to learn from each of my committee members. I am also grateful to my cohort who have helped make this journey more enjoyable. I greatly appreciate my friends and family who have offered kind words of encouragement along the way. I would also like to thank my future husband, Kevin Poppe, for his constant support in this journey. His practical knowledge and calming presence have been invaluable. And finally, I would like thank my parents, Robert and Leslie Getz, who let me find my own path in life, but have always cheered me on in any of my endeavors. This journey has been for them.

ABSTRACT

TESTING THE CHRONIC CARE MODEL FOR DEPRESSION IN HOMEBOUND OLDER ADULTS

Brittney R. Getz

July 17, 2015

Homebound older adults are a unique population of older adults with many chronic illnesses and complex care needs (Qui et al., 2010). Depression is highly prevalent in homebound older adults (Qui et al., 2010). Many Chronic Care Models (CCMs) have been developed to provide a better system of care to those with chronic health conditions (Bodenheimer, Wagner, & Grumbach, 2002; Wagner et al., 2001; Wagner, Austin, & Von Korff, 1996a, 1996b). The Chronic Care Model for Depressed Homebound Older Adults is a model that was specifically designed for the depressed homebound elderly. It addresses many areas for improvement of care including delivery system design, communication/collaboration, education of patients and caregivers, technology, training/education of providers, and specialist involvement. This dissertation examined aspects of this model in the current home health care system to test model-predicted relationships between home health system characteristics and outcomes. Outcomes of interest were hospitalizations, nursing home admissions, and emergency room visits. CCM model relevant independent variables examined include the number of services provided by each agency, the number of visits provided to each client, and caregiver involvement. This study also examined whether home health patients who are

admitted from a short-term hospital stay are more likely to be depressed than those who are admitted from any other location. A five percent sample of the Home Health Outcome and Assessment Information Set (OASIS), a national database containing assessments of each Medicare home health recipient, was used. Results showed that the number of home health visits were related to an increased likelihood of ER visits, hospitalizations, and skilled nursing facility (SNF) admissions, providing support for the part of the proposed model that emphasizes communication between patients/caregivers and providers. Increased number of home health services was related to decreased ER visits, providing support for the importance of the delivery system design piece of the model. Discharge from an acute hospital stay was related to diagnosis of depression, and those with caregivers were less likely to be depressed. This provided support for caregiver involvement. Implications of these findings are discussed.

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INTRODUCTION

The homebound elderly are a unique population of older adults. They suffer from more physical and psychiatric conditions than older adults who are not homebound (Qiu et al., 2010). It is estimated that 3.6 million of the 38.9 million adults over the age of 65 (9.3%) are homebound (Qiu et al., 2010). They are more likely than non-homebound older adults to be older, female, live in poverty, live alone, have impairments in instrumental activities of daily living (IADLs) and activities of daily living (ADLs), and have increased mortality (Beck, Arizmendi, Purnell, Fultz, & Callahan, 2009; Bruce et al., 2002; Cohen-Mansfield, Shmotkin, & Hazan, 2010).

Depression is also highly prevalent in homebound older adults (Qiu et al., 2010). Having depression is related to increased medical illnesses, functional impairments, social isolation, financial difficulties, and pain, factors which are already prevalent in homebound older adults (Choi & McDougall, 2007). Properly treating depression may help to alleviate some of these factors that are causing the need for more home care treatment in general. Furthermore, depression may be a chronic disorder in homebound older adults (Cohen-Mansfield et al., 2010; Ell, Unützer, Aranda, Sanchez, & Lee, 2005; Raue et al., 2003), which implies that it should be treated in a chronic care model. Depression is not currently being adequately treated in the homebound elderly (Qiu et al., 2010). Chronic care models are currently being explored for use with older adults in primary care and home care (Bruce et al., 2004; Ciechanowski et al., 2004; Unutzer et al., 2002).

This dissertation proposed using a new model of care, *The Chronic Care Model for Depressed Homebound Older Adults* (Figure 1), that attempts to integrate proper depression treatment for homebound older adults into the home health system by using a chronic care model. This model suggests that several areas are important for depression care in homebound older adults including patient education, patient technology, communication and collaboration between patients and providers, delivery system design, provider communication and collaboration, provider training and education, specialist involvement, and provider technology.

The purpose of this dissertation was to examine aspects of this proposed model, including delivery system design, communication between providers and clients, caregiver involvement and how these are related to improved outcomes for depressed homebound older adults. This dissertation examined how the care provided by the home health agency is related to a depressed homebound older adult's health care use such as hospitalizations and nursing home placements. The sample was nationally representative of older adult Medicare home health care agency users, and the data came from the Home Health Outcome and Assessment Information Set (OASIS), the Home Health Compare Database, and the Master Beneficiary Summary File.

Homebound Older Adults

There are many different definitions of homebound status that are used in research (Qiu et al., 2010). Medicare defines homebound status as an individual necessitating a great deal of effort or assistance to leave home, and this must be a result of an injury or illness. According to Medicare, to be homebound, one cannot leave the house frequently or for long periods of time or should leave only for medical services. Leaving the home

to participate in adult day programs and religious services is permitted. This definition of homebound status will be used in this study because Medicare OASIS data are being used.

Homebound older adults are at greater risk for disability, medical conditions, cognitive impairment, and depression than non-homebound older adults. In terms of the number of conditions that are present in homebound older adults, a study of 468 recipients of a home health program that resided in an urban county and met a definition of homebound created by the program found that 27.4% have one or fewer medical or psychiatric conditions, 40.8% have two or three comorbid conditions, and 31.9% have four or more comorbid conditions (Beck et al., 2009; Qiu et al., 2010). This sample was quite racially diverse with 64% being African American. Cardiovascular disease was the most prevalent medical disorder, followed by general weakness, and chronic pulmonary disease (Qiu et al., 2010). Hypertension and diabetes are also common and often cause people to become homebound. Musculoskeletal disease is also common in homebound older adults (Beck et al., 2009). A study of 878 older adults living in a rural environment found that weight loss was a significant predictor of being homebound (Ganguli, Fox, Gilby, & Belle, 1996). Also, as expected based on the definitions of homebound, level of mobility is associated with homebound status (Kono & Kanagawa, 2001). Homebound older adults are also more likely than older adults who are not homebound to have functional impairments with 98% having one or more IADL impairment and 71% having one or more ADL impairment (Beck et al., 2009). It is clear that homebound older adults are at risk for many physical conditions.

Homebound older adults also have a high level of cognitive impairment. In a study of 468 older adults enrolled in a home call program, it was found that 53% had Mini-Mental State Exam (MMSE) scores below 24 (Beck et al., 2009). A study of 415 homebound older adults found that 29% had dementia (Kronish, Federman, Morrison, & Boal, 2006). When examining a sample of 100 older adult recipients of home care services with no prior history of cognitive impairment, it was found that 17% showed some level of cognitive impairment (Setter et al., 2009). This suggests that cognitive impairment is often not diagnosed in homebound older adults. Cognitive impairment is a significant problem in homebound older adults that will need to be addressed in interventions.

It is well supported that in community-dwelling older adults, rates of clinically significant depression are between 8 and 15%. Older adults with functional impairment due to medical conditions are more at risk for depression. Depression also tends to be more common in the oldest old due to increased probability of being female, having more physical disability, having more cognitive impairment, and having a lower socioeconomic status (Blazer, 1994; Blazer, 2003; Karel & Hinrichsen, 2000). However, there is limited data on the prevalence of psychiatric disorders in homebound older adults.

Depression is the most prevalent psychiatric diagnosis in homebound older adults behind dementia. Bruce and McNamara (1992) analyzed data from 2,553 older adults living in New Haven, CT. In a poor determination of homebound status that did not take into account physical illnesses or disabilities, the authors found that when comparing older adults who were in a bed or chair for most of the day to older adults who did not

meet this criterion for homebound status, 21.8% vs. 11.0% were cognitively impaired, 2.3% vs. 0.7% were depressed, 3.9% vs. 1.7% had dysthymia, and 2.2% vs. 0.4% had an anxiety disorder. When the authors controlled for demographics and the increased physical disabilities and chronic medical conditions present in those who were in a bed or chair for most of the day, they found that only dysthymia was still significantly different between the two groups. The representativeness of this sample is questionable as the study was conducted on data collected in the 1980s, their determination of homebound status is different from more recent studies, and they did not find a relationship between disability and homebound status as has been found in other studies of homebound older adults (Bruce et al., 2002; Cohen-Mansfield et al., 2010; Inoue & Matsumoto, 2001)

More recently, Bruce and colleagues (2002) examined the prevalence of major depression in 539 older adults who were new admits to a home health care agency in a large suburban county in NY. A structured interview revealed that 13.5% of the sample had major depression, and this was the first depressive episode for the majority (71%). Furthermore, they found that 78% of those who had major depression had been experiencing depression for more than two months. Choi and McDougall (2007) reported that as many as 42% of homebound older adults in their sample of 81 low-income Meals on Wheels (MOW) recipients residing in a large urban area in TX scored in the depressed range on the Geriatric Depression Scale. This percentage of homebound older adults with depressive symptoms was significantly greater than older adult participants in a senior center even when taking into account demographics, health issues, and other life stressors. A study of 736 racially diverse MOW participants in a large urban area in TX found that 17.5% of the sample had symptoms of depression that were

in the clinically significant range when using the Patient Health Questionnaire- 9 (PHQ-9) (Choi et al., 2010). Another study that used the PHQ-9 to assess depression in 403 older adult recipients of MOW in a large suburban county in NY found that 12.2% of the sample had clinically significant depression and 17% showed mild symptoms of depression (Sirey et al., 2008). It seems that rates of minor and major depression are significant in homebound older adults and more prevalent than in non-homebound community-dwelling older adults. It should be noted that the rates of depression in homebound older adults may be higher than reported because many of the studies of prevalence were conducted with older adults who were receiving home care services and ignored those who were not receiving home care services. It is possible that the rates of depression are higher in those who are homebound but are not receiving home care services.

There is also some evidence that depression in homebound older adults may be chronic. Cohen-Mansfield and colleagues (2010) found, in a cross-sectional analysis of 1,812 Israeli older adults, that homebound status was related to depressed mood even when controlling for demographics, health, and functional impairment. However, in a longitudinal analysis, the authors found that the relationship between homebound status and future depressed mood was no longer significant when taking prior depressed mood into account. This may indicate that depression in homebound older adults is a chronic condition, and provides a case for its treatment in a chronic care model. Also, it suggests that those who are depressed are at a greater risk for becoming homebound. However, it is also possible that the low power of the longitudinal sample contributed to this finding. More longitudinal research is needed. A study of the persistence of major depression

over a one-month period in 539 newly admitted home care recipients also provides evidence that depression may be persistent in this population. Raue and colleagues (2003) found that after one month, 42% of the sample still met criteria for major depressive disorder, 27% partially remitted, and 31% fully remitted. The median length of the depression was four months. They did not find an association between having depression for the first time and remission, nor between remission and whether depression occurred for greater or less than 4 months, indicating that treatment may be helpful regardless of depression history. In another study providing some evidence of depression persistence, Ell and colleagues (2005) used the PHQ-9 to monitor depression over a two week period in a sample of 930 newly admitted home care program participants, and they found that 67% still met criteria for probable major or minor depression. Rates of depression may be greater than reported because those with more severe symptoms of depression such as active suicidal ideation are often excluded from studies.

Depression Risk Factors

Risk factors for depression in homebound older adults have also been examined. One study has compared symptoms of depression in 81 homebound older adult recipients of MOW to symptoms of depression in 130 non-homebound older adult senior center participants residing in a low-income, urban area of TX (Choi & McDougall, 2007). Being homebound was significantly related to having more symptoms of depression. However, they found that coping resources, specifically social support and moderate or vigorous exercise at least three times a week, mediated the relationship between

homebound status and depression and symptoms of depression were no longer significantly related to being homebound when including these variables.

Choi and colleagues (2010) have also examined the factors that are related to depression severity in 736 MOW clients. They found that being female, having more chronic medical diagnoses, increased level of cognitive impairment, and increased nutritional risk were correlated positively with depression severity. Also, African American race was negatively correlated with depression severity. Low income status (below the poverty guidelines) approached a significant relationship with depression severity. Bruce and colleagues (2002) found that major depression in 539 new home health care admits was related to more medical diagnoses, impairments in instrumental activities of daily living (IADLs), increased pain, and prior experiences of depression. Major depression was specifically associated with diabetes, end-stage organ impairment, history of heart attack, and peripheral vascular disease, which has been shown elsewhere (Qiu et al., 2006). Raue and colleagues (2003) found that in the same sample, those whose depression fully remitted at one month were more likely than those who did not fully remit to have less impairment in IADLs at baseline, experience a lot of pain, and have not experienced a recent stressful life event. Other research shows that hospitalizations may also increase risk for depression, however the relationship may be bidirectional (Davydow, Zivin, & Langa, 2014).

Onder and colleagues (2005) also found a relationship between pain and depression in 3,976 older adult recipients of home care in Europe, which is consistent with findings of Sirey and colleagues (2008). There was a significant difference in the number of those who were depressed who did not experience pain (11.3%) and those who

were depressed who did experience pain (19.5%). Depression in older adult home health care recipients also increases risk for falls (Byers et al., 2008).

A study using the PHQ-9 to determine probable major and minor depression in 930 newly admitted home care program participants found that older adults who were female and Latino were more likely to score in the probable minor or major depression range, and those who were married and African American were less likely to score in this range (Ell et al., 2005). Another study found no difference in rates of depression between 56 African American and 458 White older adult newly admitted home health care recipients as determined by the Structured Clinical Interview for DSM-IV disorders (SCID; Fyffe, Sirey, Heo, & Bruce, 2004). They found no differences between length of depressive episode or age of onset of depression between African Americans and White Americans. This study, however, may have lacked power due to the differences in sample sizes of each race.

Other studies have found an association between depression and social isolation (Choi & McDougall, 2007; Raue, Meyers, Rowe, Heo, & Bruce, 2007; Rowe, Conwell, Schulberg, & Bruce, 2006). Choi and colleagues (2010) found that 59.6% of a sample of 736 older adult recipients of MOW live alone, while Raue and colleagues (2007) found that 39% of 539 older adult users of home health care services live alone. In a study of 81 low-income older adult recipients of MOW, 24.7% considered their loneliness or not having enough friends to be a problem (Choi & McDougall, 2007). The MOW recipients had lower subjective views of their social support from family and friends than participants who attended senior centers. Gellis (2010) found that in a sample of 289 older adult home care recipients, those who were depressed had significantly fewer social

visits per week than those who were not depressed. It should be noted that the findings on the factors related to depression in homebound older adults are not yet fully understood and the relationships may be bidirectional, occur in the other direction, or be caused by other variables.

Studies show that it is difficult to fully identify the homebound older adult population because the definition of homebound status is debated, and more research is needed in many areas. It seems that they suffer from many comorbid medical conditions and are at a greater risk for depression than community-dwelling older adults. Also, many of the characteristics that are common in homebound older adults such as increased medical diagnoses, impairment in ADLs, and social isolation also place them at a greater risk for depression. Current home health care practices for homebound older adults will now be discussed.

Home Health Care Practices for Management of Depression in Homebound Older Adults

Health Care Utilization

There is a high rate of hospitalization and emergency room visits in older adult users of home health care (Smith et al., 2005). There are few studies examining the relationship between homebound older adults' use of different home health care services and depression. Friedman and colleagues (2009) found that diagnoses of minor or major depression in 539 older adult newly admitted home health care recipients in suburban NY seemed to have no effect on their use of specific services including use of a skilled nurse, home health aide, physical, occupational, or speech therapist, or medical social services worker. The authors state that the lack of a relationship is most likely caused by the facts

that the older adults are in a transitional state, coming from a hospital, nursing home, or rehabilitation facility to home health care and that they have disability and chronic illnesses. Given these medical realities, treatment for depression needs to be integrated with care for their other illnesses. Research also shows that depression can increase the short-term risk for hospitalization in older adults who are newly admitted to home health care as Sheeran and colleagues (2010) found in a sample of 48 English or Spanish speaking homecare recipients in NY, VT, and FL. Depressed homebound older adults are also at greater risk for emergency room visits (Choi, Marti, Bruce, & Kunik, 2012d). Himelhoch and colleagues (2004) found that for medical beneficiaries with at least one chronic condition, a depression diagnosis increased the likelihood of ER Visits and hospitalizations.

Provision and Use of Depression Care

In the current delivery system design, the primary care provider (PCP) is most likely to provide treatment when depression occurs in homebound older adults; however, only 13.6% of homebound older adults consult a PCP when they are feeling depressed (Choi, et al., 2012c; Choi & McDougall, 2007). Homebound older adults are more likely to follow up on referrals to PCPs than specialists such as psychiatrists when it comes to treatment for mental health. This suggests that PCPs need to be more educated on depression in homebound older adults (Habib, Sanchez, Pervez, & Devanand, 1998). Other studies suggest that homebound older adults do not commonly seek out any treatment for their depression (Choi & McDougall, 2007). In Choi and McDougall's study of 81 low-income older adult MOW recipients and 130 older adult senior center users, 4.9% of homebound older adults talked to a psychiatrist or psychologist when

coping with their depression. This may be because few psychologists and psychiatrists are involved in the current homecare system (Choi, 2009; Johnston et al., 2010). Homebound older adults were also not likely to seek out support from social workers, with only 12.3% using this as a coping strategy. They were more likely to seek out social worker support than non-homebound older adults, likely due to their involvement in home-based programs such as MOW where social workers are commonly employed. Homebound older adults were also more likely to use frequent praying, watching TV or listening to music, talking to a family member, talking to a friend, and waiting and hoping the problem will go away to cope with their depression than to seek professional help (Choi, 2012c; Choi & McDougall, 2007).

A survey of 54 home health agency directors found that agencies are hesitant in assisting with behavioral problems, poor at diagnosing previously undiagnosed disorders, and tend to be biased against the acceptance of clients with psychiatric diagnoses (Zeltzer & Kohn, 2006). A survey of 26 MOW associations in 14 states found that 92% of agencies reported that depression was a problem for their clients and not all of these used a depression screener (Choi, 2009). Only 38% of staff members who served clients had a master's degree, and 81% had a bachelor's degree. Sixty-two percent provided some degree of case management services. For clients with suspected depression, only 19% of agencies referred to mental health specialists (all of these agencies were in large cities), 19% referred to case managers at an agency that sponsored them, 12% referred to Adult Protective Services for severe depression, 50% talked with the client or notified the family, and 4% (only one agency) provided short-term depression treatment. Sixty-five percent of agencies reported interest in including a short-term depression treatment for

their clients, but many were concerned that high caseloads would make this difficult to implement. More evidence on the provision of depression care in organizations such as these is needed.

The Chronic Care Model

The Chronic Care Model (CCM) was first proposed by Wagner and colleagues to meet the health care needs of those with chronic illnesses (Bodenheimer, Wagner, & Grumbach, 2002; Wagner et al., 2001; Wagner, Austin, & Von Korff, 1996a, 1996b). They noted the large percentage of older adults with chronic illnesses, accounting for 75% of all health care spending, and that the health care system is set up to treat acute illness. Their CCM includes six essential pieces (see Figure 1; "The Chronic Care Model," 2006): community resources and policies, health care organization, self-management support, delivery system design, decision support, and clinical information systems. The community resources and policies piece posits that health care providers need to be aware of the resources and policies in the community so they can refer their patients to the appropriate places. The health care organization piece states that "the structure, goals, and values of a provider organization and its relationships with purchasers, insurers, and other providers form the foundation upon which the remaining 4 components of the chronic care model rest" (Bodenheimer et al., 2002, p. 1776). The organization must see the CCM as a priority. Self-management support requires that the patient is the one responsible for managing their chronic illness, and they need to be taught to manage their illness and offered support in this endeavor. Delivery system design supports the practice that some medical personnel offer acute care treatment while others offer chronic care treatment. Non-physician personnel are capable of helping

patients manage their chronic illnesses, and physicians should only be involved in training and when the case is complicated. This level of specialist involvement fits with the findings of screening for depression in homebound older adult (Brown, Kaiser, & Gellis, 2007; Brown, Raue, Roos, Sheeran, & Bruce, 2010; Bruce et al., 2007). Planned visits are important. Decision support posits that patients should be taught evidence-based clinical practice standards for use in their daily lives, and they should be able to contact a specialist by phone. Clinical information systems describe computerized information that should serve as a reminder system for primary care teams to follow best practices, provide feedback to physicians on their performance on chronic illness measures, and serve as a registry (list of patients who have a certain chronic illness) to help with providing a client's care.

Chronic Care Models for Homebound Older Adults

Three CCMs have been developed for older adults including one for providing frail older adults primary care at home (Muntinga et al., 2012), one that was designed for use with homebound older adults (Suter, Hennessey, Florez, & Newton Suter, 2011; Suter et al., 2008), and the VA's model of Home-Based Primary Care (HBPC; Hicken & Plowhead, 2010; Wharton et al., 2012). Although only the VA model thoroughly accounts for depression, these CCMs include many pieces that are useful for managing depression in homebound older adults. Characteristics such as continuous assessment, specialist involvement, use of technology, and patient education can be helpful in depression management. However, some pieces need to be added in order to provide adequate care for depressed homebound older adults. These pieces include use of empirically-supported depression treatments, training for care providers, communication

between care providers, and caregiver involvement. Some interventions developed for depressed older adults include some of the pieces that are missing from the CCMs developed for homebound older adults (Bruce et al., 2004; Unutzer et al., 2002; Ciechanowski et al., 2004; Bruce et al., 2011a; Bruce et al., 2011b). These CCM-based interventions will be discussed as the proposal model is explained.

Chronic Care Model for Depression

The chronic care model has been adapted for managing depression in a wide variety of settings, many in primary care (Holm & Severinsson, 2012; Katon, 2012; Thota et al., 2012; Woltmann et al., 2012). CCMs for depression have not only had positive outcomes for decreasing depression but also for improving quality of life and social role function (Woltmann et al., 2012). There is also evidence that treatment adherence, treatment response, and patient satisfaction with the care improves (Thota et al., 2012). Being able to redesign the system of delivery and having the strong support of a leader are important factors for the successful implementation of CCMs for depression in primary care (Holm & Severinsson, 2012). Problems in the organization, administrators, and professionals in applying the changes outlined by the CCM and difficulties in the care manager's understanding of his or her responsibilities for each depressed client may prevent CCMs from being successfully implemented. Also, many chronic care models for the management of depression are cost-effective and cheaper than or cost the same as usual care (Jacob et al., 2012; Woltmann et al., 2012).

Chronic Care Model for Depressed Homebound Older Adults and Future Directions

The Chronic Care Model for Depressed homebound Older Adults is an effort to bridge the gap between current treatment of depressed homebound older adults and chronic care models so that this population of older adults can be provided with the best overall health care. This model includes five pieces for care optimization: Training/Education, Technology, Communication/Collaboration, Delivery System Design, and Specialist Involvement. For successful implementation, it is recommended that all involved know their roles and what changing their current system will require (Holm & Severinsson, 2012). The model is shown in Figure 2. As can be seen, the community, health care system, patient/caregiver, and providers are all important players in the model.

Training/Education

Patient education. Psychoeducation may be particularly useful for homebound older adults because Sirey and colleagues (2008) found that depressed homebound older adults are poor at identifying their own depression. Sheeran and colleagues (2011) used psychoeducation in their telehealth depression care management intervention that improved depression symptoms. Perhaps if older adults knew more about the symptoms of depression and how they can sometimes overlap with symptoms of physical disorders and side effects of medications, they would be more likely to seek treatment for their depression. Psychoeducation for depression should be present in many different arenas: home health care agencies, hospitals, nursing homes, rehab facilities, and primary care offices. The staff at these health care organizations should be trained to recognize the

symptoms of depression and information about depression in older adults should be displayed prominently.

Provider education. Training and education about depression in homebound older adults are also important for providers. Many CCM-based interventions for depression have trained providers on management of depression using specialists (Bruce et al., 2004; Ciechanowski et al., 2004; Unutzer et al., 2002). However, a "train-the-trainer model" has also been shown to be effective (Delaney et al., 2011). In this model, an expert trains a trainer who then goes on to train others. Home health nurses and case managers need to be trained on recognizing and treating depression in homebound older adults. PCPs need to be trained on management of depression in older adults as they may be the first line of treatment (Choi, et al., 2012c; Choi & McDougall, 2007; Habib et al., 1998). Also, organizations need to be trained on this updated model of care for depressed homebound older adults so that implementation is as successful as possible.

Delivery System Design

A major piece of this model is to redesign the delivery system specifically for this population. This will include more visits (both in-person and by telephone) between homebound older adults and home health care providers, thorough assessments, and the use of empirically-supported treatments. A high-touch delivery system as suggested in the original CCM will be important (Wagner, Austin, & Van Korff, 1996a, 1996b). The CCM developed for home care recipients by Suter and colleagues (Suter, Hennessey, Florez, & Newton Suter, 2011; Suter et al., 2008) also suggests that providing more visits is important for providing quality care. This model also recommends that health care offer more services, such as mental health and primary care. The VA Home-Based

Primary Care (HBPC) program offers many services including primary care, nursing, social work, pharmacy, psychology, recreation therapy, and this program has been successful at reducing ER visits and hospitalizations (Darkins et al., 2008; Edes et al., 2010). The proposed model also posits that admission to the program is continuous, as is the case in other models such as the VA Home-Based Primary Care (HBPC) program (Edes et al., 2010).

Targeted assessment of depression and risk factors. An important part of the delivery system design for this model is the assessment that occurs upon admission and throughout care. Research shows that home health care nurses can be trained to better identify depression in their routine provision of care (Brown et al., 2007; Brown et al., 2010; Bruce et al., 2007). Studies find that the PHQ-9 is more accurate at identifying depression than the PHQ-2 used in the OASIS (Ell et al., 2005); however, training in better use of the OASIS may also be acceptable. One intervention developed for this purpose is the TRaining In the Assessment of Depression (TRIAD) intervention, which helped home care nurses use the OASIS screening to more accurately identify depression (Brown et al., 2007; Brown et al., 2010; Bruce et al., 2007).

Even if an older adult does not meet criteria for depression, the assessor should look for certain risk factors for depression such as somatic symptoms of depression, ADL impairment, a poor sense of subjective health, and decline in ADL impairment (Weinberger et al., 2009). Risk for development or persistence of suicidal ideation should also be assessed. A lower perceived level of social support is another important risk factor that should also be assessed (Raue et al., 2007). Risk factors for not responding well to treatment, for having chronic depression, or for developing depression

in the year after starting to receive home health care should be noted. A period of watchful waiting as suggested by Weinberger and colleagues (2009) would be preferable for those who have some of these risk factors, with periodic reassessments of depression as this would be more cost effective than treating the risk for depression. Those who have living arrangement/housing problems may not respond as well to Problem-Solving Therapy (PST; Choi et al., 2012a), so other treatment options such as antidepressants and other types of psychotherapy should be considered for these people. These risk factors should be recorded in the patient's medical record so that the entire care team is aware of the risk for depression or lack of response to a particular depression treatment.

Screening for cognitive impairment is also an important part of this assessment process because it is the most prevalent psychiatric diagnosis in homebound older adults, and it can often be undetected in this population (Kronish et al., 2006; Setter et al., 2009). Cognitive impairment complicates the treatment and detection of depression because it can mimic the symptoms of depression and more severe cognitive impairment can make some psychosocial interventions for depression more difficult. Psychosocial interventions that involve caregivers and promote adaptation to the environment such as in-home problem adaptation therapy (PATH) may be the first line of suggested treatment for depressed homebound older adults with cognitive impairment (Kiosses, Arean, Teri, & Alexopoulos, 2010). PATH is a type of PST developed specifically for cognitively impaired older adults that uses caregiver involvement and helps the client to better adapt to their environment.

Provision of care. Like many of the CCM-based interventions for depressed older adults that have been successful (Katon, 2012; McEvoy & Barnes, 2007), the proposed

model uses a stepped care approach. Depressed homebound older adults should be informed of what treatments will be most beneficial to them and then choose the treatment that they most prefer because allowing a client to choose their treatment is associated with less early drop out (Choi & Morrow-Howell, 2007; Gum et al., 2006; Landreville et al., 2001). For some, a peer volunteer program may be most effective, for others an antidepressant may work, and for others psychotherapy may have the best outcome. The least burdensome options should be tried first to see if they have an effect before the most burdensome interventions are attempted.

A key feature of this model is that depression care is integrated into the health care that homebound older adults are already receiving for their chronic diseases. Those who are depressed may benefit from the chronic illness self-management training advocated in CCM models (Bodenheimer et al., 2002; Suter et al., 2011; Suter et al., 2008; Wagner et al., 1996a, 1996b) because they are more likely to experience improvement in self-efficacy (Jerant, Kravitz, Moore-Hill, & Franks, 2008).

Caregiver involvement. Caregiver involvement may also be useful when available for depressed homebound older adults, but has not often been integrated into CCMs. African American caregivers and caregivers who are in a younger generation than the homebound older adult may be more interested in receiving training to improve their caregiving skills than older or white caregivers (Wilkins, Bruce, & Sirey, 2009). Also, when there is a closer relationship between the caregiver and the patient, the patient is less likely to be admitted to a nursing home (Kesselring et al., 2001). More research is needed in the use of caregivers to help with management of care. However, the caregiver should be involved in helping the homebound older adult in a manner that is most helpful

for both parties because caregiving can be burdensome. Caregiver presence is another aspect of the model that will be explored in this study.

Depression care manager. Having a depression care manager is also important. If possible, depression management should be the sole responsibility of a care manager or specialist as is the case in the Improving Mood-Promoting Access to Collaborative Treatment (IMPACT) and Program to Encourage Active Rewarding Lives for Seniors (PEARLS) interventions because current home health care workers do not have the time or resources to take on these added responsibilities (Ciechanowski, et al., 2004; Unutzer, et al., 2002). The IMPACT intervention is a program to treat depression in older adults in primary care by using a depression care manager and problem solving therapy. Comparing the IMPACT participants (N= 906) to usual care participants (N = 895) at one-year, 45% of IMPACT participants had at least a 50% reduction in symptoms of depression compared to only 19% of usual care participants (Unutzer et al., 2002). PEARLS is an in-home intervention for depressed older adults that used a care manager and problem solving therapy. Participants were randomized to the PEARLS intervention (N = 72) or usual care (N = 66). At one year, PEARLS participants were more likely to have experienced full depression remission and a 50% or greater lessening of symptoms of depression than those in usual care (Ciechanowski et al., 2004). Care managers should be taught about the importance of the model because successful implementation of a CCM-based intervention depends partly on a care manager who believes in the importance of the intervention (Casado et al., 2008). Use of nurses and social workers to manage depression and serve as care managers in home health care may be ideal (Davitt & Gellis, 2011).

Communication/Collaboration

Communication between patients and care providers and among providers themselves is a very important piece of the Chronic Care Model for Depressed homebound older adults. This is a key factor for the success of CCM-based interventions such as PEARLS (Steinman et al., 2012). Communication is also essential in ensuring adequate collaboration among care providers (Bao et al., 2011; Holm & Severinsson, 2012; Thota et al., 2012). This piece of the model was tested in this study by examining the number of home health visits that occur. More home visits is indicative of more contact and communication between patients/caregivers and providers.

Collaboration between social services and psychology is also an important piece of the model. This was included in successful CCM-based interventions for depression in older adults (Bruce et al., 2004; Ciechanowski et al., 2004; Unutzer et al., 2002), and it has also been recommended from studies of PST with older adult recipients of home care (Choi, 2009). The interventions that foster collaboration between home health care agencies and the health care system seem to be more effective than the interventions that operate outside of home health care agencies. Home health care service agencies should seek to employ or refer to a mental health professional who is aware of the unique difficulties of working with depressed homebound older adults.

Collaboration should also occur between organizations, both those in the community and those in the health care field. This is a factor that has been present in many CCM-based depression interventions for older adults (Bruce et al., 2004; Ciechanowski et al., 2004; Gitlin et al., 2012; Quijano et al., 2007; Unutzer et al., 2002). There have been many successful collaborations between home health care service

agencies and primary care clinics. Expanding such collaboration among hospitals, nursing homes, rehabilitation facilities, primary care clinics, mental health services, senior service centers, adult care centers, and home health care agencies could insure more rapid referral to appropriate services, including mental health services when appropriate.

Transitional care is also important in this model. Better communication among health care and community organizations could optimize care and improve transitions between care organizations. Transitional care from a hospital or rehab facility to home care can be optimized with a program that initiates home health care quickly, connects the patient with needed services, conducts a thorough assessment, uses telephone and in-home follow-ups, and looks for 11 risk factors for hospital readmission (Watkins, Hall, & Kring, 2012). In-home visits and the use of a care manager are important factors of transitional care to prevent hospitalizations (Naylor, Aiken, Kurtzman, Olds, & Hirschman, 2011). Home visit interventions are effective at preventing nursing home admission and decline in functioning if they include multidimensional assessment, follow-up visits, and are geared towards older adults who are not at great risk for death (Stuck, Egger, Hammer, Minder, & Beck, 2002). These are all features that are suggested by this Chronic Care Model for Depressed homebound older adults.

Specialist Involvement

Mental health specialist involvement is important in this model. A number of CCM-based interventions (Bruce et al., 2011a; Bruce et al., 2011b), have included involvement of a specialist when the care manager deems it necessary. The Depression CARE for PATients at Home (Depression CAREPATH) intervention involved specialists

if necessary and was found to be effective at reducing depression in older adult recipients of home health care (Bruce et al., 2011a; Bruce et al., 2011b). The mental health specialist can also provide training. Using specialists on an as-needed basis minimizes costs, and successful implementation of depression care management models has shown that routine specialist involvement may be unnecessary (Casado et al., 2008; Quijano et al., 2007). Specialists may also be able to provide supervision and consultation to home health care staff who are implementing depression care management if providing in-house supervision is difficult, as has been shown in some cases (Casado et al., 2008).

Technology

Technology can be effective in helping to manage depression and chronic illnesses in homebound older adults (Choi et al., 2012b; Gaikwad & Warren, 2009; Nakamura, Takano, & Akao, 1999; Sheeran et al., 2011), and it is also recommended in many CCMs (Suter et al., 2011; Suter et al., 2008; Wagner et al., 2001, 1996a, 1996b). Telehealth management of chronic diseases has also been shown to reduce hospitalizations, increase satisfaction with care, and it is more cost effective than other interventions (Darkins et al., 2008). The proposed depression care management model also integrates technology utilization for keeping track of assessments, treatments, and treatment follow-ups, recording risk factors, and tracking demographics. Telephone calls to check in are an important part of this model, as advocated by Suter and colleagues (2008; 2011).

Implementing the Model: Research Questions

The proposed model is an attempt to address the needs of a vulnerable population by integrating depression management into a chronic care model that changes the

structure of the current health care system. This model proposes changes in many different aspects of care in the hopes that these changes will improve the health of depressed homebound older adults. It incorporates research about health and depression in homebound older adults, current home health care system practices, CCMs, and CCM-based interventions to create an innovative Chronic Care Model for Depression in homebound older adults.

The current home health care system creates some problems for the implementation of this model. A large barrier that currently exists in transforming the home health care system is that Medicare Part A currently only funds for 60-day intervals. Home health care is more cost effective than long-term facility care (Qiu et al., 2010), but until the funding for home health care is changed, it will be difficult to change depression management in home health care (Ell et al., 2007). Compelling research on the cost-effectiveness of CCM-based interventions could help in this endeavor. Pieces of the proposed model should also be tested to determine which piece or pieces are necessary to produce the desired outcomes.

Little is known about outcomes such as hospitalizations, emergency room visits, and nursing home placement for depressed homebound older adults. It is known that depressed homebound older adults are at a greater risk for hospitalization in the short-term when they are newly admitted to home care (Sheeran et al., 2010). Also, depressed homebound older adults are at a greater risk for emergency room visits (Choi et al., 2012d). The HBPC system used in the VA has been shown to decrease hospitalizations (Darkins et al., 2008). In-home visits and use of a care manager have been shown to reduce hospitalizations (Naylor et al., 2011). Preventive in-home interventions have also

been shown to decrease nursing home admissions (Stuck et al., 2002). ER visits, hospitalizations, and Skilled Nursing Facility (SNF) admissions were the outcomes examined in this study because they serve as objective measures of functioning, and linking features of chronic care models such as the one proposed to cost-saving outcomes may improve the likelihood that CCMs will be implemented.

The present study aimed to examine how aspects of *The Chronic Care Model for Depressed Homebound Older Adults* related to three specific outcomes: ER visits, hospitalizations, and SNF admissions for homebound older adults. In this study, the overlapping aspects of the proposed model between patient and provider were examined, including the communication between client and provider and the delivery system design. This was the first study to examine how aspects of the current home health care system are related to patient outcomes for depressed homebound older adults. This study also examined caregiver involvement. To test the communication piece of the model, the number of visits between patients and providers was used. The delivery system design piece of the model was tested using the number of services the home health agency can provide to the patient.

Hypothesis 1. Depressed home health care recipients who receive more visits from their home health agency will have fewer ER visits, hospitalizations, and SNF admissions.

Hypothesis 2. Home health agencies that provide more services to their depressed clients will have clients who have fewer ER visits, hospitalizations, and SNF admissions.

Hypothesis 3. Depressed home health care recipients who have a caregiver involved in their care will have fewer ER visits, hospitalizations, and SNF admissions

than those who do not have a caregiver involved in their care. Also, this effect will be greater for African Americans.

Hypothesis 4. Home health care recipients who are discharged from a short-term hospital stay to a home health agency will be more likely to be depressed that those who were not discharged from a short-term hospital stay. This effect will be greater for those clients who do not have a caregiver involved in their care.

METHODS

Sample

The study samples were drawn from two national databases available from the Centers for Medicare/Medicaid Services (CMS). The Medicare and Medicaid Home Health Outcome and Assessment Information Set (OASIS) consists of information about socio-demographics, environment, support system, health status, functional status, and health service utilization characteristics of home health care recipients. The database contains information about home health care recipients from the years 1999 to 2012. The Master Beneficiary Summary File contains demographic information, information about medical conditions, and information about home health visits, ER visits, hospitalizations, and SNF admissions. A 5% random sample of these databases was requested. This ensured that the sample is nationally representative. The Home Health Compare database was also used to examine some variables such as the number of services offered.

Measures

The following items from the OASIS database and Master Beneficiary Summary File database were the independent and dependent variables for the four hypotheses.

The OASIS variable, M1000: "from which of the following inpatient facilities was the patient discharged during the past 14 days?" determined discharge from short-term hospital stay. The options included long-term nursing facility, skilled nursing facility, short-stay acute hospital, long-term care hospital, inpatient rehabilitation hospital

or unit, psychiatric hospital or unit, other, and patient was not discharged from an inpatient facility.

The Home Health Compare database lists the services that each agency provides which served as the indicator of the number of services provided by each home health care agency to their clients. These services included nursing care, physical therapy, occupational therapy, speech pathology, medical social services, and home health aide services.

This study used two two different depression indicators: the PHQ-2 and a Medicare Claims variable. Each of these measures was used to identify depressed patients for analyses addressing Hypotheses 1-3, and served as dependent variables in tests of Hypothesis 4. The OASIS variable M1730 Depression Screening, consists of the Patient Health Questionnaire 2 (PHQ-2), which is a depression screening assessment tool (Kroenke & Spitzer, 2002; Kroenke, Spitzer, & Williams, 2003; Lowe, Kroenke, & Grafe, 2005). Studies indicate that it is a valid screening tool for major depression in older adults (Li, Friedman, Conwell, & Fiscella, 2007) and find that the PHQ-2 has excellent sensitivity (87%) and good specificity (78%; Kroenke et al., 2003; Lowe et al., 2005; Arrol et al., 2010) for detecting major depression and good sensitivity (79%) and excellent specificity (86%) for detecting any depressive disorder (Lowe et al., 2005). The Master Beneficiary Summary File measure of depression is based on Medicare Claims. This variable indicates that a Medicare claim has been made for depression and the beneficiary has received a service or treatment for this condition. This measure had a sensitivity of 42% and a specificity of 88%. when compared to SCID interviews to identify major and minor depression (Hwang et al., 2015). Hwang and colleagues also

found that the Medicare Claims measure of depression may be biased due to patient ethnicity and medical comorbidities. Medicare Claims data may underestimate the prevalence of depression (Noyes, Liu, Lyness, & Friedman, 2011).

The OASIS variable M1100 Patient Living Situation served as the indicator of caregiver involvement. This item identified whether the patient lives alone, lives with other person(s) in the home, or lives in a congregate situation. It also determined the availability of assistance: around the clock, regular daytime, regular nighttime, occasional/short-term assistance, no assistance available. Those who had no assistance available were designated as "No caregiver involvement," compared with those who lived alone and those who lived in congregate housing.

The Master Beneficiary Summary File variable Acute Stays, which provides the number of acute inpatient hospitalizations that the beneficiary experienced in 2012 was the determinant of the variable hospitalizations.

The Master Beneficiary Summary File variable Hospital Outpatient Emergency Room Visits, which provided the number of ER visits the beneficiary had in 2012 in which they were not admitted to the hospital was the determinant of the variable ER visits.

The Master Beneficiary Summary File variable SNF stays, which provides the number of nursing home (or Skilled Nursing Facility (SNF)) admissions in 2012 was the determinant of the variable SNF admissions.

The Master Beneficiary Summary File variable home health visits, which reveals the number of home health visits that the beneficiary received in 2012, was the indicator of the number of home health visits that were provided to each patient.

Demographic information such as age, ethnicity, and gender were also be available in both the OASIS and the Master Beneficiary Summary Files.

Based on research on factors related depression in home health care recipients, the analyses controlled for several variables. These included medical illnesses and functional impairment. The Master Beneficiary Summary File contained information about medical diagnoses of each home health care user, and variables in this file determined presence of certain potentially confounding medical conditions. The following medical conditions that were present in the Master Beneficiary Summary File were used independently in the analyses. These included Acute Myocardial Infarction (AMI), Dementia, Chronic Kidney Disease (CKD), Chronic Obstructive Pulmonary Disease (COPD), Congestive Heart Failure (CHF), Diabetes, and Stroke/TIA. These conditions were included as independent dichotomous factors (disease absence vs. disease presence). The OASIS variables M1800 Grooming, M1810 Ability to dress upper body safely, M1820 Ability to dress lower body safely, M1830 Bathing, M1840 Toilet transferring, M1845 Toileting hygiene, M1850 Transferring, M1860 Ambulation/Locomotion, M1870 Feeding or eating, M1880 Ability to plan and prepare light meals, and M1890 Ability to use telephone determined functional impairment. Each functional impairment item is scored on a scale starting at 0 and ranging from 3 to 6. To calculate the total level of functional impairment, a sum of all the items created a continuous IADL/ADL impairment variable, such that higher scores are indicative of more impairment.

Analyses

This study used SPSS Version 22 to conduct data analyses. The p-value was set at 0.01 to decrease the probability of Type I error due to the large power of the sample.

To analyze the hypotheses, the three databases were linked. The OASIS database contained the most information about the sample. This was used as the base file. The number of services, a variable in the Home Health Compare database, was linked to the OASIS database based on the Home Health Agency Medicare ID. The number of home health visits, ER visits, hospitalizations, and SNF admission, variables in the Master Beneficiary Summary File, were linked to the OASIS database based on the beneficiary ID. There were 862,543 patients in the original OASIS database. This number was reduced to 219,883 with no missing PHQ-2 data and 227,283 with no missing Medicare Claim depression data. These numbers were further reduced when conducting the analyses due to missing data in other variables. Negative binomial regressions were used in Hypotheses 1-3. Negative binomial regression is recommended for use with overdispersed count data, meaning data where the variance is much greater than the mean (Gardner, Mulvey, & Shaw, 1995; Piza, 2012). The three main dependent variables in this study: ER visits, hospitalizations, and SNF admissions were extremely positively skewed with variance much greater than the mean. Linear regression analyses could not be used because the dependent variables were not normal, even after multiple transformations were employed. Also, when employing a linear regression, the analyses showed heteroscedasticity. The negative binomial regression allowed for both non-normality and heteroscedasticity.

Hypothesis 1: Depressed home health care recipients who receive more visits from their home health agency will have fewer ER visits, hospitalizations, and SNF admissions. Six negative binomial regressions were used. These analyses included only depressed home health care clients. Three analyses were conducted with each depression sample (PHQ-2

and Medicare Claims), one for each dependent variable (ER visits, hospitalizations, and SNF admissions). The number of home health visits provided and the potential confounding factors were the independent variables. Each of these dependent variables was tested as a continuous variable (the number of occurrences of each).

Hypothesis 2: Home health agencies that provide more services to their depressed clients will have clients who have fewer ER visits, hospitalizations, and SNF admissions. Six negative binomial regressions were used to test this hypothesis. Only depressed home health clients were included in these analyses. Three analyses were conducted with each depression sample (PHQ-2 and Medicare Claims); one for each dependent variable (ER visits, hospitalizations, and SNF admissions). Due to the fact that many home health care recipients received services from the same home health agencies, analyses were conducted at the home health agency level. The averages of the continuous independent variables were computed for each home health agency across the depressed home health care recipients who used that agency. Percentages of the categorical independent variables were computed including percentage of females, percentages of presence of each medical condition, percentage of those who live alone, percentage of those who live with a caregiver, and percentages of those in each race. The services provided by the agency and the potential confounding factors were the independent variables and the dependent variables were hospitalizations, nursing home admissions, and emergency room visits. Each of these dependent variables were continuous sum variables (the total number of occurrences of each for all users of that home health agency). Number of users of the home health agency was natural log transformed and then entered as an offset variable, because of the assumption of the negative binomial regression that requires

count data rather than averages for the dependent variables. The log transformation of the offset variable was completed because the negative binomial regression employs a log link function.

Hypothesis 3: Depressed home health care recipients who have a caregiver involved in their care will have fewer ER visits, hospitalizations, and SNF admissions than those who do not have a caregiver involved in their care. Also, this effect will be greater for African Americans.

Six negative binomial regressions were again used. These analyses examined only those participants who are depressed. Three analyses were conducted with each depression sample (PHQ-2 and Medicare Claims), one for each dependent variable (ER visits, hospitalizations, and SNF admissions). The independent variables were caregiver involvement and the potentially cofounding factors and the dependent variables were hospitalizations, nursing home admissions, and emergency room visits. Each of these dependent variables was tested as a continuous variable (the number of occurrences of each). Then, an interaction term was created to test whether African American race moderated the relationship between caregiver involvement and each outcome variable.

Hypothesis 4: Home health care recipients who are discharged from a short-term hospital stay to a home health agency will be more likely to be depressed that those who were not discharged from a short-term hospital stay. This effect will be greater for those clients who do not have a caregiver involved in their care. This was tested using two logistic regressions with discharge location as the independent variable and depression (PHQ-2 and Medicare Claims) as the dependent variable. Discharge location was a categorical variable with the options being discharge from short term hospital stay vs. no discharge

from short term hospital stay. Caregiver presence was added to the model to examine if this is a moderator of the relationship between discharge location and depression. Caregiver presence was a categorical variable with the options being homebound older adult lives alone, lives with a caregiver, or lives in congregate housing. To test the moderation effect, an interaction term was created for discharge location and caregiver availability. The analysis controlled for the factors that are related to depression in homebound older adults including medical diagnoses and functional impairment.

RESULTS

Descriptive statistics: Descriptive statistics for each of the 20 analyses are shown in Tables 1-8. Each table contains information about results of the same analysis conducted with each depression sample (PHQ-2 and Medicare Claims). Table 1 contains information about the descriptive statistics for all three negative binomial regressions testing the effects of the number of home health visits on the number of ER visits, hospitalizations, and SNF admissions for each depression sample. Means and standard deviations for variables entered into the equation are provided. Tables 9-18 provide information on regression coefficients for each analysis. The samples vary based on hypothesis and analysis. Hypotheses 1, 2, and 3 looked at only the depressed people in the sample. Hypothesis 4 examined the entire sample. Of the overall sample of (219,883 for the PHQ-2 variable and 227,283 for the Medicare Claims variable) subjects, the PHQ-2 determined that 15,473 (7.0% of the sample) were depressed, and the Medicare Claims determined that 27,249 (12.0% of the sample) were depressed. The resulting depression percentages fell within the ranges of depression that have been found with homebound older adults (Bruce & McNamara, 1992; Choi & McDougall, 2007; Choi et al., 2010; Qiu et al., 2010). The demographics of the PHQ-2 and Medicare Claims samples vary a bit depending on the variables used in each analysis.

Hypothesis 1. The first hypothesis examined whether the number of home health visits was related to ER visits, hospitalizations, and SNF admissions for depressed homebound older adults. The hypothesis was tested with three negative binomial

regression analyses on each depression sample (PHQ-2 and Medicare Claim Data), with the following independent variables: Number of ER visits, number of hospitalizations, and the number of SNF admissions, yielding six negative binomial regressions in total. In each analysis, sex, age, race, living situation (alone, caregiver, congregate housing), AMI, Dementia, CKD, COPD, CHF, Diabetes, Stroke/TIA, and level of IADL/ADL dependence, and the number of home health visits were entered into the analysis. The first set of negative binomial regressions tested whether increased home health visits decreased the number of ER visits. Table 1 shows the descriptive statistics of these analyses, and Table 9 shows the results of the two negative binomial regression analyses with ER visits as the dependent variable. In both of these analyses the Pearson Chi-Square Value was not significant, indicating that the models fit the data well. The Omnibus Tests yielded the following likelihood ratio Chi Squares: ($\chi^2(19) = 845.39$, $p = 0.000$; $\chi^2(19) = 1031.00$, $p = 0.000$, respectively), indicating that the models were statistically significant. Table 9 shows the regression coefficients and incidence rate ratios (IRRs) for each variable entered into the equation; the following variables contributed significantly to both equations: Race, age, Dementia, CKD, COPD, CHF, Stroke/TIA, and living situation were significantly related to the number of ER visits. IRR indicates that for every one unit increase in the independent variable, the dependent variable increases by the value of the IRR. Sex, AMI, and IADL/ADL dependence were also significantly related to the number of ER visits with the PHQ-2 sample only. Number of visits also contributed significantly (p=0.001 PHQ-2, p=0.000 Medicare Claims) to number of ER visits in both equations with an IRR of 1.001, indicating that

the percent change in the incident rate of number of ER visits is a 0.1% increase for every unit increase in number of visits.

The second set of negative binomial regressions tested whether home health visits were related to the number of hospitalizations. Table 10 shows the results of the two negative binomial regression analyses (PHQ-2 and Medicare Claim) with number of hospitalizations as the dependent variable. In both of these analyses the Pearson Chi-Square Value was not significant, indicating that the models fit the data well. The Omnibus Tests yielded the following likelihood ratio Chi Squares: ($\chi^2(19) = 1208.83$, $p = 0.000$; $\chi^2(19) = 1345.00$, $p = 0.000$, respectively), indicating that the models were statistically significant. In each analysis, sex, age, race, living situation (alone, caregiver, congregate housing), AMI, Dementia, CKD, COPD, CHF, Diabetes, Stroke/TIA, and level of IADL/ADL dependence, and the number of home health visits were entered into the analysis. Race, age, AMI, CKD, COPD, CHF, Stroke/TIA, and living situation were significant contributors to the number of hospitalizations in both models. Level of IADL/ADL dependence was also significantly related to number of hospitalizations in the Medicare Claims sample. Number of visits also contributed significantly (p=0.001 PHQ-2, p=0.008 Medicare Claims) to number of hospitalizations in both equations with an IRR of 1.001, indicating that the percent change in the incident rate of number of hospitalizations is a 0.1% increase for every unit increase in number of visits.

The third set of negative binomial regressions tested whether home health visits were related to the number of SNF admissions. Table 11 shows the results of the two negative binomial regression analyses (PHQ-2 and Medicare Claim) with number of SNF admissions as the dependent variable. In both of these analyses the Pearson Chi-Square

Value was not significant, indicating that the models fit the data well. The Omnibus Tests yielded the following likelihood ratio Chi Squares: ($\chi^2(19) = 689.53$, $p = 0.000$; $\chi^2(19) = 942.59$, $p = 0.000$, respectively), indicating that the models were statistically significant. In each analysis, sex, age, race, living situation (alone, caregiver, congregate housing), AMI, Dementia, CKD, COPD, CHF, Diabetes, Stroke/TIA, and level of IADL/ADL dependence, and the number of home health visits were entered into the analysis. Race, age, Dementia, CKD, COPD, CHF, Stroke/TIA, living situation, and IADL/ADL dependence were significantly related to the number of SNF admissions in both models. Sex was also a significant contributor to SNF admissions in the Medicare Claims sample. In the PHQ-2 sample, number of visits (p=0.000) was significantly related to SNF admissions with an IRR of 1.001, indicating that the percent change in the incident rate of number of SNF admissions is a 0.1% increase for every unit increase in number of visits. This was not found in the Medicare Claims sample (p=0.020).

Hypothesis 2: The second hypothesis examined whether number of services offered by the home health agency was related to ER visits, hospitalizations, and SNF admissions for depressed homebound older adults. The hypothesis was tested with three negative binomial regression analyses with each depression sample (PHQ-2 and Medicare Claim Data), using the following dependent variables: Number of ER visits (total count per agency), number of hospitalizations (total count per agency), and the number of SNF admissions (total count per agency), yielding six negative binomial regressions in total. The negative binomial regression requires count data as the dependent variable. There were different numbers of home health care participants being represented in each agency, so the number of home health care participants per agency

was log transformed and entered as an offset variable so that the dependent variable was not biased due to agency size. The subject in this analysis was home health agency with all other variables being an aggregate of data for each agency. In each analysis, sex (percent female), age (mean), race (percent Caucasian, percent African American, percent Asian, percent Other, percent Hispanic, and percent North American Native), living situation (percent alone, percent caregiver), AMI (percent diagnosed), Dementia (percent diagnosed), CKD (percent diagnosed), COPD (percent diagnosed), CHF (percent diagnosed), Diabetes (percent diagnosed), Stroke/TIA (percent diagnosed), and level of IADL/ADL dependence (mean), and number of home health services were entered into the analysis. The first set of negative binomial regressions tested whether increased home health services decreased the number of ER visits. Table 2 shows the descriptive statistics of these analyses, and Table 12 shows the results of the two negative binomial regression analyses with ER visits as the dependent variable. In both of these analyses the Pearson Chi-Square Value was not significant, indicating that the models fit the data well. The Omnibus Tests yielded the following likelihood ratio Chi Squares: ($\chi^2(19) = 517.58$, $p = 0.000$; $\chi^2(19) = 552.93$, $p = 0.000$, respectively), indicating that the models were statistically significant. Age, Dementia, CKD, COPD, CHF, and Stroke/TIA were significantly related to the number of ER visits in both models. Sex, AMI, IADL/ADL dependence, and living with a caregiver were also significant in the PHQ-2 sample. The number of services approached significance in the PHQ-2 sample with an IRR of 0.937, ($p = 0.018$) indicating that the percent change in the incident rate of number of ER visits is a 6% decrease for every unit increase in number of services in the PHQ-2 sample. The

number of services was not significantly related to the number of ER visits in the Medicare Claims sample (p=0.039).

The second set of negative binomial regressions tested the relationship between number of services offered by the home health agency and the number of hospitalizations. Table 3 shows the descriptive statistics of these analyses, and Table 13 shows the results of the two negative binomial regression analyses (PHQ-2 and Medicare Claim) with number of hospitalizations as the dependent variable. In each analysis, sex (percent female), age (mean), race (percent Caucasian, percent African American, percent Asian, percent Other, percent Hispanic, and percent North American Native), living situation (percent alone, percent caregiver), AMI (percent diagnosed), Dementia (percent diagnosed), CKD (percent diagnosed), COPD (percent diagnosed), CHF (percent diagnosed), Diabetes (percent diagnosed), Stroke/TIA (percent diagnosed), and level of IADL/ADL dependence (mean), and number of home health services were entered into the analysis. In both of these analyses the Pearson Chi-Square Value was not significant, indicating that the models fit the data well. The Omnibus Tests yielded the following likelihood ratio Chi Squares: ($\chi^2(19) = 700.40$, $p = 0.000$; $\chi^2(19) = 633.98$, $p = 0.000$, respectively), indicating that the models were statistically significant. Age, AMI, CKD, COPD, CHF, and Stroke/TIA, were significantly related to the number of hospitalizations in both models. Dementia was significantly related to number of hospitalizations in the PHQ-2 model. Living with a caregiver was marginally significant (p= 0.012) in the Medicare Claims model. The number of services was not related to hospitalizations in either sample (p=0.253, PHQ-2; p=0.511, Medicare Claims).

The third set of negative binomial regressions tested whether number of services offered by the home health agency was related to the number of SNF admissions. Table 4 shows the descriptive statistics of these analyses, and Table 14 shows the results of the two negative binomial regression analyses (PHQ-2 and Medicare Claim) with number of SNF admissions as the dependent variable. In each analysis, sex (percent female), age (mean), race (percent Caucasian, percent African American, percent Asian, percent Other, percent Hispanic, and percent North American Native), living situation (percent alone, percent caregiver), AMI (percent diagnosed), Dementia (percent diagnosed), CKD (percent diagnosed), COPD (percent diagnosed), CHF (percent diagnosed), Diabetes (percent diagnosed), Stroke/TIA (percent diagnosed), and level of IADL/ADL dependence (mean), and number of home health services were entered into the analysis. In both of these analyses the Pearson Chi-Square Value was not significant, indicating that the models fit the data well. The Omnibus Tests yielded the following likelihood ratio Chi Squares: ($\chi^2(19) = 494.43$, $p = 0.000$; $\chi^2(19) = 529.30$, $p = 0.000$, respectively), indicating that the models were statistically significant. Age, Dementia, CKD, CHF, and Stroke/TIA were significantly related to the number of SNF admissions in both models. COPD was significant in the PHQ-2 sample. Living with a caregiver was a significant predictor in the Medicare Claims sample. The number of services was not related to SNF admissions in either sample (p=0.246, PHQ-2; p=0.269, Medicare Claims).

Hypothesis 3: The third hypothesis examined whether having a caregiver involved in one's care was related to ER visits, hospitalizations, and SNF admissions for depressed homebound older adults. The hypothesis was tested with three negative binomial regression analyses on each depression sample (PHQ-2 and Medicare Claim Data), with

the following independent variables: Number of ER visits, number of hospitalizations, and the number of SNF admissions, yielding six negative binomial regressions in total. In each analysis, sex, age, race, AMI, Dementia, CKD, COPD, CHF, Diabetes, Stroke/TIA, level of IADL/ADL dependence, and living situation were entered into the analysis. The first set of negative binomial regressions tested whether caregiver involvement was related to the number of ER visits. Table 5 shows the results of the two negative binomial regression analyses with ER visits as the dependent variable. In both of these analyses the Pearson Chi-Square Value was not significant, indicating that the models fit the data well. The Omnibus Tests yielded the following likelihood ratio Chi Squares: ($\chi^2(30) = 2292.55$, $p = 0.000$; $\chi^2(30) = 3077.33$, $p = 0.000$, respectively), indicating that the models were statistically significant. Sex, race, age, AMI, Dementia, CKD, COPD, CHF, Diabetes, Stroke/TIA, and IADL/ADL dependence were found to be significantly related to the number of ER visits in both models. Presence of a caregiver was not a significant contributor in either model (p=0.808, PHQ-2; p=0.612, Medicare Claims).

The second set of negative binomial regressions tested whether caregiver involvement was related to the number of hospitalizations. Table 6 shows the descriptive statistics of these analyses, and Table 16 shows the results of the two negative binomial regression analyses (PHQ-2 and Medicare Claim) with number of hospitalizations as the dependent variable. In both of these analyses the Pearson Chi-Square Value was not significant, indicating that the models fit the data well. The Omnibus Tests yielded the following likelihood ratio Chi Squares: ($\chi^2(30) = 2817.35$, $p = 0.000$; $\chi^2(30) = 3514.61$, $p = 0.000$, respectively), indicating that the models were statistically significant. In each

analysis, sex, age, race, AMI, Dementia, CKD, COPD, CHF, Diabetes, Stroke/TIA, level of IADL/ADL dependence, and living situation were entered into the analysis. Age, AMI, Dementia, CKD, COPD, CHF, and Stroke/TIA were significantly related to the number of hospitalizations in both models. Diabetes was significantly related to the number of hospitalizations in the PHQ-2 model only. Race was significantly related to the number of hospitalizations in the Medicare Claims model only. Presence of a caregiver was not a significant contributor in either model (p=0.567, PHQ-2; p=0.232, Medicare Claims).

The third set of negative binomial regressions tested whether caregiver involvement was related to the number of SNF admissions. Table 7 shows the descriptive statistics of these analyses, and Table 17 shows the results of the two negative binomial regression analyses (PHQ-2 and Medicare Claim) with number of SNF admissions as the dependent variable. In both of these analyses the Pearson Chi-Square Value was not significant, indicating that the models fit the data well. The Omnibus Tests yielded the following likelihood ratio Chi Squares: ($\chi^2(30) = 1485.40$, $p = 0.000$; $\chi^2(30) = 2054.07$, $p = 0.000$, respectively), indicating that the models were statistically significant. In each analysis, sex, age, race, AMI, Dementia, CKD, COPD, CHF, Diabetes, Stroke/TIA, level of IADL/ADL dependence, and living situation were entered into the analysis. Race, Dementia, CKD, COPD, CHF, Stroke/TIA, and IADL/ADL dependence were significantly related to the number of SNF admissions in both models. Sex and age were significantly related to the number of SNF admissions in the Medicare Claims sample only. Presence of a caregiver was not a significant contributor to the

number of SNF admissions in either model (p=0.515, PHQ-2; p=0.292, Medicare Claims).

Hypothesis 4: The fourth hypothesis examined whether older adults who were discharged from a short-term hospital stay to a home health agency were more likely to be depressed than those who were not discharged from a short-term hospital stay. As discussed above, this analysis included the overall sample, not just those who are depressed. Table 8 shows the descriptive statistics of these analyses. The two measures of depression (PHQ-2 and Medicare Claim Data) were each used as the dependent variable. Two logistic regressions are discussed below. The PHQ-2 sample results will be discussed first.

A logistic regression was used to determine if those home health care recipients who are discharged from a short-term hospital stay are more likely to be depressed (according to the PHQ-2) than those who are not discharged from a short-term hospital stay. Also, it was examined whether this effect was greater for those who do not have a caregiver involved in their care. The logistic regression model was statistically significant, $\chi^2(21) = 3542.824$, p=0.000. The model explained 4.8% (Nagelkerke R^2) of the variance in depression and correctly classified 92.8% of the cases. Sensitivity was 0.0076%, specificity was 99.9988%, positive predictive value was 33.3%, and negative predictive value was 92.8%. Of the 169,333 subjects who were not depressed in this sample, this model successfully predicted all but 2 as not being depressed. Sex, age, race, living situation (alone, caregiver, congregate housing), AMI, Dementia, CKD, COPD, CHF, Diabetes, Stroke/TIA, and level of IADL/ADL dependence were entered into the analysis. Race, age, sex, Dementia, CKD, COPD, CHF, and IADL/ADL dependence

were significantly related to depression (as determined by the PHQ-2 and shown in Table 18). Discharge from an acute hospital stay was also significantly related to depression (p=0.000). For each unit increase in discharge from an acute hospital stay, the odds of having depression increases by a factor of 1.26. Living situation was also significantly related to depression (p=0.000). The odds of being depressed for those who live alone are 1.10 times less than for those who live in congregate housing. The odds of being depressed for those who live with a caregiver are 1.40 times less than for those who live in congregate housing. The interaction between discharge from a short-term hospital stay and caregiver was not significant (p=0.856).

A logistic regression was used to determine if those home health care recipients who are discharged from a short-term hospital stay are more likely to be depressed, according to the Medicare Claim data, than those who are not discharged from a short-term hospital stay. Also, it was examined whether this effect was greater for those who do not have a caregiver involved in their care. The logistic regression model was not statistically significant, $\chi^2(21) = 20.553$, p=0.486. The model explained 0.0% (Nagelkerke R^2) of the variance in depression and correctly classified 88.0% of the cases. Sensitivity was 0.0%, specificity was 100.0%, positive predictive value was 0.0%, and negative predictive value was 88.0%. Sex, age, race, living situation (alone, caregiver, congregate housing), AMI, Dementia, CKD, COPD, CHF, Diabetes, Stroke/TIA, and level of IADL/ADL dependence were entered into the analysis. No variables were significantly related to depression (as determined by the Medicare Claims data and shown in Table 18).

DISCUSSION

This dissertation examined aspects of the current Medicare Home Health Care system to determine if patients who are depressed have better outcomes depending on characteristics of home health agencies. The two main hypotheses investigated whether depressed homebound older adults are less likely to go to the ER, be hospitalized, or be admitted to a nursing home if their home health agency provides a greater number of visits and more services. This study also aimed to discover whether having a caregiver involved in the care of a depressed homebound older adult decreased negative outcomes such as ER visits, hospitalizations, and SNF admissions and if this effect was greater for African Americans. Another goal of this study was to determine if the type of setting from which patients are discharged to home care, acute-stay hospitalization in particular, would be related to higher likelihood of depression. Overall, results suggested that the number of visits did have an effect on the number of ER visits, hospitalizations, and SNF admissions such that the number of home health visits was positively related to the dependent variables, although this effect was small. The results are mixed for the effects of the number of services based on the measure of depression used. The PHQ-2 model showed that more services was related to fewer ER visits. The Medicare Claims model showed no effects for the number of services. Caregiver presence was determined to have no effect on the number of ER visits, hospitalizations, and SNF admissions. The study also showed that acute hospital discharge was related to greater likelihood of depression in the PHQ-2 sample and that caregiver presence did not moderate this effect.

The different measures of depression yielded different results, possibly influenced by the way that each measure was determined. This will be discussed in more detail later in this discussion. Overall, the results provided some support for the hypotheses and the chronic care model from which they were derived.

The first hypothesis explored whether the number of home health visits was related to the number of ER visits, hospitalizations, and SNF admissions. The results using the PHQ-2 sample indicated a relationship between number of visits and admissions, such that for every additional home health visit, ER visits, hospitalizations, and SNF admissions increased by 0.1%. The same was found for the number of ER visits and hospitalizations with the Medicare Claims sample. The effect sizes were very small, with the IRR being 1.001. However, even with a small IRR, it is possible that this can have an effect in actual use. Ten additional home health visits would be required to increase the likelihood of one additional ER visit, hospitalization, or SNF admission. The average number of home health visits is 43 with a standard deviation of 49, so it is possible that many home health care recipients have increased ER visits, hospitalizations, and SNF admissions related to the number of home health visits they receive. It is also possible that increased home health visits is related to increased numbers of ER visits, hospitalizations, and SNF admissions because home health care recipients are being evaluated more frequently and thus, there are more opportunities for providers to recognize needs for these types of health care use. Another factor that may be influencing the results is that the data does not make it clear whether the home health visits predated the ER visits, hospitalizations, and SNF admissions. The Master Beneficiary Summary file contains information about the number of each of these

variables during 2012. It is not possible to determine whether the home health visits predate the ER visits, hospitalizations, and SNF admissions. This makes it possible that ER visits, hospitalizations, and SNF admissions are having an effect on the number of home health visits. It is also possible that the timing of the visits has an effect on hospitalizations. Research has shown that increased visits following admission to home care can reduce hospitalizations (Fazzi et al., 2006). The majority of home health agencies have not been successful at reducing hospitalizations with the percentage remaining at 28% per year from 2003 to 2006 according to Home Health Compare (Fazzi et al., 2006). Only 10% of home health agencies had hospitalization rates at 10% or lower. It is also possible that factors such as polypharmacy contribute to hospitalizations (Sehgal et al., 2013), a variable which was not accounted for in this model. The finding that increased home health care visits were associated with increased likelihood of ER visits, hospitalizations, and SNF admissions suggests that communication between patients/caregivers and providers is an important piece of the Chronic Care Model for Homebound Older Adults.

Hypothesis 2 predicted that number of services offered by the home health agency would be related to the number of ER visits, hospitalizations, and SNF admissions. The results of analyses testing this hypothesis again varied by the sample used. The results were similar across the different dependent variables in failing to show a relationship between number of services and number of ER visits, hospitalizations, or SNF admissions. In the PHQ-2 sample, the number of services was marginally related to the number of ER visits such that for every unit increase in the number of services, the likelihood of ER visits decreased by 6%; although the alpha for this relationship was only

.018, somewhat larger than the .01 target set for this study, 6% difference in emergency room admissions could be clinically significant on a national level. Perhaps, if home health care recipients are receiving visits from a greater number of disciplines, different providers may be more likely to recognize and treat factors that cause ER visits making home health care recipients less likely to go to the ER. The findings from the two samples were inconsistent, raising the question of the validity or stability of the samples. The two depression sample groups have poor convergence (1,872 subjects were identified by both depression measures as being depressed, 0.01% of the overall sample and 4.8% of those determined to be depressed by either measure) and are likely different samples as is clear in the descriptive statistics available in Tables 2, 3, and 4. The differences in findings between the two samples will be discussed more below. The fact that more services was related to fewer ER visits does imply that delivery system design is an important piece of the model that should be further explored. The VA Home-Based Primary Care (HBPC) offers many services to their recipients and they are known to help decrease ER visits and hospitalizations (Darkins et al., 2008; Edes et al., 2010). It seems likely that the addition of more services that are not currently offered by the Medicare Home Health system such as mental health services would further decrease health care use.

The third hypothesis examined whether depressed homebound older adults who have a caregiver are less likely to visit the ER, be hospitalized, and admitted to a nursing home than depressed homebound older adults who do not have a caregiver. No significant relationships between caregiver presence and ER visits, hospitalizations, or SNF admissions were found in either sample. Assuming the results are valid, it does not

seem that caregiver involvement has an effect on the health use outcomes such as ER visits, hospitalizations, and SNF admissions. However, as with the previous analyses, it is unclear when the ER visits, hospitalizations, and SNF admissions happened. The original hypothesis aimed to examine if more ER visits, hospitalizations, and SNF admissions were present following admission to Medicare Home Health Care. This could not be determined from the data used to test this hypothesis. More data is needed to discover exactly how caregiver presence can impact health care use. It would be interesting to explore level of caregiver support in future analyses. Perhaps there is a difference in care recipient's health care use based on the amount of time they receive care from the caregiver.

As predicted in Hypothesis 4, discharge from a short-term hospital stay was related to the likelihood of depression. However, the results varied based on the measure of depression used. The model explained 4.8% of the variance of the PHQ-2 depression criterion and had terrible sensitivity (0.0076%) with excellent specificity (99.9988%). According to this model, the incidence rate of depression would increase by 26% with every one unit increase in acute hospital discharge. Caregiver involvement was significant such that those who lived with a caregiver were least likely to be depressed, followed by those who lived alone, and those who lived in congregate housing were most likely to be depressed. Caregiver involvement was not a significant moderator of hospital discharge. The model was not significant with Medicare Claims data with a terrible sensitivity of 0% and an excellent specificity of 100%. Research has shown that many homebound older adults live alone and consider loneliness to be a problem (Choi & McDougall, 2007). Perhaps loneliness is increasing the risk for depression in those who

live alone. Also, it follows that those who live in congregate housing are the most likely to be depressed because studies have shown that there are high rates of depression and subclinical depression in this population (Adams & Moon, 2009; Parmelee, Katz, & Lawton, 1992; Parmelee, Katz, & Lawton, 1989). The logistic regression model was good at identifying people who were not depressed in the PHQ-2 model. There were many false negatives in the model, indicating that the model did not excel at identifying depression. The model did not significantly predict depression as defined by the Medicare Claims criterion. Consistent with some other findings of risk factors for depression, younger people, females, Hispanics, those with chronic diseases (dementia, CKD, COPD, and CHF), and those who have more IADL/ADL impairment were more likely to be depressed (Choi & McDougall, 2007; Fiske, Wetherell, & Gatz, 2009; Jorm, 2000; Blazer, 1994; Blazer, 2003; Karel & Hinrichsen, 2000). These findings also provide support for the importance of caregiver involvement for depressed home health care recipients. They indicate that having a caregiver can decrease one's chances of depression. This indicates that caregiver presence is an important factor in the Chronic Care Model for Depression in Homebound Older Adults.

Sample and Methodological Issues

This study examines a very large sample that is representative of the population of Medicare home health recipients in the US, making the results applicable to current users. This sample is demographically and medically consistent with other samples of home health users (Kronish, et al., 2006). Twenty-nine percent of the overall sample used in this dissertation had dementia, which is consistent with the number found by Kronish and colleagues. Consistent with findings of disease prevalence in homebound older adults,

cardiovascular disease is the most common disease in this sample, followed by diabetes and COPD (Beck et al., 2009; Qiu et al., 2010). This sample is also representative because it includes home health recipients from all 50 states. This sample was 65.4% female, 80.7% Caucasian, and 12.3% African American. This is consistent with the national rates for recipients of home health care. Medicare home health users are 62.9% female, 78.1% Caucasian, and 14.1% African American ("Home Health Chartbook," 2014). The mean age was 77 consistent with a mean age of 76.2 found in other samples of homebound older adults (Qiu et al., 2015).

The two measures of depression (PHQ-2 and Medicare Claims) vary somewhat in rate of depression, with 7.0% of the sample determined to be depressed according to the PHQ-2 and 12% of the sample determined to be depressed according to Medicare Claims. Although both of these measures have issues, the resulting depression percentages fall within the ranges of depression that have been found with homebound older adults (Bruce & McNamara, 1992; Choi & McDougall, 2007; Choi et al., 2010; Qiu et al., 2010). A crosstab analysis between the two depression measures used in the present study revealed that of the 219,883 subjects without missing data in either depression variable, 180,715 (82.2%) were determined by both samples to not be depressed and 1,872 (0.01%) were determined by both samples to be depressed. The group that was identified by both variables as depressed included 12.1% of the depressed PHQ-2 sample and 7.3% of the depressed Medicare Claims sample. Many subjects (23,695; 10.8% of the overall sample) were rated as depressed according to Medicare Claims that were not rated as depressed according to PHQ-2. Fewer subjects (13,601; 6.2%) were rated as depressed by the PHQ-2 sample that were not rated as depressed according to Medicare

Claims. The two samples converged on 83.0% of the sample; this agreement was accounted for primarily by the non-depressed patients. Therefore, the two depression samples likely varied in demographics due to the small convergence. Sample differences will be discussed more below. The two measures of depression also had a very small correlation at 0.005. Another possibility for differences in the two measures of depression is that many of the 23,695 who were rated as depressed by the Medicare Claims sample and not by the PHQ-2 sample may have been successfully treated for their depression so the PHQ-2 would identify them as not depressed. Those who were identified as depressed by both samples are most likely actually depressed and are currently receiving some sort of treatment. The 13,601 who were identified as depressed by the PHQ-2 measure and not by the Medicare Claims measure may have been the true depressed people who were not receiving treatment. It would be interesting to run future analyses on this sample in particular because they were rated as depressed during their admission to Medicare Home Health Care and they did not receive treatment during 2012. Another possibility that could explain some of the difference in depression prevalence between the two samples is that the data do not indicate when Medicare claims depression diagnosis was made, and the PHQ-2 diagnosis was given during the beneficiaries' admission to Medicare Home Healthcare. The Medicare claim could have been made at any point during the year 2012. The two may not correspond because the PHQ-2 measure may have been given first during the beneficiary's admission to Medicare Home Health Care indicating no depression, and then the beneficiary could have become depressed later in the year and filed a Medicare depression claim when they were no longer admitted to Medicare Home Health care. Also, the Medicare depression

claim could have been made and the depression successfully treated before the beneficiary was admitted to Medicare Home Health care and no longer depressed. The PHQ-2 measure would have indicated no depression at this time. The PHQ-2 is a better indicator of depression for testing the hypotheses in this study because it indicates if depression was present during Medicare Home Health admission.

There appear to be demographic differences between depressed people as determined by the two different measures (PHQ-2 and Medicare Claims). The average age in the depressed PHQ-2 sample was 73.59 (SD=13.49) vs. 77.14 (SD=11.85) in the depressed Medicare Claims sample. The PHQ-2 sample was 68.2% female whereas the Medicare Claims sample was 64.8% female. The PHQ-2 sample was 83.6% White, 10.3% African American, 1.0% Other, 1.1% Asian, 3.1% Hispanic, and 0.7% North American Native, while the Medicare Claims sample was 80.9% White, 12.0% African American, 1.1% Other, 1.7% Asian, 3.6% Hispanic, and 0.5% North American Native. In the PHQ-2 sample, 27.8% of recipients lived alone, 59.6% lived with a caregiver, and 12.6% lived in congregate housing which is similar to the Medicare Claims sample where 26.3% of recipients lived alone, 63.8% lived with a caregiver, and 9.9% lived in congregate housing. The average rate of impairment in IADL/ADLs was 16.79 (SD=8.74) in the PHQ-2 sample and 15.64 (SD=8.49) in the Medicare Claims sample. The rate of medical conditions varied a bit across the two samples: AMI: 9.3% (PHQ-2) vs. 8.8% (Medicare Claims), Dementia: 35.9% (PHQ-2) vs. 29.9% (Medicare Claims), CKD: 54.2% (PHQ-2) vs. 41.5% (Medicare Claims), COPD: 50.0% (PHQ-2) vs. 42.0% (Medicare Claims), CHF: 52.3% (PHQ-2) vs. 48.5% (Medicare Claims), Diabetes: 51.4% (PHQ-2) vs. 47.8% (Medicare Claims), and Stroke/TIA: 29.3% (PHQ-2) vs. 26.3%

(Medicare Claims). There were some apparent differences in rates of Dementia, CKD, COPD, CHF, Diabetes, and Stroke/TIA such that the PHQ-2 sample had a higher rate of all these conditions. The differences in rates of CKD and COPD were particularly pronounced. It is likely that the PHQ-2 sample was a more medically burdened sample. This may correspond with why there were such differences between the results of the two samples. The Medicare Claims sample has been treated for depression at some point in time because this is a requirement to make a Medicare Claim. The PHQ-2 sample may have a greater rate of chronic conditions because of their depression diagnosis and the fact that most of the sample has not received treatment for their depression. It has been shown that depression is comorbid with many chronic health conditions (Qiu, et al., 2010; Beck et al., 2009). The Medicare Claims depressed sample has received some sort of treatment for depression, which may decrease their risk for other chronic conditions. The rates of chronic conditions in both depressed samples are higher than rates in the overall homebound population; however, this is consistent with previous findings of depressed home health users having more chronic conditions (Qiu, et al., 2010; Beck et al., 2009).

The fact that the Medicare Claims measure identified 12% of the sample as depressed and the PHQ-2 measure only identified 7% of the sample as depressed may indicate that the Medicare Claims variable is the more sensitive measure, although this is contradictory to studies examining the sensitivity and specificity of Medicare Claims (Hwang et al., 2015; Noyes et al., 2011). The PHQ-2 is less sensitive to types of depression other than major depression (Arroll et al., 2010). The Medicare Claims may be capturing those with minor depression because the PHQ-2 is less sensitive at

determining minor depression. Also, the Medicare Claims sample may be capturing those who identify their depression somatically or cognitively, which the PHQ-2 does not evaluate (Birrer & Vemuri, 2004; Park & Unützer, 2011). Although, this possibility is contradictory to research that shows that Medicare Claims has also been found to have poor sensitivity in detecting minor depression (Hwang et al., 2015). The people identified as depressed by both samples are likely to have major depression, due to the sensitivity of the PHQ-2 at detecting this. They are also likely to be seeking treatment for depression, due to being positively rated for depression by Medicare Claims. Another major difference between the two depression measures is the point at which they are measured. The PHQ-2 can only be measured at one time, during the beneficiary's admission to Medicare Home Health Care. However the Medicare Claims measure can be determined at any point in the year. The Medicare Claims depression sample is likely larger because there are more opportunities during the year for beneficiaries to file a claim for depression. With the PHQ-2, there is only one opportunity.

Due to the variability in depression samples, an analysis that examines only those who are selected as depressed by both depression variables used in this study would likely yield interesting results. Patients in the combined depression sample are likely to have more severe depression, and thus could yield results that are more in line with proposed hypotheses. It is known that both the PHQ-2 and Medicare Claims sample are not as sensitive at determining minor depression, so it is likely that those in this combined sample would have clear major depression. As mentioned above, it would also be particularly interesting to test the hypotheses in the group that is identified as depressed by the PHQ-2 but not by Medicare Claims. This would be the group that is depressed

during their admission to Medicare Home Health care and they would not have sought treatment during the year 2012. The Chronic Care Model for Homebound Older Adults was designed for this group.

Limitations

As with any large, public database, there were numerous missing data points that affected the size and nature of the sample. There were 862,543 patients in the original database. This number was reduced to 219,883 with no missing PHQ-2 data and 227,283 with no missing Medicare Claim depression data. In the OASIS database, there was much missing data in essential variables such as discharge from home health care to ER, hospital, and nursing home. This forced the use of the Master Beneficiary Summary File data, which did not specify when the home health visits, ER visits, hospitalizations, and SNF admissions occurred; it simply provided the number of each that occurred in 2012. It was unclear if the ER visits, hospitalizations, and SNF admissions followed the home health visits, making the results cross-sectional rather than longitudinal. The inability to examine timing of visits is a limitation of this study. Research has found that increased visits following admission to home health care can reduce hospitalizations (Fazzi et al., 2006). The data in this study provided how many visits of each type were given in 2012, but it did not provide information about when these visits were completed. Future research should also examine when home health visits occur, and if home health visits are provided more frequently upon admission, does this decrease likelihood of hospitalization as found by Fazzi and colleagues (2006)? It is possible that the increased ER visits, hospitalizations, and SNF admissions are related to increased home health visits rather than the proposed direction of the relationship. In the future, a true

longitudinal design could be used to determine if there is in fact a way to decrease excess health care use for depressed homebound elders.

Another limitation was the definition of homebound employed, as this study included Medicare Home Health Care recipients only. To qualify for Medicare home health care, one must be homebound and a doctor must certify this. Medicare defines homebound as having a condition that prevents one from leaving one's home without help, or leaving one's home is not advised because of one's medical condition, and significant effort to leave one's home (Qiu et al., 2010). As Qiu and colleagues discussed, this definition of homebound status is limited by social and cultural factors.

There may be variables available in public data sets that were not examined in this study but that could also be valuable for informing our understanding of depression care for home health recipients. For example, information is available in the Home Health Compare database about whether the agency is non-profit, for-profit, or government, and there are quality ratings of the home health agency available. Research has found that non-profit home health agencies have lower costs, higher scores on quality ratings, and have lower hospitalization rates than for-profit agencies (Cabin, Himmelstein, Siman, & Woolhandler, 2014). These factors may play a role in outcomes for depressed homebound older adults, and future research should explore how these factors are related to health care use outcomes.

Conclusions

The current study examined the current system of Medicare Home Health Care with the intention of finding systems already in place that are beneficial for the depressed homebound elderly. To the extent that there are current features in place that are related

to positive outcomes, this study provides information about what can be done in the current home health care system to decrease expensive health care use such as ER visits, hospitalizations, and SNF admissions. This study found that aspects of the current health care system are related to ER visits, hospitalizations, and SNF admissions in depressed home health care recipients. Placing these features back into the context of the Chronic Care Model for Depressed Homebound Older Adults provides support for the following pieces of the model: communication between patient/caregiver and provider, delivery system design, and caregiver involvement. The first hypothesis in this study showed that as the number of home health visits increases, so do the number of ER visits, hospitalizations, and SNF admissions providing support for the communication piece of the model. It is apparent that the amount of contact between patients/caregivers and providers in home health care is related to increased health care use. The second hypothesis showed that delivery system design is an important piece of the model because the number of services offered by the home health agency appears to have an inverse relationship with the number of ER visits. This shows that offering more services may increase positive outcomes for depressed homebound older adults and indicates that the way in which the system is designed can have an effect on outcomes. The fourth hypothesis provided evidence that caregiver presence decreases risk for depression in homebound older adults. This provides support for the importance of caregiver involvement in the Chronic Care Model for Homebound Older Adults. While the results of the relationships found are still questionable due to the cross-sectional nature of the design, they do suggest that delivery system design, communication between

patient/caregiver and provider, and caregiver support are important factors in care for depressed homebound older adults. These factors should be explored further.

Studies have shown that Medicare home health agencies have been unsuccessful at reducing hospitalizations and ER visits from the years 2004 to 2012 (Fazzi et al., 2006; MedPAC, 2012). The results of this study indicate that more needs to be done in the current Medicare home health care system to decrease numbers of ER visits, hospitalizations, and SNF admissions. A major difference between the Medicare Home Health model and the proposed Chronic Care Model for Depressed Homebound Older Adults is that Medicare Home Health care is not permanent and a beneficiary can only receive 60 days of care at a time. Models such as the VA HBPC program, which has been successful at reducing ER visits and hospitalizations (Darkins et al., 2008; Edes et al., 2010), are more permanent. The VA HBPC program also offers many more services (at least nine) than the Medicare Home Health system. Due to the success of the VA HBPC program at reducing ER visits and hospitalizations and the finding from this study that increased services were associated with decreased likelihood of ER visits, it follows that increased number of services may lead to less additional health care use. It seems that the more services (at least six) that are offered, the fewer ER visits, hospitalizations, and SNF admissions may be required. More research is needed to determine the optimal number of services as well as type of services. This study was not able to assess these outcomes as optimally as desired. The ideal study would involve collecting data from home health agencies around the country, getting information about where the beneficiary is discharged from, their reason for admission to home health care, the number and types of services that are provided, when these services are provided,

medical diagnoses, level of caregiver support, mental health history, level of IADL/ADL impairment, income status, pain, size of the agency, number of beneficiaries the agency is capable of providing care for, whether the agency has any sort of mental health provider on staff, how staff members are trained to assess for depression, for-profit vs. non-profit status, and information about discharge from home health care. This type of information would allow the study to examine data longitudinally, and it would also provide more information about how each home health agency is actually functioning. Much of how Medicare Home Health agencies may function in ways that are in accordance with the Chronic Care Model for Depressed Homebound Older Adults is unable to be assessed in this current study. This larger study would allow many of the questions that arise from this current study to be answered.

This study does provide some evidence that the Medicare Home Health care system may simply not be set up to reduce health care use in its current form. However, it is also possible that some additional health care use may be helpful. Some ER visits, hospitalizations, and SNF admissions may help to treat life-threatening illnesses, making them desirable. Home health visits may play a role in this type of preventative care. It would be interesting to explore how many ER visits, hospitalizations, and SNF admissions are considered helpful or warranted and how many are considered excessive. It is likely that changes in the Medicare Home Health system to make it more like the proposed chronic care model would result in better outcomes for the depressed homebound older adults. Other specific changes in the Medicare Home Health system might include things like fall prevention programs, front loading home health visits, a 24 hour response program, medication management, and support for home health

management as studies have shown that the home health agencies that have been successful at decreasing hospitalizations have qualities such as these (Fazzi et al., 2006). Use of care managers and preventative interventions with multidimensional assessment and follow-up visits have also been shown to be effective at reducing hospitalizations and SNF admissions (Naylor et al., 2011; Stuck et al., 2002). Medicare home health agencies may need to implement more practices such as telephone monitoring, more integrated care (more services and more communication between disciplines), and more evidence-based practices, which have all been found to reduce hospitalizations and ER visits (Parker et al., 2014). More randomized controlled trials (RCTs) are needed to test the effects of different models of home health care on the number of hospitalizations and nursing home admissions. The suggested changes in care would be costly, yet they would likely offset the costs of increased ER visits, hospitalizations, and SNF admissions. If more research can be done to show that spending more money on home health care practices, such as those discussed and suggested in the Chronic Care Model for Homebound Older Adults, will help save money on hospitalizations and nursing home admissions, then it is likely that Medicare would be more willing to change their home health care system. If Medicare can see that those who receive constant home health care are less likely to have unnecessary ER visits, hospitalizations, and SNF admissions, they may change the current reimbursement system such that home health care can be a more permanent method of care as it is in the VA HBPC system.

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Table 1

Sample Characteristics for Hypothesis 1: Number of Visits x ER Visits, Hospitalizations, and SNF Admissions for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2			*Medicare Claims*		
Variable	Category	Mean	SD	N(%)	Mean	SD	N(%)
Age		74.700	13.300		78.100	11.527	
Sex	Male			2769(31.3)			5148(34.0)
	Female			6084(68.7)			9995(66.0)
Race	White			7485(84.5)			12376(81.7)
	Black			852(9.6)			1720(11.4)
	Other			73(0.8)			168(1.1)
	Asian			94(1.1)			244(1.6)
	Hispanic			273(3.1)			557(3.7)
	North American Native			65(0.7)			62(0.4)
Caregiver	No			2455(27.7)			4068(26.9)
	Yes			5169(58.4)			9428(62.3)
	Congregate Housing			1229(13.9)			1647(10.9)
Acute Myocardial Infarction	No			7858(88.8)			13533(89.4)
	Yes			995(11.2)			1610(10.6)
Dementia	No			4911(55.5)			9490(62.7)
	Yes			3942(44.5)			5653(37.3)
Chronic Kidney Disease	No			4034(45.6)			7622(50.3)
	Yes			4819(54.4)			7521(49.7)
Chronic Obstructive Pulmonary Disease	No			3720(42.0)			7556(49.9)
	Yes			5133(58.0)			7587(50.1)
Congestive Heart Failure	No			3408(38.5)			6319(41.7)
	Yes			5445(61.5)			8824(58.3)
Diabetes	No			3849(43.5)			6978(46.1)
	Yes			5004(56.5)			8165(53.9)
Stroke/Transient Ischemic Attack	No			5758(65.0)			10315(68.1)
	Yes			3095(35.0)			4828(31.9)
Level of IADL/ADL dependence		17.200	8.700		16.010	8.493	
Number of Home Health Visits		42.700	49.400		33.111	45.282	
Number of ER Visits		1.800	3.100		1.080	1.972	

Note: n = 8,853 (PHQ-2), n = 15,143 (Medicare Claims)

Table 2

Sample Characteristics for Hypothesis 2: Number of Services x ER Visits for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2		*Medicare Claims*	
Variable	Category	Mean	SD	Mean	SD
Age		72.439	11.18213	76.0	9.60804
Sex	Male				
	Female	67.747	37.7406	64.887	36.5224
Race	White	80.355	34.5948	75.503	36.6705
	Black	12.243	28.6503	15.07	30.7887
	Other	0.91	7.6249	1.15	8.2998
	Asian	1.428	10.5957	1.905	11.2433
	Hispanic	3.879	16.7378	5.535	19.7659
	North American Native	0.858	8.1604	0.579	6.5904
Caregiver	No	27.109	34.7406	26.279	32.634
	Yes	60.999	38.5522	63.123	36.1845
Acute Myocardial Infarction	No				
	Yes	9.412	22.7541	8.9	20.8752
Dementia	No				
	Yes	36.851	38.2042	32.048	34.9624
Chronic Kidney Disease	No				
	Yes	46.379	38.9929	43.414	36.9643
Chronic Obstructive Pulmonary Disease	No				
	Yes	52.214	39.3126	45.968	37.3315
Congestive Heart Failure	No				
	Yes	53.668	39.0207	51.725	37.3053
Diabetes	No				
	Yes	53.817	38.9607	52.413	37.4591
Stroke/Transient Ischemic Attack	No				
	Yes	30.132	35.5093	27.468	32.9221
Level of IADL/ADL dependence		16.5794	7.37179	15.497	6.64724
Number of Home Health Services		5.7428	0.68163	5.7319	0.7
Number of ER Visits		4.3319	7.53525	3.4968	6.15934

Note: n = 4,498 (PHQ-2), n = 5,972 (Medicare Claims)

Table 3

Sample Characteristics for Hypothesis 2: Number of Services x Hospitalizations for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2		*Medicare Claims*	
Variable	Category	Mean	SD	Mean	SD
Age		73.349	10.544	76.508	9.238
Sex	Male				
	Female	68.021	37.060	65.264	35.926
Race	White	80.996	33.717	76.222	35.923
	Black	11.815	27.838	14.674	30.158
	Other	0.939	7.688	1.190	8.440
	Asian	1.416	10.461	1.798	10.677
	Hispanic	3.783	16.364	5.363	19.256
	North American Native	0.790	7.668	0.564	6.442
Caregiver	No	27.129	34.151	26.202	32.124
	Yes	60.628	38.022	62.920	35.780
Acute Myocardial Infarction	No				
	Yes	9.750	22.946	9.026	20.823
Dementia	No				
	Yes	38.133	37.975	32.812	34.873
Chronic Kidney Disease	No				
	Yes	46.936	38.343	43.905	36.550
Chronic Obstructive Pulmonary Disease	No				
	Yes	52.857	38.597	46.400	36.879
Congestive Heart Failure	No				
	Yes	54.794	38.223	52.668	36.744
Diabetes	No				
	Yes	53.977	38.259	52.583	36.951
Stroke/Transient Ischemic Attack	No				
	Yes	30.760	35.200	28.073	32.853
Level of IADL/ADL dependence		16.705	7.273	15.586	6.600
Number of Home Health Services		5.748	0.678	5.741	0.664
Number of Hospitalizations		4.667	7.944	4.723	8.824

Note: n = 4,255 (PHQ-2), n = 5,772 (Medicare Claims)

Table 4

Sample Characteristics for Hypothesis 2: Number of Services x SNF Admissions for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2		*Medicare Claims*	
Variable	Category	Mean	SD	Mean	SD
Age		73.349	10.544	76.508	9.238
Sex	Male				
	Female	68.021	37.060	65.264	35.926
Race	White	80.996	33.717	76.222	35.923
	Black	11.815	27.838	14.674	30.158
	Other	0.939	7.688	1.190	8.440
	Asian	1.416	10.461	1.798	10.677
	Hispanic	3.783	16.364	5.363	19.256
	North American Native	0.790	7.668	0.564	6.442
Caregiver	No	27.129	34.151	26.202	32.124
	Yes	60.628	38.022	62.920	35.780
Acute Myocardial Infarction	No				
	Yes	9.750	22.946	9.026	20.823
Dementia	No				
	Yes	38.133	37.975	32.812	34.873
Chronic Kidney Disease	No				
	Yes	46.936	38.343	43.905	36.550
Chronic Obstructive Pulmonary Disease	No				
	Yes	52.857	38.597	46.400	36.879
Congestive Heart Failure	No				
	Yes	54.794	38.223	52.668	36.744
Diabetes	No				
	Yes	53.977	38.259	52.583	36.951
Stroke/Transient Ischemic Attack	No				
	Yes	30.760	35.200	28.073	32.853
Level of IADL/ADL dependence		16.705	7.273	15.586	6.600
Number of Home Health Services		5.748	0.678	5.741	0.664
Number of SNF Admissions		1.425	2.622	1.490	2.880

Note: n = 4,255 (PHQ-2), n = 5,772 (Medicare Claims)

Table 5

Sample Characteristics for Hypothesis 3: Caregiver Presence x ER Visits for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2			*Medicare Claims*		
Variable	Category	Mean	SD	N(%)	Mean	SD	N(%)
Age		72.910	13.723		76.560	12.100	
Sex	Male			4172(31.8)			7989(35.2)
	Female			8953(68.2)			14711(64.8)
Race	White			10971(83.6)			18359(80.9)
	Black			1352(10.3)			2721(12.0)
	Other			125(1.0)			257(1.1)
	Asian			139(1.1)			380(1.7)
	Hispanic			410(3.1)			826(3.6)
	North American Native			86(0.7)			95(0.4)
Acute Myocardial Infarction	No			11942(91.0)			20778(91.5)
	Yes			1183(9.0)			1922(8.5)
Dementia	No			8532(65.0)			16064(70.8)
	Yes			4593(35.0)			6636(29.2)
Chronic Kidney Disease	No			7166(54.6)			13450(59.3)
	Yes			5959(45.4)			9250(40.7)
Chronic Obstructive Pulmonary Disease	No			6602(50.3)			13184(58.1)
	Yes			6523(49.7)			9516(41.9)
Congestive Heart Failure	No			6336(48.3)			11806(52.0)
	Yes			6789(51.7)			10894(48.0)
Diabetes	No			6404(48.8)			11870(52.3)
	Yes			6721(51.2)			10830(47.7)
Stroke/Transient Ischemic Attack	No			9367(71.4)			16869(74.3)
	Yes			3758(28.6)			5831(25.7)
Level of IADL/ADL dependence		16.700	8.720		15.600	8.490	
Caregiver	No			3653(27.8)			5941(26.2)
	Yes			7857(59.9)			14534(64.0)
	Congregate Housing			1615(12.3)			2225(9.8)
Number of ER Visits		1.310	2.910		0.780	1.750	

Note: n = 13,125 (PHQ-2), n = 22,700 (Medicare Claims)

Table 6

Sample Characteristics for Hypothesis 3: Caregiver Presence x Hospitalizations for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2			*Medicare Claims*		
Variable	Category	Mean	SD	N(%)	Mean	SD	N(%)
Age		74.560	13.093		77.920	11.429	
Sex	Male			3690(31.3)			7154(34.4)
	Female			8085(68.7)			13630(65.6)
Race	White			9952(84.5)			16975(81.7)
	Black			1142(9.7)			2390(11.5)
	Other			119(1.0)			242(1.2)
	Asian			120(1.0)			335(1.6)
	Hispanic			356(3.0)			743(3.6)
	North American Native			73(0.6)			79(0.4)
Acute Myocardial Infarction	No			10640(90.4)			18932(91.1)
	Yes			1135(9.6)			1852(8.9)
Dementia	No			7331(62.3)			14302(68.8)
	Yes			4444(37.7)			6482(31.2)
Chronic Kidney Disease	No			6302(53.5)			12072(58.1)
	Yes			5473(46.5)			8712(41.9)
Chronic Obstructive Pulmonary Disease	No			5753(48.9)			11777(56.7)
	Yes			6022(51.1)			9007(43.3)
Congestive Heart Failure	No			5428(46.1)			10384(50.0)
	Yes			6347(53.9)			10400(50.0)
Diabetes	No			5701(48.4)			10759(51.8)
	Yes			6074(51.6)			10025(48.2)
Stroke/Transient Ischemic Attack	No			8206(69.7)			15146(72.9)
	Yes			3569(30.3)			5638(27.1)
Level of IADL/ADL dependence		16.950	8.737		15.770	8.551	
Caregiver	No			3299(28.0)			5529(26.6)
	Yes			6914(58.7)			13089(63.0)
	Congregate Housing			1562(13.3)			2166(10.4)
Number of Hospitalizations		1.460	1.935		1.110	1.417	

Note: n = 11,775 (PHQ-2), n = 20,784 (Medicare Claims)

Table 7

Sample Characteristics for Hypothesis 3: Caregiver Presence x SNF Admissions for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2			*Medicare Claims*		
Variable	Category	Mean	SD	N(%)	Mean	SD	N(%)
Age		74.560	13.093		77.920	11.429	
Sex	Male			3690(31.3)			7154(34.4)
	Female			8085(68.7)			13630(65.6)
Race	White			9952(84.5)			16975(81.7)
	Black			1142(9.7)			2390(11.5)
	Other			119(1.0)			242(1.2)
	Asian			120(1.0)			335(1.6)
	Hispanic			356(3.0)			743(3.6)
	North American Native			73(0.6)			79(0.4)
Acute Myocardial Infarction	No			10640(90.4)			18932(91.1)
	Yes			1135(9.6)			1852(8.9)
Dementia	No			7331(62.3)			14302(68.8)
	Yes			4444(37.7)			6482(31.2)
Chronic Kidney Disease	No			6302(53.5)			12072(58.1)
	Yes			5473(46.5)			8712(41.9)
Chronic Obstructive Pulmonary Disease	No			5753(48.9)			11777(56.7)
	Yes			6022(51.1)			9007(43.3)
Congestive Heart Failure	No			5428(46.1)			10384(50.0)
	Yes			6347(53.9)			10400(50.0)
Diabetes	No			5701(48.4)			10759(51.8)
	Yes			6074(51.6)			10025(48.2)
Stroke/Transient Ischemic Attack	No			8206(69.7)			15146(72.9)
	Yes			3569(30.3)			5638(27.1)
Level of IADL/ADL dependence		16.950	8.737		15.770	8.551	
Caregiver	No			3299(28.0)			5529(26.6)
	Yes			6914(58.7)			13089(63.0)
	Congregate Housing			1562(13.3)			2166(10.4)
Number of SNF Admissions		0.440	0.867		0.350	0.735	

Note: n = 11,775 (PHQ-2), n = 20,784 (Medicare Claims)

Table 8

Sample Characteristics for Hypothesis 4: Logistic Regression Testing the Effects of Acute Hospital Discharge on Diagnosis of Depression

				PHQ-2			*Medicare Claims*
Variable	Category	Mean	SD	N(%)	Mean	SD	N(%)
Sex	Male			63112(34.6)			65263(34.6)
	Female			119346(65.4)			123347(65.4)
Race	White			147368(80.8)			152176(80.7)
	Black			22461(12.3)			23262(12.3)
	Other			2016(1.1)			2107(1.1)
	Asian			2885(1.6)			3022(1.6)
	Hispanic			6430(3.5)			6704(3.6)
	North American Native			755(0.4)			777(0.4)
Acute Myocardial Infarction	No			166910(91.5)			172641(91.5)
	Yes			15548(8.5)			15969(8.5)
Dementia	No			131334(72)			134185(71.1)
	Yes			51124(28)			54425(28.9)
Chronic Kidney Disease	No			107681(59)			111563(59.2)
	Yes			74777(41)			77047(40.8)
Chronic Obstructive Pulmonary Disease	No			106052(58.1)			110032(58.3)
	Yes			76406(41.9)			78578(41.7)
Congestive Heart Failure	No			94559(51.8)			97989(52)
	Yes			87899(48.2)			90621(48)
Diabetes	No			95141(52.1)			98723(52.3)
	Yes			87317(47.9)			89887(47.7)
Stroke/Transient Ischemic Attack	No			135561(74.3)			139888(74.2)
	Yes			46897(25.7)			48722(25.8)
Caregiver	No			49449(27.1)			50337(26.7)
	Yes			116138(63.7)			119913(63.6)
	Congregate Housing			16871(9.2)			18360(9.7)
Acute Hospital Discharge	No			97956(53.7)			101842(54)
	Yes			84502(46.3)			86768(46)
Age		76.37	12.12		76.45	12.17	
IADL/ADL dependence		15.22	8.02		15.49	8.34	

Note: n = 182,458 (PHQ-2), n = 188,610 (Medicare Claims)

Table 9

Results of Negative Binomial Regression Model for Hypothesis 1, Number of Visits x ER Visits for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2							*Medicare Claims*				
Variable		Coefficient	St Er	IRR	IRR 95%		Variable		Coefficient	St Er	IRR	IRR 95%	
Age		-0.024	0.001	0.977	0.975	0.979	Age		-0.022*	0.001	0.979	0.977	0.981
Sex	Male	-0.108*	0.030	0.897	0.847	0.951	Sex	Male	-0.063	0.025	0.939	0.894	0.985
	Female							Female					
Race	White	-0.021	0.156	0.979	0.721	1.328	Race*	White	0.082	0.179	1.086	0.765	1.541
	Black	-0.006	0.161	0.994	0.725	1.362		Black	0.086	0.181	1.090	0.765	1.554
	Other	0.054	0.214	1.056	0.694	1.606		Other	-0.098	0.211	0.906	0.600	1.369
	Asian	-0.192	0.208	0.825	0.548	1.241		Asian	-0.352	0.205	0.704	0.470	1.052
	Hispanic	-0.305	0.175	0.737	0.523	1.038		Hispanic	-0.170	0.189	0.844	0.583	1.221
	North American Native							North American Native					
Caregiver	No	-0.097	0.046	0.908	0.829	0.994	Caregiver*	No	-0.140*	0.042	0.869	0.800	0.944
	Yes	-0.105	0.042	0.900	0.829	0.977		Yes	-0.168*	0.038	0.845	0.785	0.911
	Congregate Housing							Congregate Housing					
Acute Myocardial Infarction	No	-0.199*	0.043	0.820	0.754	0.891	Acute Myocardial Infarction	No	-0.084*	0.037	0.919	0.855	0.988
	Yes							Yes					
Dementia	No	-0.165*	0.030	0.848	0.799	0.900	Dementia	No	-0.309*	0.026	0.734	0.698	0.773
	Yes							Yes					
Chronic Kidney Disease	No	-0.173*	0.029	0.841	0.794	0.891	Chronic Kidney Disease	No	-0.203*	0.025	0.816	0.778	0.856
	Yes							Yes					
Chronic Obstructive Pulmonary Disease	No	-0.230*	0.029	0.794	0.750	0.841	Chronic Obstructive Pulmonary Disease	No	-0.231*	0.024	0.794	0.757	0.832
	Yes							Yes					
Congestive Heart Failure	No	-0.117*	0.032	0.890	0.836	0.947	Congestive Heart Failure	No	-0.150*	0.026	0.861	0.818	0.907
	Yes							Yes					
Diabetes	No	0.004*	0.029	1.004	0.948	1.063	Diabetes	No	0.031	0.025	1.031	0.983	1.082
	Yes							Yes					
Stroke/Transient Ischemic Attack	No	-0.180*	0.029	0.836	0.789	0.885	Stroke/Transient Ischemic Attack	No	-0.022*	0.025	0.832	0.792	0.874
	Yes							Yes					
Level of IADL/ADL dependence		-0.007*	0.002	0.993	0.989	0.996	Level of IADL/ADL dependence		-0.004	0.002	0.996	0.994	0.999
Number of Home Health Visits		0.001*	0.000	1.001	1.000	1.001	Number of Home Health Visits		0.001*	0.000	1.001	1.001	1.002

*Sig < 0.01, overall significance for caregiver and race are noted by asterisks in the variables column

Table 10

Results of Negative Binomial Regression Model for Hypothesis 1, Number of Visits x Hospitalizations for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2							*Medicare Claims*				
Variable		Coefficient	St Er	IRR	IRR 95%		Variable		Coefficient	St Er	IRR	IRR 95%	
Age		-0.014*	0.001	0.987	0.984	0.989	Age		-0.011*	0.001	0.989	0.987	1.000
Sex	Male	-0.005	0.029	0.995	0.939	1.054	Sex	Male	0.008	0.023	1.008	0.963	1.055
	Female							Female					
Race*	White	0.137	0.161	1.147	0.837	1.571	Race*	White	0.046	0.168	1.047	0.753	1.456
	Black	0.070	0.165	1.072	0.776	1.483		Black	-0.167	0.171	0.846	0.605	1.183
	Other	0.246	0.217	1.279	0.837	1.956		Other	-0.079	0.197	0.924	0.628	1.359
	Asian	-0.078	0.210	0.925	0.612	1.397		Asian	-0.220	0.190	0.802	0.552	1.165
	Hispanic	-0.256	0.180	0.775	0.545	1.101		Hispanic	-0.289	0.178	0.749	0.529	1.062
	North American Native							North American Native					
Caregiver*	No	0.155*	0.048	1.168	1.063	1.284	Caregiver*	No	0.146*	0.042	1.158	1.066	1.257
	Yes	0.288*	0.044	1.334	1.225	1.453		Yes	0.262*	0.038	1.299	1.206	1.401
	Congregate Housing							Congregate Housing					
Acute Myocardial Infarction	No	-0.233*	0.042	0.792	0.730	0.860	Acute Myocardial Infarction	No	-0.248*	0.034	0.781	0.731	0.834
	Yes							Yes					
Dementia	No	-0.016	0.030	0.984	0.927	1.044	Dementia	No	0.002	0.025	1.002	0.954	1.053
	Yes							Yes					
Chronic Kidney Disease	No	-0.521*	0.029	0.594	0.561	0.629	Chronic Kidney Disease	No	-0.424*	0.023	0.655	0.625	0.685
	Yes							Yes					
Chronic Obstructive Pulmonary Disease	No	-0.259*	0.029	0.772	0.729	0.817	Chronic Obstructive Pulmonary Disease	No	-0.228*	0.023	0.796	0.762	0.833
	Yes							Yes					
Congestive Heart Failure	No	-0.300*	0.032	0.741	0.696	0.789	Congestive Heart Failure	No	-0.281*	0.025	0.755	0.719	0.793
	Yes							Yes					
Diabetes	No	-0.022	0.029	0.978	0.924	1.037	Diabetes	No	0.019	0.023	1.019	0.974	1.067
	Yes							Yes					
Stroke/Transient Ischemic Attack	No	-0.130*	0.029	0.878	0.830	0.930	Stroke/Transient Ischemic Attack	No	-0.113*	0.024	0.894	0.853	0.936
	Yes							Yes					
Level of IADL/ADL dependence		0.003	0.002	1.003	1.000	1.006	Level of IADL/ADL dependence		0.004*	0.001	1.004	1.001	1.007
Number of Home Health Visits		0.001*	0.000	1.001	1.001	1.002	Number of Home Health Visits		0.001*	0.000	1.001	1.000	1.001

*Sig < 0.01, overall significance for caregiver and race are noted by asterisks in the variables column

Table 11

Results of Negative Binomial Regression Model for Hypothesis 1, Number of Visits x SNF Admissions for both Depression Samples (PHQ-2) and (Medicare Claims)

PHQ-2							*Medicare Claims*						
Variable		Coefficient	St Er	IRR	IRR 95%		Variable		Coefficient	St Er	IRR	IRR 95%	
Age		0.006*	0.002	1.006	1.003	1.009	Age		0.010*	0.002	1.010	1.007	1.013
Sex	Male	-0.078	0.040	0.925	0.855	1.001	Sex	Male	-0.093*	0.033	0.912	0.855	0.972
	Female							Female					
Race*	White	0.035	0.221	1.036	0.672	1.597	Race*	White	-0.160	0.227	0.852	0.546	1.330
	Black	-0.290	0.229	0.748	0.477	1.172		Black	-0.468	0.232	0.626	0.398	0.986
	Other	0.010	0.301	1.010	0.560	1.821		Other	-0.436	0.276	0.647	0.376	1.112
	Asian	-0.630	0.304	0.533	0.294	0.967		Asian	-0.631	0.264	0.532	0.317	0.893
	Hispanic	-0.838*	0.260	0.433	0.260	0.720		Hispanic	-1.110*	0.250	0.330	0.202	0.538
	North American Native							North American Native					
Caregiver*	No	0.234*	0.062	1.264	1.119	1.427	Caregiver*	No	0.166*	0.053	1.180	1.064	1.309
	Yes	0.120	0.056	1.127	1.010	1.258		Yes	-0.057	0.048	0.944	0.859	1.038
	Congregate Housing							Congregate Housing					
Acute Myocardial Infarction	No	-0.104	0.055	0.901	0.809	1.003	Acute Myocardial Infarction	No	-0.067	0.046	0.935	0.854	1.023
	Yes							Yes					
Dementia	No	-0.354*	0.040	0.702	0.649	0.760	Dementia	No	-0.322*	0.034	0.724	0.678	0.773
	Yes							Yes					
Chronic Kidney Disease	No	-0.473*	0.040	0.623	0.576	0.675	Chronic Kidney Disease	No	-0.382*	0.032	0.682	0.640	0.727
	Yes							Yes					
Chronic Obstructive Pulmonary Disease	No	-0.186*	0.039	0.831	0.769	0.897	Chronic Obstructive Pulmonary Disease	No	-0.123	0.032	0.884	0.831	0.940
	Yes							Yes					
Congestive Heart Failure	No	-0.232*	0.044	0.793	0.728	0.864	Congestive Heart Failure	No	-0.245	0.035	0.783	0.731	0.839
	Yes							Yes					
Diabetes	No	0.006	0.039	1.006	0.931	1.086	Diabetes	No	0.012	0.032	1.012	0.950	1.078
	Yes							Yes					
Stroke/Transient Ischemic Attack	No	-0.152*	0.039	0.859	0.797	0.927	Stroke/Transient Ischemic Attack	No	-0.101*	0.032	0.904	0.849	0.963
	Yes							Yes					
Level of IADL/ADL dependence		0.009*	0.002	1.009	1.005	1.014	Level of IADL/ADL dependence		0.010*	0.002	1.010	1.006	1.013
Number of Home Health Visits		0.001*	0.000	1.001	1.001	1.002	Number of Home Health Visits		0.001	0.003	1.001	1.000	1.001

*Sig < 0.01, overall significance for caregiver and race are noted by asterisks in the variables column

Table 12

Results of Hypothesis 2 Number of Services x ER Visits for both Depression Samples (PHQ-2) and (Medicare Claims)

PHQ-2							*Medicare Claims*						
Variable		Coefficient	St Er	IRR	IRR 95%		Variable		Coefficient	St Er	IRR	IRR 95%	
Age		-0.021*	0.002	0.980	0.976	0.983	Age		-0.016*	0.002	0.984	0.980	0.988
Sex	Male						Sex	Male					
	Female	0.002*	0.001	1.002	1.001	1.003		Female	0.001	0.001	1.001	1.000	1.002
Race	White	0.011	0.005	1.011	1.001	1.021	Race	White	0.004	0.005	1.004	0.995	1.014
	Black	0.010	0.005	1.010	1.000	1.021		Black	0.003	0.005	1.003	0.993	1.012
	Other	0.009	0.006	1.009	0.998	1.020		Other	-0.003	0.005	0.997	0.987	1.007
	Asian	0.006	0.006	1.006	0.995	1.020		Asian	-0.002	0.005	0.998	0.988	1.008
	Hispanic	0.006	0.005	1.006	0.996	1.017		Hispanic	-0.002	0.005	0.998	0.989	1.007
	North American Native	0.014	0.006	1.014	1.003	1.016		North American Native	0.008	0.005	1.008	0.997	1.018
Caregiver	No	-0.002	0.001	0.998	0.996	1.000	Caregiver	No	-0.001	0.001	0.999	,997	1.001
	Yes	-0.003*	0.001	0.997	0.996	0.999		Yes	-0.001	0.001	0.999	0.998	1.001
Acute Myocardial Infarction	No						Acute Myocardial Infarction	No					
	Yes	0.003*	0.001	1.003	1.001	1.005		Yes	0.001	0.001	1.001	0.999	1.003
Dementia	No						Dementia	No					
	Yes	0.003*	0.001	1.003	1.002	1.004		Yes	0.004*	0.001	1.004	1.003	1.005
Chronic Kidney Disease	No						Chronic Kidney Disease	No					
	Yes	0.003*	0.001	1.003	1.002	1.004		Yes	0.004*	0.001	1.004	1.003	1.005
Chronic Obstructive Pulmonary Disease	No						Chronic Obstructive Pulmonary Disease	No					
	Yes	0.005*	0.001	1.005	1.004	1.006		Yes	0.004*	0.001	1.004	1.003	1.005
Congestive Heart Failure	No						Congestive Heart Failure	No					
	Yes	0.003*	0.001	1.003	1.002	1.004		Yes	0.004*	0.001	1.004	1.002	1.005
Diabetes	No						Diabetes	No					
	Yes	0.000	0.001	1.000	0.999	1.001		Yes	-0.001	0.001	0.999	0.998	1.000
Stroke/Transient Ischemic Attack	No						Stroke/Transient Ischemic Attack	No					
	Yes	0.003*	0.001	1.003	1.002	1.004		Yes	0.004*	0.001	1.004	1.003	1.005
Level of IADL/ADL dependence		-0.008*	0.003	0.992	0.987	0.998	Level of IADL/ADL dependence		-0.005	0.003	0.995	0.989	1.000
Number of Home Health Services		-0.065	0.028	0.937	0.888	0.989	Number of Home Health Services		-0.053	0.026	0.949	0.903	0.997

*Sig < 0.01

Table 13

Results of Hypothesis 2 Number of Services x Hospitalizations for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2							*Medicare Claims*				
Variable		Coefficient	St Er	IRR	IRR 95%		Variable		Coefficient	St Er	IRR	IRR 95%	
Age		-0.014	0.002	0.986	0.982	0.990	Age		-0.006*	0.002	0.994	0.990	0.998
Sex	Male						Sex	Male					
	Female	0.000	0.001	1.000	0.999	1.001		Female	0.000	0.001	1.000	0.999	1.001
Race	White	0.009	0.006	1.009	0.998	1.020	Race	White	0.008	0.006	1.008	0.996	1.019
	Black	0.007	0.006	1.007	0.996	1.018		Black	0.004	0.006	1.004	0.992	1.016
	Other	0.004	0.006	1.004	0.991	1.016		Other	0.006	0.006	1.006	0.994	1.019
	Asian	0.006	0.006	1.006	0.994	1.017		Asian	0.003	0.006	1.003	0.991	1.015
	Hispanic	0.003	0.006	1.003	0.992	1.015		Hispanic	0.002	0.006	1.002	0.990	1.014
	North American Native	0.009	0.006	1.009	0.997	1.021		North American Native	0.009	0.007	1.009	0.996	1.022
Caregiver	No	0.001	0.001	1.001	0.999	1.002	Caregiver	No	0.000	0.001	1.000	0.999	1.002
	Yes	0.001	0.001	1.001	1.000	1.002		Yes	0.002	0.001	1.002	1.000	1.003
Acute Myocardial Infarction	No						Acute Myocardial Infarction	No					
	Yes	0.004*	0.001	1.004	1.002	1.006		Yes	0.004*	0.001	1.004	1.003	1.006
Dementia	No						Dementia	No					
	Yes	0.002*	0.001	1.002	1.001	1.003		Yes	0.001	0.001	1.001	1.000	1.002
Chronic Kidney Disease	No						Chronic Kidney Disease	No					
	Yes	0.007*	0.001	1.007	1.006	1.008		Yes	0.007*	0.001	1.007	1.006	1.008
Chronic Obstructive Pulmonary Disease	No						Chronic Obstructive Pulmonary Disease	No					
	Yes	0.004*	0.001	1.004	1.003	1.005		Yes	0.003*	0.001	1.003	1.002	1.004
Congestive Heart Failure	No						Congestive Heart Failure	No					
	Yes	0.004*	0.001	1.004	1.002	1.005		Yes	0.004*	0.001	1.004	1.003	1.005
Diabetes	No						Diabetes	No					
	Yes	0.000	0.001	1.000	0.999	1.002		Yes	-0.001	0.001	0.999	0.998	1.000
Stroke/Transient Ischemic Attack	No						Stroke/Transient Ischemic Attack	No					
	Yes	0.003*	0.001	1.003	1.001	1.004		Yes	0.002*	0.001	1.002	1.001	1.003
Level of IADL/ADL dependence		0.003	0.003	1.003	0.997	1.009	Level of IADL/ADL dependence		0.001	0.003	1.001	0.995	1.006
Number of Home Health Services		0.033	0.029	1.033	0.977	1.092	Number of Home Health Services		0.017	0.026	1.017	0.967	1.070

*Sig < 0.01

Table 14

Results of Hypothesis 2 Number of Services x SNF Admissions for both Depression Samples (PHQ-2) and (Medicare Claims)

		PHQ-2							*Medicare Claims*				
Variable		Coefficient	St Er	IRR	IRR 95%		Variable		Coefficient	St Er	IRR	IRR 95%	
Age		0.007	0.003	1.007	1.002	1.013	Age		0.014*	0.003	1.014	1.009	1.020
Sex	Male						Sex	Male					
	Female	0.001	0.001	1.001	0.999	1.002		Female	0.000	0.001	1.000	0.999	1.002
Race	White	0.003	0.007	1.003	0.990	1.017	Race	White	0.005	0.008	1.005	0.990	1.021
	Black	-0.001	0.007	0.999	0.986	1.012		Black	0.001	0.008	1.001	0.986	1.016
	Other	-0.003	0.008	0.997	0.982	1.012		Other	-0.001	0.008	0.999	0.983	1.016
	Asian	-0.006	0.008	0.994	0.980	1.009		Asian	0.003	0.008	0.997	0.982	1.013
	Hispanic	-0.009	0.007	0.991	0.977	1.005		Hispanic	-0.008	0.008	0.992	0.977	1.008
	North American Native	0.007	0.007	1.007	0.992	1.021		North American Native	0.007	0.009	1.007	0.990	1.024
Caregiver	No	0.002	0.001	1.002	0.999	1.004	Caregiver	No	-0.001	0.001	0.999	0.997	1.001
	Yes	0.000	0.001	1.000	0.998	1.002		Yes	-0.004	0.001	0.996	0.995	0.998
Acute Myocardial Infarction	No						Acute Myocardial Infarction	No					
	Yes	0.002	0.001	1.002	1.000	1.004		Yes	0.001	0.001	1.001	0.999	1.003
Dementia	No						Dementia	No					
	Yes	0.005*	0.001	1.005	1.004	1.006		Yes	0.004*	0.001	1.004	1.003	1.005
Chronic Kidney Disease	No						Chronic Kidney Disease	No					
	Yes	0.007*	0.001	1.007	1.005	1.008		Yes	0.006*	0.001	1.006	1.005	1.007
Chronic Obstructive Pulmonary Disease	No						Chronic Obstructive Pulmonary Disease	No					
	Yes	0.003*	0.001	1.003	1.002	1.004		Yes	0.001*	0.001	1.001	1.000	1.002
Congestive Heart Failure	No						Congestive Heart Failure	No					
	Yes	0.003*	0.001	1.003	1.002	1.005		Yes	0.004*	0.008	1.004	1.002	1.005
Diabetes	No						Diabetes	No					
	Yes	0.000	0.001	1.000	0.998	1.001		Yes	0.000	0.001	1.000	0.998	1.001
Stroke/Transient Ischemic Attack	No						Stroke/Transient Ischemic Attack	No					
	Yes	0.003*	0.001	1.003	1.001	1.004		Yes	0.002*	0.001	1.002	1.001	1.003
Level of IADL/ADL dependence		0.003	0.004	1.003	0.996	1.011	Level of IADL/ADL dependence		0.006	0.004	1.006	0.999	1.013
Number of Home Health Services		0.044	0.038	1.045	0.970	1.126	Number of Home Health Services		0.038	0.035	1.039	0.971	1.112

*Sig < 0.01

Table 15

Results of Hypothesis 3 Caregiver Presence x ER Visits for both Depression Samples (PHQ-2) and (Medicare Claims)

PHQ-2							*Medicare Claims*						
Variable		Coefficient	St Er	IRR	IRR 95%		Variable		Coefficient	St Er	IRR	IRR 95%	
Age		-0.022*	0.001	0.978	0.977	0.980	Age						
Sex	Male	-0.172*	0.026	0.842	0.799	0.886	Sex	Male	-0.105*	0.022	0.900	0.861	0.940
	Female							Female					
Race*	White	-1.024	0.419	0.359	0.158	0.816	Race*	White	-0.036	0.423	0.965	0.421	2.210
	Black	-0.898	0.440	0.407	0.172	0.965		Black	-0.049	0.442	0.952	0.401	2.263
	Other	-0.294	1.178	0.053	0.005	0.532		Other	-0.876	0.643	0.416	0.118	1.468
	Asian	-0.928	0.577	0.395	0.128	1.225		Asian	-0.363	0.530	0.696	0.246	1.967
	Hispanic	-1.220	0.490	0.295	0.113	0.771		Hispanic	-0.674	0.501	0.510	0.191	1.360
	North American Native							North American Native					
Acute Myocardial Infarction	No	-0.249*	0.040	0.780	0.721	0.844	Acute Myocardial Infarction	No	-0.112*	0.035	0.894	0.834	0.958
	Yes							Yes					
Dementia	No	-0.440*	0.028	0.644	0.610	0.680	Dementia	No	-0.519*	0.024	0.595	0.567	0.624
	Yes							Yes					
Chronic Kidney Disease	No	-0.344*	0.026	0.709	0.674	0.746	Chronic Kidney Disease	No	-0.364*	0.023	0.695	0.665	0.726
	Yes							Yes					
Chronic Obstructive Pulmonary Disease	No	-0.443	0.026	0.642	0.611	0.676	Chronic Obstructive Pulmonary Disease	No	-0.425*	0.022	0.654	0.626	0.683
	Yes							Yes					
Congestive Heart Failure	No	-0.234*	0.028	0.792	0.749	0.837	Congestive Heart Failure	No	-0.297*	0.024	0.743	0.709	0.779
	Yes							Yes					
Diabetes	No	-0.096*	0.026	0.909	0.864	0.956	Diabetes	No	-0.073*	0.022	0.929	0.889	0.971
	Yes							Yes					
Stroke/Transient Ischemic Attack	No	-0.298*	0.027	0.742	0.704	0.782	Stroke/Transient Ischemic Attack	No	-0.324	0.023	0.723	0.691	0.757
	Yes							Yes					
Level of IADL/ADL dependence		-0.009*	0.002	0.991	0.988	0.994	Level of IADL/ADL dependence		-0.004*	0.001	0.996	0.993	0.999
Caregiver	No	-1.511*	0.505	0.221	0.082	0.594	Caregiver	No	-0.340	0.566	0.712	0.235	2.157
	Yes	-0.914	0.451	0.401	0.166	0.970		Yes	0.001	0.458	1.001	0.408	2.457
	Congregate Housing							Congregate Housing					

*Sig < 0.01, overall significance for caregiver and race are noted by asterisks in the variables column

Table 16

Results of Hypothesis 3 Caregiver Presence x Hospitalizations for both Depression Samples (PHQ-2) and (Medicare Claims)

PHQ-2							*Medicare Claims*						
Variable		Coefficient	St Er	IRR	IRR 95%		Variable		Coefficient	St Er	IRR	IRR 95%	
Age		-0.017*	0.001	0.983	0.981	0.985	Age		-0.014*	0.001	0.986	0.984	0.988
Sex	Male	-0.035	0.027	0.966	0.915	1.019	Sex	Male	-0.016	0.021	0.984	0.943	1.026
	Female							Female					
Race	White	-0.489	0.456	0.613	0.251	1.500	Race*	White	-0.286	0.404	0.751	0.340	1.659
	Black	-0.678	0.486	0.507	0.196	1.315		Black	-0.495	0.427	0.610	0.264	1.408
	Other	-1.637	0.975	0.195	0.029	1.315		Other	-0.652	0.584	0.521	0.166	1.635
	Asian	-0.419	0.628	0.658	0.192	2.252		Asian	-0.514	0.519	0.598	0.216	1.656
	Hispanic	0.106	0.517	1.112	0.404	3.064		Hispanic	-0.378	0.473	0.685	0.271	1.732
	North American Native							North American Native					
Acute Myocardial Infarction	No	-0.272*	0.040	0.762	0.705	0.823	Acute Myocardial Infarction	No	-0.284*	0.032	0.753	0.707	0.802
	Yes							Yes					
Dementia	No	-0.213*	0.029	0.808	0.764	0.855	Dementia	No	-0.171*	0.024	0.843	0.805	0.883
	Yes							Yes					
Chronic Kidney Disease	No	-0.695*	0.027	0.499	0.473	0.526	Chronic Kidney Disease	No	-0.584*	0.022	0.557	0.534	0.581
	Yes							Yes					
Chronic Obstructive Pulmonary Disease	No	-0.408*	0.027	0.665	0.631	0.701	Chronic Obstructive Pulmonary Disease	No	-0.349*	0.021	0.705	0.677	0.735
	Yes							Yes					
Congestive Heart Failure	No	-0.427*	0.030	0.652	0.616	0.691	Congestive Heart Failure	No	-0.415*	0.023	0.660	0.631	0.691
	Yes							Yes					
Diabetes	No	-0.077*	0.027	0.926	0.878	0.977	Diabetes	No	-0.054	0.022	0.947	0.908	0.988
	Yes							Yes					
Stroke/Transient Ischemic Attack	No	-0.204	0.028	0.815	0.772	0.860	Stroke/Transient Ischemic Attack	No	-0.193*	0.023	0.824	0.789	0.861
	Yes							Yes					
Level of IADL/ADL dependence		0.003	0.002	1.003	1.000	1.006	Level of IADL/ADL dependence		0.002	0.001	1.002	1.000	1.005
Caregiver	No	-0.199	0.544	0.820	0.282	2.382	Caregiver	No	0.144	0.542	1.155	0.399	3.339
	Yes	-0.421	0.495	0.657	0.249	1.733		Yes	0.031	0.443	1.032	0.433	2.460
	Congregate Housing							Congregate Housing					

*Sig < 0.01, overall significance for caregiver and race are noted by asterisks in the variables column

Table 17

Results of Hypothesis 3 Caregiver Presence x SNF Admissions for both Depression Samples (PHQ-2) and (Medicare Claims)

PHQ-2							*Medicare Claims*						
Variable		Coefficient	St Er	IRR	IRR 95%		Variable		Coefficient	St Er	IRR	IRR 95%	
Age		0.004	0.002	1.004	1.000	1.007	Age		0.008*	0.002	1.009	1.006	1.011
Sex	Male	-0.098	0.039	0.906	0.840	0.977	Sex	Male	-0.119*	0.031	0.888	0.835	0.944
	Female							Female					
Race*	White	-0.450	0.639	0.638	0.182	2.229	Race*	White	-0.473	0.554	0.623	0.210	1.847
	Black	-0.834	0.688	0.434	0.113	1.672		Black	-0.706	0.584	0.494	0.157	1.551
	Other	-26.048*	0.351	0.000	0.000	0.000		Other	-0.626	0.763	0.535	0.120	2.388
	Asian	-0.972	1.005	0.378	0.053	2.710		Asian	-0.632	0.692	0.532	0.137	2.062
	Hispanic	-0.788	0.755	0.455	0.103	1.997		Hispanic	-1.025	0.657	0.359	0.099	1.301
	North American Native							North American Native					
Acute Myocardial Infarction	No	-0.106	0.053	0.899	0.810	0.998	Acute Myocardial Infarction	No	-0.110	0.045	0.895	0.820	0.977
	Yes							Yes					
Dementia	No	-0.547*	0.039	0.578	0.536	0.624	Dementia	No	-0.503*	0.032	0.605	0.568	0.644
	Yes							Yes					
Chronic Kidney Disease	No	-0.649*	0.039	0.522	0.484	0.564	Chronic Kidney Disease	No	-0.521*	0.031	0.594	0.559	0.631
	Yes							Yes					
Chronic Obstructive Pulmonary Disease	No	-0.308*	0.038	0.735	0.682	0.791	Chronic Obstructive Pulmonary Disease	No	-0.232*	0.030	0.793	0.748	0.842
	Yes							Yes					
Congestive Heart Failure	No	-0.345*	0.042	0.708	0.652	0.769	Congestive Heart Failure	No	-0.366*	0.034	0.694	0.649	0.741
	Yes							Yes					
Diabetes	No	-0.035	0.038	0.966	0.897	1.040	Diabetes	No	-0.054	0.031	0.947	0.892	1.006
	Yes							Yes					
Stroke/Transient Ischemic Attack	No	-0.215*	0.037	0.807	0.750	0.868	Stroke/Transient Ischemic Attack	No	-0.156*	0.031	0.855	0.805	0.909
	Yes							Yes					
Level of IADL/ADL dependence		0.010*	0.002	1.010	1.005	1.014	Level of IADL/ADL dependence		0.010*	0.002	1.010	1.006	1.011
Caregiver	No	0.313	0.734	1.368	0.324	5.764	Caregiver*	No	-0.889	0.854	0.411	0.077	2.194
	Yes	-0.366	0.692	0.693	0.179	2.690		Yes	-0.067	0.603	0.935	0.287	3.049
	Congregate Housing							Congregate Housing					

*Sig < 0.01, overall significance for caregiver and race are noted by asterisks in the variables column

Table 18

Logistic Regression Predicting Likelihood of Depression (Using both PHQ-2 and Medicare Claims) based on Short-term hospital discharge

Variable		PHQ-2								Medicare Claims							
		B	SE	Wald	*df*	*p*	Odds Ratio	95% CI for Odds Ratio		*B*	SE	Wald	*df*	*p*	Odds Ratio	95% CI for Odds Ratio	
								Lower	Upper							Lower	Upper
Age		-0.036*	0.001	2332.072	1	0.000	0.964	0.963	0.966	0.001	0.001	1.784	1	0.182	1.001	1.000	1.002
Sex	Male	-0.221*	0.020	121.436	1	0.000	0.802	0.771	0.834	0.031	0.015	4.149	1	0.042	1.031	1.001	1.063
	Female																
Race*	White	-0.289	0.117	6.078	1	0.014	0.749	0.596	0.943	-0.018	0.110	0.027	1	0.869	0.982	0.792	1.218
	Black	-0.783*	0.120	42.63	1	0.000	0.457	0.361	0.578	-0.047	0.111	0.180	1	0.671	0.954	0.767	1.187
	Other	-0.531*	0.149	12.633	1	0.000	0.588	0.439	0.788	-0.010	0.128	0.006	1	0.939	0.990	0.770	1.273
	Asian	-0.748*	0.146	26.318	1	0.000	0.473	0.356	0.630	0.022	0.123	0.031	1	0.860	1.022	0.804	1.299
	Hispanic	-0.641*	0.128	25.221	1	0.000	0.527	0.410	0.677	0.000	0.116	0.000	1	0.997	1.000	0.797	1.255
	North American Native																
IADL/ADL dependence		-0.026*	0.001	25.221	1	0.000	1.026	1.024	1.028	0.001	0.001	2.179	1	0.140	1.001	1.000	1.003
Acute Myocardial Infarction		-0.034	0.033	1.060	1	0.303	0.967	0.906	1.031	0.004	0.026	0.019	1	0.892	1.004	0.953	1.057
Dementia		-0.374*	0.022	286.481	1	0.000	0.688	0.659	0.719	-0.014	0.018	0.611	1	0.434	0.986	0.953	1.021
Chronic Kidney Disease		-0.123*	0.020	36.233	1	0.000	0.884	0.849	0.920	0.010	0.016	0.394	1	0.530	1.010	0.979	1.042
COPD		-0.257*	0.020	169.402	1	0.000	0.773	0.744	0.804	-0.015	0.015	0.986	1	0.321	0.985	0.955	1.015
Congestive Heart Failure		-0.073*	0.022	11.217	1	0.001	0.930	0.891	0.970	0.010	0.017	0.333	1	0.564	1.010	0.977	1.043
Diabetes		0.002	0.020	0.010	1	0.920	1.002	0.964	1.042	-0.006	0.015	0.168	1	0.682	0.994	0.964	1.024
Stroke/TIA		-0.055	0.022	6.383	1	0.012	0.947	0.908	0.988	0.018	0.017	1.068	1	0.301	1.018	0.984	1.053
Caregiver*	No	-0.100	0.066	2.270	1	0.132	0.905	0.795	1.030	-0.016	0.052	0.096	1	0.757	0.984	0.888	1.090
	Yes	-0.340*	0.062	30.012	1	0.000	0.712	0.630	0.804	-0.014	0.049	0.085	1	0.770	0.986	0.895	1.085
	Congregate Housing																
Acute Hospital Discharge		0.234*	0.066	12.523	1	0.000	1.263	1.110	1.437	-0.028	0.054	0.272	1	0.602	0.972	0.875	1.080

* indicates $p<0.01$

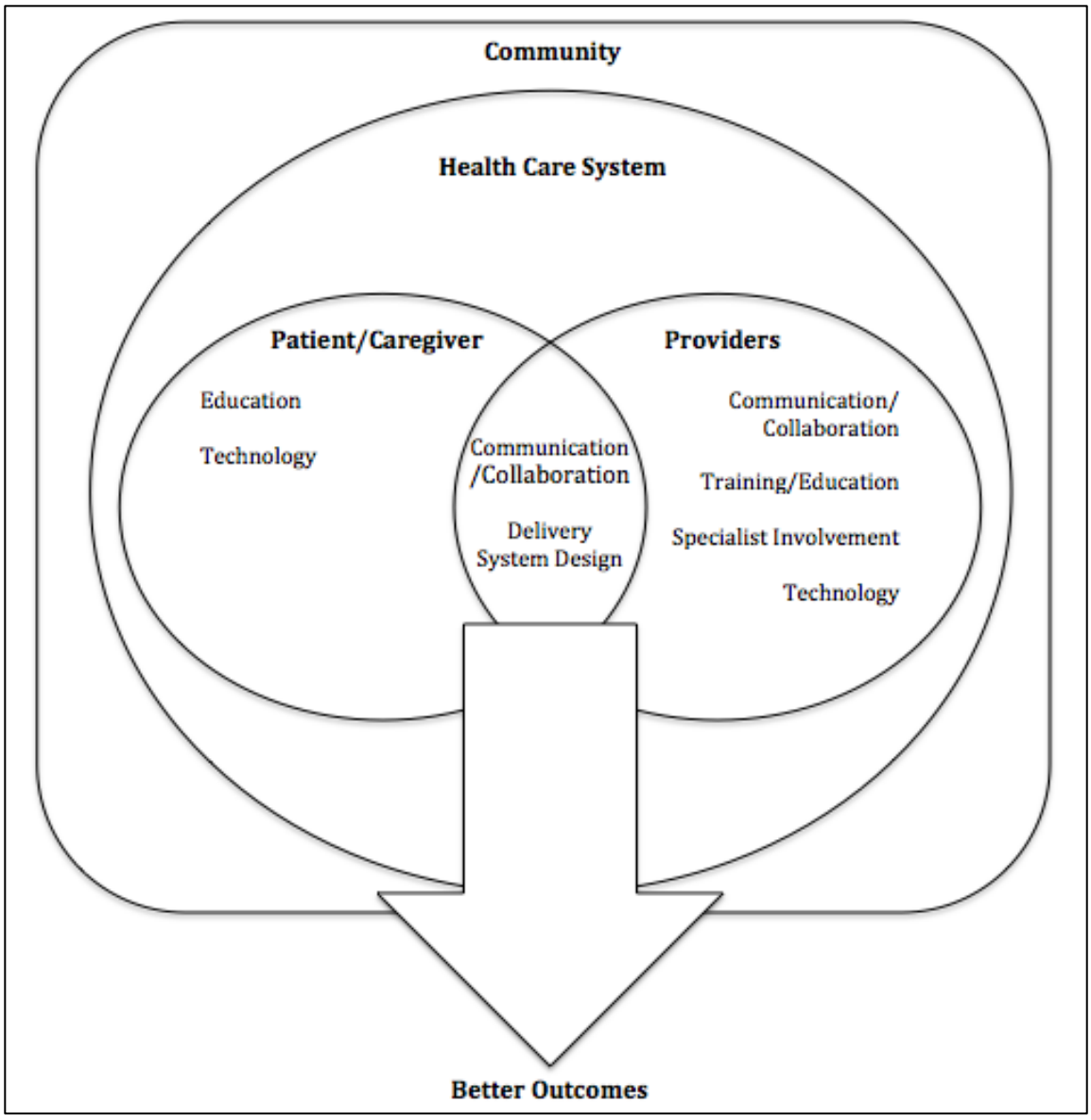

Figure 1. The Chronic Care Model for Depressed Homebound Older Adults

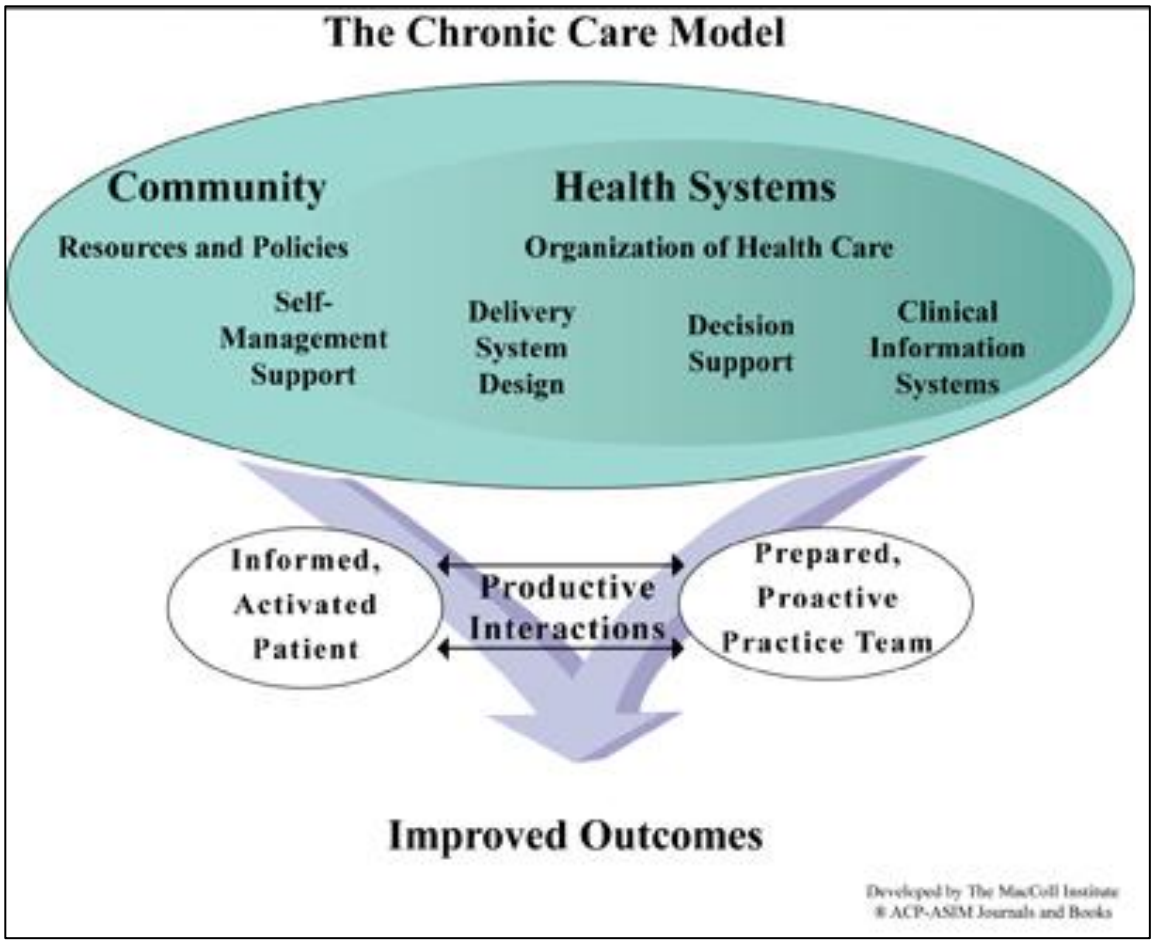

Figure 2. The Chronic Care Model proposed by Wagner and colleagues (1996a, 1996b; "The Chronic Care Model," 2006

CURRICULUM VITAE

Brittney R. Getz
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EDUCATION

Memphis VA Medical Center, August 2014 – August 2015
Memphis, TN
Clinical Internship, Director of Training: Karen Clark, Ph.D.
General Track

University of Louisville, 2015
Louisville, KY
Clinical Psychology Doctoral Program
Masters of Arts (M.A.) and Doctor of Philosophy (Ph.D.) in Clinical Psychology
Department of Psychological and Brain Sciences, Advisor: Suzanne Meeks, Ph.D.
Dissertation: Testing the Chronic Care Model for Depression in Homebound Older Adults

Wofford College, 2010
Spartanburg, SC
Bachelor of Science (B.S.) in Psychology and Bachelor of Arts (B.A.) in Spanish, Magna Cum Laude

MANUSCRIPTS

Meeks, S., Getz, B. R., Hess, L. S., Kostiwa, I. M., Ludwin, B. M., Rodgers, J. R., & Shah, S. N. (2015). The BE-ACTIV Project: How research, professional training, education, and practice were integrated in a single clinical trial. *Gerontology & Geriatrics Education, 36*(3), 318-329. doi: 10.1080/02701960.2015.1031893

Pittman, D. W., Parker, J., Getz, B. R., Jackson, C. M., Le, T. A., Riggs, S. B., & Shay, J. M. (2012). Cost-free and sustainable incentive increases healthy eating decisions during elementary school lunch. *International Journal of Obesity, 36*(1), 76-79. doi: 10.1038/ijo.2011.205

Reid, A. K., Nill, C. A., & Getz, B. R. (2010). Changes in stimulus control during guided skill learning in rats. *Behavioural Processes, 84*(1), 511-515. doi: 10.1016/j.beproc.2010.01.001

PRESENTATIONS

Getz, B., & Meeks, S. (Submitted). Testing the Chronic Care Model for Depression in Homebound Older Adults. Poster to be presented at the 68th Annual Scientific Meeting of the Gerontological Society of America, Orlando, Fl.

Imel, J., Shah, S., Getz, B., & Meeks, S. (2013, November). Comparing resiliency in early and late-life bereavement. Poster presented at the 66th Annual Scientific Meeting of the Gerontological Society of America, New Orleans, LA.

Getz, B., Kostiwa, I., Shah, S., Ludwin, B., & Meeks, S. (2012, November). Nursing Home Employee Perception of Organizational Culture and its Relation to Job Satisfaction. Poster presented at the 65th Annual Scientific Meeting of the Gerontological Society of America, San Diego, CA.

Shah, S., Getz, B., Ludwin, B., Kostiwa, I., & Meeks, S. (2012, November). The utility of the Revised Memory and Behavior Problems Checklist - Nursing Home version (RMBPC-NH) in a depressed long-term care sample. Poster presented at the 65th Annual Scientific Meeting of the Gerontological Society of America, San Diego, CA.

Getz, B., & Meeks, S. (2011, November). The Effects of Number of Activities and Affect on Quality of Life in Adult Day Center Participants. Poster presented at the 64th Annual Scientific Meeting of the Gerontological Society of America, Boston, MA.

Getz, B.R. & Thomson, A. A. (2010, May). Survey of Upstate Veterans. Presented at the Wofford College Student Science Research Colloquium, Spring 2010, Spartanburg, SC.

Getz, B., Rondon, A., Harper, I., Dekine, T., Anders, A., Birckbichler, J., & Stephens, B. (2010, March). ePortfolio-based assessment of educational outcomes: artifacts and reflections. Poster presented at the annual meeting of the Southeastern Psychological Association, Chattanooga, TN.

Getz, B., Rondon, A., Anders, A., Harper, I., Dekine, T., Birckbichler, J., & Stephens, B. (2010, March). ePortfolio, interactive resume, and evaluation of job applications. Poster presented at the annual meeting of the Southeastern Psychological Association, Chattanooga, TN.

Getz, B. R., Jackson, C. M., Riggs, S. B., & Shay, J. M. (2009, December). Education & praise are sufficient to improve healthy eating during elementary school lunch service. Presented at the Wofford College Student Science Research Colloquium, Fall 2009, Spartanburg, SC.

Anders, T. P., Getz, B. R., Nill, C. A., & Sahms, J. S. (2009, December). Examination of the Effects of Working Memory Training on Working Memory Capacity and Transfer to Fluid Intelligence. Presented at the Wofford College Student Science Research Colloquium, Fall 2009, Spartanburg, SC.

Getz, B. R., Rondon, A. T., Stephens, B. R., & Klein, N. D. (2009, July). Students' Views of Job Applicants' Capabilities via E-portfolios and Resumes. Poster presented at the annual meeting of the Conference on Applied Psychology, Clemson, SC.

Rondon, A. T., Getz, B. R., Stephens, B. R., & Klein, N. D. (2009, July). Assessment of general education outcomes: ePortfolio artifacts and reflections. Poster presented at the annual meeting of the Conference on Applied Psychology, Clemson, SC.

Reid, A. K., Nill, C. N., & Getz, B. R. (2009, May). Internalization of Stimulus Control during Skill Learning: When Can the Coach Leave? Poster presented at the annual meeting of the Society for Quantitative Analyses of Behavior, Phoenix, AZ.

Nill, C. N., & Getz, B. R. (2009, May). Internalization of Stimulus Control during Skill Learning: When Can the Coach Leave? Presented at the Wofford College Student Science Research Colloquium, Spring 2009, Spartanburg, SC.

Nill, C. N., Getz, B. R. (2009, May). Teaching Rats to Find Land Mines: A Feasibility Study Presented at the Wofford College Student Science Research Colloquium, Spring 2009, Spartanburg, SC.

GRANTS

Meeks, S., & Getz, B. R. (2013). Peer Volunteers as Clinician Extenders for Treating Depression and Anxiety in Homebound Elders.
Funding Agency: University of Louisville Intramural Research Incentive Grant
Funding Period: January 1, 2013 – December 31, 2013
Amount Received: $1,932

CLINICAL EXPERIENCE

Private Practice Practicum
August 2012- July 2014
-Supervised by Dr. Shelley Mehl
-Population: Children, Adults
-Presenting problems: Mood disorders, Anxiety disorders, Behavioral problems in children
-Learning about different treatment modalities such as interpersonal therapy
-Conducting individual therapy with children and adults
-Conducting group therapy for children with social skills deficits

Anxiety Research and Treatment Team, University of Louisville
August 2012- July 2014
-Supervised by Dr. Woodruff-Borden
-Population: Children, Adults, and Older Adults
-Presenting problems: Anxiety disorders, Mood disorders
-Developing case formulations for each client and tailoring treatment accordingly
-Conducting cognitive-behavioral therapy with clients

Long-term Care Practicum
January 2011- July 2014
-Supervised by Dr. Suzanne Meeks
-Population: Older Adults
-Presenting problems: Mood disorders, Anxiety disorders, Psychosis, Behavioral Problems, Dementia, Mild Cognitive Impairment
-Conduct individual therapy
-Consult with nursing home staff
-Conduct neuropsychological assessment to test for cognitive impairment
-Conduct structured interviews (SCID) to arrive at clear diagnoses

Geropsychology Team, University of Louisville
August 2010- August 2012
-Supervised by Dr. Benjamin Mast
-Population: Older Adults
-Presenting problems: Dementia, Mild Cognitive Impairment, Mood disorders, Anxiety disorders
-Conduct neuropsychological assessment to test for cognitive impairment
-Conduct therapy with older adults
-Provide case management for clients by working on an interdisciplinary team
-Provide feedback to clients and their families about neuropsychological assessment as part of an interdisciplinary team meeting

Interned with Marriage and Family Therapist, Spartanburg Department of Mental Health, Spartanburg, SC.
January 2009
-Supervised by Perry Henson
-Sat in on therapy sessions
-Learned about working in a clinical setting

RESEARCH EXPERIENCE

Testing the Chronic Care Model for Depression in Homebound Older Adults
September 2013- Present
-Dissertation Committee: Dr. Suzanne Meeks, Dr. Benjamin Mast, Dr. Barbara Stetson, Dr. Scott LaJoie, and Dr. Janet Woodruff-Borden
-Dissertation study examining whether home health agencies that provide care to their depressed clients in accordance with the Chronic Care Model for Depressed Homebound Older Adults have better outcomes
-Using data from the Medicare Home Health Agency Outcome and Assessment Information Set (OASIS)

Predicting trajectories of flourishing and failing in new nursing home residents. R01 MH092317-01A1 (Meeks, PI)
April 2013- July 2014
-Supervised by Dr. Suzanne Meeks
-Conduct structured clinical interviews (SCID) with nursing home residents
-Assess study participant's quality of life, hope, optimism, social support, religious involvement, and cognitive ability (DRS)
-Arrive at a consensus diagnosis based on the SCID with Dr. Suzanne Meeks

Peer Volunteers as Clinician Extenders for Treating Depression and Anxiety in Homebound Elders
May 2012- May 2013
-Supervised by Dr. Suzanne Meeks
-Proposed a research project for treating anxiety and depression in homebound older adults using older adult volunteers as clinician extenders
-Collaboration with ElderServe and Seven Counties Services Inc.

BE-ACTIV: Treating Depression in Nursing Homes. R01 MH074865 (Meeks, PI)
July 2010- July 2013
-Supervised by Dr. Suzanne Meeks
-Population: Older Adults
-Presenting problems: Depression
-Conduct 10-week, manualized behavioral therapy with depressed nursing home residents
-Collaborate with nursing home staff and resident's family on treatment implementation
-Assess study participants' mood, activity levels, satisfaction with the intervention

Aging and Mental Health Lab Research Assistant, University of Louisville.
July 2010- July 2014
-Mentored by Dr. Suzanne Meeks
-Contribute to lab research
-Collaborate with other students on their projects
-Work on literature review of behavioral and environmental interventions for depression in long-term care

-Presented research at the Gerontological Society of America
Cognitive Aging Lab Research Assistant, Wofford College.
September 2009- May 2010
-Supervised by Dr. Kara Bopp
-Evaluated working memory training in older adults
-Presented research at Wofford College Student Science Research Colloquium

Childhood Obesity Lab Research Assistant, Wofford College.
September 2009- May 2010
-Supervised by Dr. Dave Pittman
-Examined effects of behavioral intervention on elementary school students' lunch choices
-Co-authored publication in *International Journal of Obesity* on this intervention
-Presented research at Wofford College Student Science Research Colloquium

REU Intern at NSF Supported Summer Program in Applied Psychology, Clemson University.
May 2009- August 2009
-Supervised by Dr. Benjamin Stephens
-Evaluated the effectiveness of using electronic portfolios as an education outcome measure
-Presented research at Southeastern Psychological Association and Conference on Applied Psychology

Survey of Upstate Veterans, Wofford College.
October 2008- May 2010
-Supervised by Dr. John Lefebvre
-Created survey for veterans in the upstate of South Carolina

Research Assistant in Learning and Adaptive Behavior, Wofford College.
Spring 2009
-Supervised by Dr. Alliston Reid
-Evaluated skill learning in rats
-Co-authored publication in *Behavioural Processes* on operant conditioning in rats
-Presented research at Society for the Quantitative Analyses of Behavior and Wofford College Student Science Research Colloquium

HONORS & ACHIEVEMENTS

Golden Key International Honor Society, University of Louisville, 2011- Present
University Fellowship, University of Louisville School of Interdisciplinary and Graduate Studies, 2010- 2012
Phi Beta Kappa, Wofford College
James E. Seegars Award, Outstanding Psychology Major, Wofford College, 2010
Sigma Delta Pi, Spanish Honor Society, Wofford College 2008- 2010
Dean's List, Wofford College, 2006- 2010

MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS

American Psychological Association, Student Affiliate, 2010- Present
Campus Representative, Advocacy Coordinating Team, 2010- 2013
American Psychological Association, Division 12, Section II, Student Member, 2012-Present
Kentucky Psychological Association, Student Affiliate, 2011- Present
Gerontological Society of America, Student Member, 2010- Present

REFERENCES

Suzanne Meeks, Ph.D.
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Associate Professor
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Email: b.mast@louisville.edu

Janet Woodruff-Borden, Ph.D.
University of Louisville
Department of Psychological and Brain Sciences
Director of Clinical Training, Professor
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Jennifer Jacobson, Psy.D.
Memphis VA Medical Center
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