

Mental Health Disorders of Home Care Elders in the United States:
A Secondary Analysis of the Outcome and Assessment Information Set (OASIS)

Jinjiao Wang

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ABSTRACT

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Home care has been the fastest growing sector in the U.S. healthcare system for over three decades. In 2012, there were over 4.7 million home care patients in the United States. Most of these patients were elders (4 million); and this number is expected to increase as the U.S. population continues to age. One major health concern in this elderly home care population is mental health disorders (MHDs), which have been noted with increasing rates and substantial consequences in local data. However, much of our knowledge on this topic was generated from local studies that had a number of methodological limitations. These include over reliance on local and outdated data, a lack of theoretical foundation, and a lack of statistical justification, which may well account for the high variability across findings. To date, no national investigation has been conducted on this topic, supporting the need for a large-scale study which employs recent data to better understand the prevalence, risk factors and impact of MHDs among home care elders in the U.S.

This dissertation study addressed these gaps by using the de-identified national home care dataset, Outcome and Assessment Information Set (OASIS), to: 1) examine the national prevalence of MHDs and MHD-caused medical events in the U.S. elderly home care population, and 2) identify factors associated with MHDs and MHD-caused medical events in this population.

The 5% random sample used in this study was consisted of 28,475 elderly home care patients: their average age was 79.41; patients were mostly female, white, Medicare beneficiaries, referred

from short-stay acute hospitals, and living with others at home. Approximately 38% of this sample had MHDs, mostly depression (28.0%) and anxiety (18.9%). Compared with other patients, those with MHDs were younger, more likely to be female, smokers, frail, living alone, referred from psychiatric hospitals, cognitively or sensually impaired, in poorer general health, had a recent history of falls or multiple hospitalizations, and evidenced insufficient social support. Among patients identified with MHDs, less than one third (31.8%) received mental health services, including psychiatric nursing services (n=317) and depression interventions (n=4,459). During the 60-day home care episode, 16.95% of the sample had subsequent hospitalizations and 12.72% had subsequent emergent care events; 0.45% of these medical events were directly caused by MHDs. In addition, depression intervention was the strongest risk factor for these subsequent medical events, associated with an approximate two-fold risk for all-cause hospitalizations (HR: 1.943) and emergent care events (HR: 1.974). However, 61.61% (n=2,747) of these high-risk depression intervention recipients did not screen positive for depression at admission.

Findings in this dissertation study revealed the high national prevalence of MHDs in the elderly U.S. home care population, and the strong association between these disorders and subsequent all-cause medical events. However, these MHDs were largely under-detected and under-managed in this population, highlighting the need for closer monitoring and targeted intervention through enhanced psychiatric training among front-line home care nurses. Recommendations for further work are made, including the development of an electronic algorithm of identified MHD correlates and risk factors as useful in the development of a nationwide monitoring system for geriatric MHDs in the home care setting.

Table of Contents

List of Tables	iii
List of Figures.....	iv
Chapter I: Introduction and Background	1
Overview.....	1
Under-Detection and Under-Treatment of MHDs in Home Care Elders	3
Health and Economic Burden of MHDs in U.S. Home Care Elders	4
A High-Risk Subgroup: Home Care Elders with Cancer	5
Problem Statement.....	6
Research Purpose and Question.....	9
Specific Aims and Hypotheses	9
Definitions of Key Terms and Variables	11
Chapter II: Review of the Literature.....	15
Scope of Literature Review	15
Search Strategy and Methods	15
Quality of the Reviewed Studies	17
Findings in the Existing Literature	25
Temporal trend of studies	25
Finding 1: Epidemiology of MHDs in the home care elderly population	27
Finding 2: Risk factors for MHDs in this population	28

Finding 3: Under-detection and under-treatment of MHDs in home care elders	32
Finding 4: Consequences of under-treated MHDs in home care elders	34
Finding 5: Barriers to effective detection and treatment of MHDs in home care elders ..	35
Contribution to Knowledge	43
Chapter III: Methodology/Research Design	45
Research Design	45
Theoretical Framework.....	45
Population and Sample	47
Variables of Interest.....	47
Operational Definitions of Variables	50
Plan for Data Management and Analysis	53
Data Analyses	53
Chapter IV: Results.....	58
Sample Characteristics.....	59
Primary Findings.....	64
Finding 1: Rates of MHDs and MHD-Caused Medical Events.....	64
Finding 2: Correlates of MHDs	68
Finding 3: Risk Factors for MHD-caused Medical Events.....	71
Finding 4: MHDs as Strong Risk Factors for All-cause medical events	73
Finding 5: Gaps in the Allcoation of Psychiatric Services	76

Ad Hoc Analysis Results	78
Chapter V: Discussion	80
Finding Category 1: National prevalence of MHDs in the U.S. home care elders.....	80
Finding Category 2: Correlates of MHDs in U.S. Home Care Elders.....	84
Finding Category 3: Risk Factors for MHD-caused Medical Events.....	90
Finding Category 4: Discrepancies in the Psychiatric Service Allocation	93
Finding Category 5: MHDs as Risk Factors for All-cause Medical Events	96
Strengths and Limitations	101
Conclusions and Implications.....	103

List of Tables

Table 1: Integrative Assessment of Reviewed Articles	20
Table 2: Comparison between reviewed articles	22
Table 3: Summary of reviewed articles	25
Table 4: Closing gaps in the literature	43
Table 5: Censoring situations.....	48
Table 6: Overview of Concept, Variables, and Related Data Items in OASIS	49
Table 7: Operational Definitions of Variables.....	50
Table 8: Charlson Comorbidity Index	52
Table 9: Specific Aims, Variables, and Analytical Plan.....	56
Table 10: Patient Demographics.....	59

Table 11: Medical and Health Status	61
Table 12: Functional Limitations and need for ADL/IADL assistance	63
Table 13: National Prevalence of MHDs.....	64
Table 14: Depression	65
Table 15: Anxiety Symptoms	66
Table 16: Other MHD Symptoms.....	66
Table 17: Correlation Matrix among MHDs	67
Table 18: MHD-caused Medical Events.....	67
Table 19: Correlates of Specific MHDs.....	68
Table 20: Correlates of Aggregated MHDs.....	70
Table 21: Bivariate Correlates of MHD-caused Medical Events	72
Table 22: Multivariate Risk Factors for MHD-caused Medical Events	73
Table 23: Bivariate Correlates of Total Medical Events	74
Table 24: Identified Risk Factors for All-Cause Subsequent Medical Events	75
Table 25: Gaps in Psychiatric Resource Allocation	76
Table 26: Characteristics of depression intervention recipients	78
Table 27: Medical Events Comparison.....	79

List of Figures

Figure 1: The Social Ecological Framework	9 & 46
Figure 2: Literature search flowchart (PRISMA format)	17

Figure 3: Geographical representation of reviewed studies.....	22
Figure 4: Patient disposition following the initial 60-day home care stay	58
Figure 5: Distribution of Medical Comorbidities	60

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CHAPTER I: INTRODUCTION AND BACKGROUND

Rapidly Increasing Home Care Elderly Population in the United States

The world population is aging with an increased number of people age 65 years or over. Additionally, this trend is anticipated to continue and accelerate until at least 2050 (United Nations, 2013). By the year 2040, there will be a census of approximately 79.7 million older persons in the United States, more than twice the number in 2000 (U.S. Department of Health and Human Services, 2013a). Currently, older adults live in the community rather than in long-term care facilities such as nursing homes. This is reflected in the move by many countries to shift health care delivery from inpatient facilities to the community, specifically, the elders' own homes, thereby providing what is commonly termed home health care services (Jarvis, 2001).

Home health care is not only in alignment with most patients' preference for this form of care delivery, but also beneficial in its efficacy in preventing cognitive and functional decline and reducing the medical costs (Cummings, et al., 1990; Di Gioacchino et al., 2004). In the United States, home health care has been the fastest growing delivery model in the national healthcare system for over three decades (Jarvis, 2001). In 2012, the home care sector, consisting of over 12,000 agencies, provided services to more than 4.7 million Americans, making it the largest long-term care service provider in the U.S. (Harris-Kojetin, Sengupta, Park-Lee, & Valverde, 2013). In particular, more than 80% of these home care patients are older than 65 years (Harris-Kojetin et al., 2013); and this number (4 million in 2012) will keep growing as the U.S. population continues to age (U.S. Department of Health and Human Services, 2013a).

Home Care Elders: A High-Risk Group for Mental Health Disorders (MHDs)

Overview

Home care elders have higher rates of medical complexity, comorbidity, and physical disability (Bruce et al., 2002), which leads to related health concerns. In particular, mental health disorders (MHDs) are a major concern in this regard during the last decade. In the U.S., MHDs are not uncommon in the adult population. A report from the National Institute of Mental Health shows that in any given year, approximately 26% adults in the U.S. have at least one diagnosable MHD (Kessler, Chiu, Demler, & Walters, 2005). Of particular note to the older adult population, MHDs, especially anxiety and depression, are not only prevalent in this group of people, but more likely to have multiple psychiatric comorbidities, as noted in a recent national survey about mental health comorbidity (Byers, Yaffe, Covinsky, Friedman, & Bruce, 2010). Further, when compared with the general elderly population, home care elders have even higher risks for MHDs due to their underlying frailty, comorbid chronic medical conditions, functional limitations, homebound status, lack of social support, and limited access to health care services (Cassileth et al., 1984; Choi & McDougall, 2007; Cohen-Mansfield, Shmotkin, & Hazan, 2010; Ly, 2013).

There is abundant evidence in the local data for high and ever growing rates of MHDs in the elderly home care population (32.4%-45%), at a rate of at least twice the rates of MHDs in the general elderly population (Li & Yeates, 2007; Martens et al., 2007; Martens et al., 2007). The most common MHDs in home care elders are depression and anxiety, which are respectively reported in up to 44% and 36% home care elders in this country (Bruce et al., 2002; Bruce & McNamara, 1992; Diefenbach, Tolin, Meunier, & Gilliam, 2009; Jayasinghe, Rocha, Sheeran, Wyka, & Bruce, 2013; Kronish, Federman, Morrison, & Boal, 2006; Prévaille, Cote, Boyer, & Hebert, 2004; von Strauss, Fratiglioni, Viitanen, Forsell, & Winblad, 2000). Furthermore, home care elders also tend to develop more severe forms of MHDs than elders in the general

population, e.g., major depression that leads to self-harm and suicidal ideation (Kerse et al., 2010; McAvay, Raue, Brown, & Bruce, 2005).

Under-Detection and Under-Treatment of MHDs in Home Care Elders

Despite the high rates of MHDs in this population and the fact that most late-life MHDs are in fact treatable, home care elders remain one of the most under-detected and under-treated populations for this group of disorders (Banerjee & Macdonald, 1996; Bruce et al., 2002; Zeltzer & Kohn, 2006). Very few home care elders with MHDs are detected as such by home care agency protocols and personnel, and even fewer of them are appropriately treated (Dalby et al., 2008; Szczerbinska, Hirdes, & Zyczkowska, 2012). It is reported that only 16% to 22% of depressed older home care patients received appropriate medications for their depressive symptoms, i.e. antidepressants, and none of these patients received any form of psychotherapy, despite effectiveness of these combined treatments (Banerjee & Macdonald, 1996; Bruce et al., 2002).

Accumulating evidence reveals that insufficient initial judgment of home care staff is strongly related to the poor detection and inadequate treatment for MHDs in the home care elderly population (Brown et al., 2004; Jayasinghe et al., 2013; Prévaille et al., 2004; Thobaben & Kozlak, 2011). Specifically, lack of knowledge and training in geriatric psychiatry is the most common reason that home care nurses were unable to identify MHDs in this population (Brown, Raue, Schulberg, & Bruce, 2006; Gellis, 2010; Zeltzer & Kohn, 2006). Accordingly, it has been suggested that essential training in this area be provided in order to improve the MHDs screening ability of home care nurses (Brown et al., 2004; Bruce et al., 2002; Gellis, McGinty, Horowitz, Bruce, & Misener, 2007). As recommended, home care nurses can be trained using assessment tools and systems that are already in place. For example, the Outcome and Assessment

Information Set (OASIS), which is a mandatory administrative database that is used in more than 85% of all home care agencies in the U.S. Specifically, OASIS, as a routine assessment tool, has great potential to accurately detect mental disorders, and thus improve the screening protocol and care management for MHDs in home care elders, as verified in pilot studies (Brown et al., 2004; Bruno & Ahrens, 2003).

Health and Economic Burden of MHDs in U.S. Home Care Elders

MHDs, especially the untreated and undertreated MHDs, have substantially negative consequences in the home care elderly population. For example, MHDs are related to higher sudden death rates, and lower quality of life with greater morbidity and functional limitations, higher dependence on caregivers, as well as higher risks for adverse events, such as falls (Banerjee & Macdonald, 1996; Byers et al., 2008; Davitt & Gellis, 2011; Diefenbach, Tolin, & Gilliam, 2012; Thomas Sheeran, Brown, Nassisi, & Bruce, 2004; Szczerbinska et al., 2012; Thompson, Lang, & Annells, 2008). They also evidence a higher rate of nursing home admissions and hospitalizations, resulting in a higher utilization of healthcare services by this particular group (Madigan, 2007; Miller & Rosenheck, 2007; Onder et al., 2007; Sheeran, Byers, & Bruce, 2010).

Medical expenditure associated with MHDs is substantial. Data shows that elders with MHDs, especially depression and anxiety, utilize at least 50% more health care services than those without these disorders, despite adjusting for demographics and other clinical differences (Unützer et al., 1997; Unützer et al., 2009). On an annual basis, the amount of medical expenditure for elders with MHDs is \$20,046/person, almost twice the yearly health care spending of non-affected elders (\$11,956/person) (Unützer et al., 1997; Unützer et al., 2009). Concurrently, the costs of home care services have also experienced a rapid increase. In the U.S.,

home care costs doubled in the last decade, rising from \$39.8 billion in 2003 to \$74.3 billion in 2013 (Centers for Medicare and Medicaid Services [CMS], 2011). Should the trend continue, home health care services are projected to cost \$142 billion a year by 2022 (CMS, 2011; U.S. Department of Health and Human Services, 2013b). Although specific data is not available regarding the portion of this cost that can be attributed to MHDs, extant research indicates that MHDs in home care patients are associated with a higher level of service use and medical expenditure (Banerjee & Macdonald, 1996; Unützer et al., 2009). Therefore, it is reasonable to expect that as the rates of MHDs continue to grow in the American home care elderly population, more health care resources will be utilized with a resulting increase in medical expense.

A High-Risk Subgroup: Home Care Elders with Cancer

Besides aging and being homebound, cancer is another risk factor that can precipitate the need for mental health services (Hewitt & Rowland, 2002). As data suggests, the prevalence of MHDs in cancer patients is striking, with at least half of this group being significantly distressed, depressed, or anxious (Konig et al., 2014; Lee, Katona, De Bono, & Lewis, 2010). Such prevalence (51%) is much higher than that of the other chronically ill populations (Sherif, Jehani, Saadani, & Andejani, 2001; Song, Li, Lu, Deng, & Sun, 2013).

For cancer patients, maintaining mental health is of critical importance, as it is significantly associated with their quality of life (Cohen & Leis, 2002; Grassi et al., 1996). Specifically, a healthy mental state may not only facilitate their adjustment to the disease, but enhances their physical wellbeing (Akechi, Okamura, Yamawaki, & Uchitomi, 1998). As such, early psychiatric interventions, e.g., psychotherapy, that aim to improve mental health might

substantially improve survival rates of cancer patients, especially those with MHDs (Cunningham & Watson, 2004).

This is of particular relevance to the home care population, as approximately one third of home care recipients in the U.S. are living with cancer (OASIS, 2010). In addition, the majority of these home care patients are in the palliative or terminal phase of disease periods when the presence of MHDs, such as depression, is very common (O'Connor, White, Kristjanson, Cousins, & Wilkes, 2010). Moreover, as home care services have been shown to improve the mental health status of cancer patients (McCorkle et al., 1994), more patients in this group may be admitted to home care services in the future, resulting in even higher demand for such services.

Despite these findings and projections, very few cancer patients have been identified or appropriately treated in the case a MHD diagnosis, resulting in a large number of under-detected and under-treated MHDs in this group of patients (Vanderwerker, Laff, Kadan-Lottick, McColl, & Prigerson, 2005). Therefore, it is important to investigate factors associated with the occurrence of MHDs particularly in this high-risk subgroup. So far, a number of risk factors have been identified in the general oncology population, such as gender, age, and the type of service received, e.g., palliative services versus active follow-up treatment (Cassileth et al., 1986; Given, Given, & Stommel, 1994; Koroukian, Murray, & Madigan, 2006; Martens et al., 2007). However, little is known about the risk factors in elderly cancer patients who are also receiving home care services. For example, it is still unknown if cancer poses additional risk for MHDs in this frail home care population, which may in turn be mediated by homebound, aging, and complex medical status.

Problem Statement

Call for Investigations on MHDs in the Elderly Home Care Population

MHDs in the elderly home care population are a critical public health problem, and have attracted extensive attention so far. In 2008, the National Institute of Mental Health issued a strategic plan to strengthen the implementation of mental health interventions across diverse care settings, including home health care (The National Institute of Mental Health, 2008). Four years later, a report from the Institute of Medicine (IOM) (2012) entitled “the Mental Health and Substance Use Workforce for Older Adults: In Whose Hands?”, again noted the alarming rates of MHDs in the elderly population. Specifically, this IOM report highlighted the severely inadequate provision of appropriate psychiatric services for older Americans, despite the substantial mental health needs in this population.

Conflicting Empirical Evidence about MHDs in the Elderly Home Care Population

In the research arena, several investigations have been conducted to address the issue posed by MHDs in home care elders (Brown et al., 2006; Bruce, 2001). However, data regarding the extent of MHDs in this group is only available on the local level; no national investigation has been conducted on this topic. In addition, the current evidence base is inconsistent with respect to these disorders. For example, one study found that although 13.5% of home care elders had major depression, only 22% of the depressed patients were taking antidepressants, and none of them received psychotherapy (Bruce et al., 2002). The authors further argued that the under-treatment of MHDs could be attributable to the poor recognition of these disorders in home care settings. As noted, none of the depressed patients had a psychiatric disorder listed as the primary diagnosis in their medical records (Bruce et al., 2002). However, some of the earlier evidence suggests an even higher prevalence of MHDs and a further inadequate provision of treatment. Specifically, researchers found that almost half (43.8%) of home care elders had at least one

form of MHDs, but only 10.4% of these mentally ill were appropriately treated (Banerjee, 1993; Banerjee & Macdonald, 1996; Brown et al., 2004).

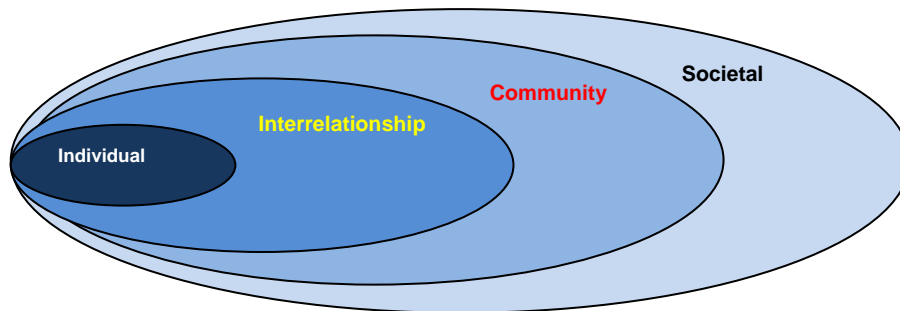
In addition to the prevalence and treatment of MHDs, the current evidence base is also inconsistent with regard to risk factors associated with these disorders. These factors identified in earlier studies include patients' demographics, such as age, gender, and race, living condition, functional limitations, and medical status (Banerjee & Macdonald, 1996; Brown et al., 2004; Bruce et al., 2002; Nagatomo & Takigawa, 1998). However, these factors were cited for different reasons. For instance, in one study, authors reported that advancing age was strongly related to the incidence of MHDs in home care elders, resulting in a higher risk for older home care patients to develop MHDs than their younger counterparts (Martens et al., 2007). However, in other studies, older age was reported as a protective factor, because it was related to a lower prevalence of MHDs in this population (Li & Conwell, 2007; Maranzan & Stones, 2013; Szczerbinska et al., 2012). In addition, while some studies reported that for home care elders, living alone and living only with spouse were associated with lower rates of MHDs, ADL lower limitations, and subsequently fewer needs for mental health services in compared with living with family (Lewin, Chain, & Calver, 2006; Nagatomo & Takigawa, 1998), there is also evidence that living alone could in fact lead to a higher prevalence of MHDs in this group of elders (Banerjee & Macdonald, 1996; Brown et al., 2004).

Specifically, there are two significant gaps in the literature on MHDs in the elderly home care population. The first centers on the actual national prevalence of MHDs in this group, the second is concerned with the lack of systematic knowledge regarding the risk factors for MHDs in this population, information which could inform focused detection efforts and targeted intervention development.

Research Purpose and Question

The purpose of this dissertation study was to examine the extent and correlates of MHDs in our current elderly homecare population. The specific research question was: What is the prevalence of common mental health disorders in the elderly home care population and their associated risk factors at the national level? This was examined from the perspective of the Social Ecological Framework (McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1996; The World Health Organization [WHO], 2014a), a theoretical framework for this study which includes four levels of risk factors when examining a population's health outcomes. These four levels are individual characteristics, interpersonal relationship, community context, and societal factors, as depicted in Figure 1.

Figure 1. Conceptual Model from the Social Ecological Framework



Specific Aims and Hypotheses

In order to answer the research question, specific aims of this dissertation study were:

Aim 1: To describe the national prevalence of MHDs and MHD-caused medical events (hospitalizations and emergent care events) during a 60-day home care episode in the U.S. elderly population receiving services through Medicare-certified home care agencies.

Aim 2: To identify the correlates of MHDs among the variables related to patient's individual characteristics, interpersonal relationships, community context, and societal factors in this population, with a particular attention to a diagnosis of cancer.

Hypothesis 2.1: The presence of MHDs in home care elders will be differentially associated with patient's demographic information including age, gender, race/ethnicity, and geographical location.

Hypothesis 2.2: The presence of MHDs in home care elders will be positively associated with the severity of medical status, a diagnosis of cancer, severity of health risks, sensory impairment, severity of functional limitations, lower levels of social support, inadequate recognition of the need for mental health services, living conditions, and financial status.

Aim 3: To identify the risk factors for MHD-caused medical events (hospitalizations and emergent care events) in this population, with particular attention to a diagnosis of cancer.

Hypothesis 3.1: The presence of MHDs, the patient's age, gender, race/ethnicity, geographical location, the severity of medical status, severity of health risks, sensory impairment, severity of functional limitations, lower levels of social support status, recognition of the need for mental health services, living conditions, and financial status will differentially predict MHD-caused medical events in this population.

Hypothesis 3.2: The number of MHD diagnoses, MHD-caused hospitalizations and MHD-caused emergent care events will be higher in home care patients who are diagnosed with cancer when compared with those who do not have a cancer diagnosis.

The long-term objective of this study is to inform the recognition and screening of MHDs in home care elders by clarifying OASIS-documented risk factors associated with MHDs in this

population, hopefully providing a springboard for improvements in awareness, detection, and long-term intervention models regarding these disorders in the home care setting. This initial exploratory study contributed to these goals by employing a methodologically sound approach using a longitudinal design and a large, national, and recent database.

Definitions of Key Terms and Variables

Definition of Key Terms

Key terms in this study were those associated with the context and population of such a study, including home care (the context) and elders or elderly population (the population). There definitions are provided as follows.

Home care: Home care, or home health care, is a wide category of health care services that can be given to the patients' home due to an illness or an injury (Centers for Medicare & Medicaid Services [CMS], 2015; Thomé, Dykes, & Hallberg, 2003). These services are ordered by a physician and provided by an interdisciplinary team of qualified health care professionals, including home care nurses and licensed therapists, such as physical therapists, speech-language pathology therapists, and occupational therapists. Recipients of home care services are often homebound or have difficulty getting out of the home (CMS, 2015). Most of these patients are frail elderly patients with comorbid medical conditions and physical disabilities, thus warranting eligibility for receipt of skilled care services at home. Home care services can be reimbursed in a number of ways, with the most common one being Medicare insurance program (part B) (CMS, 2015).

Elders or elderly population: According to the definition of the World Health Organization, elderly population in the Western countries is composed of people who are 65 years or older (The World Health Organization [WHO], 2014b). This is consistent with the age-

related eligibility for older adults in the U.S. to receive services from Medicare-certified home care agencies, which is the target population in this study.

Definitions of Variables

Central variables in this study include demographics, medical status, health risks, sensory status, functional limitations, social support status, living conditions, mental health disorders (MHDs), mental health services, and MHD-caused hospitalizations as well as MHD-caused emergent care events. Definitions of these variables are provided as follows.

Demographics: quantifiable statistics of a given population, including age, gender, race/ethnicity, geographic location, and marital status. In this study, demographics include the patient's age, gender, race/ethnicity, and geographical location.

Medical status: factors related to a patient's wellbeing and illness, such as diagnoses, treatment (medications or therapy), and prognosis. Usually, such information is obtained from the patient's medical records and medication files. In this study, medical status include primary diagnosis, secondary diagnosis, medical comorbidity, risk for hospitalization, overall health/prognosis status, and admission source in the past 14 days.

Health risks: factors that could pose additional hazards to the patient's physical and psychological wellbeing. Specifically, health risks in this study included unhealthy life styles, such as smoking, and abnormal physical indicators, such as obesity.

Sensory status: the condition of a patient's sensation or the senses, through which the patient receives signals from the outside environment, such as hearing, vision, smell (olfactory), taste, touch, and feeling, e.g., pain. In this study, sensory status include vision, hearing, the

ability to understand verbal content, and the ability of oral expression in one's own language, as they are closely related to the patient's mental health status.

Functional limitations: the factors of or related to the patient's reduced ability to perform ADL/IADL tasks, such as dressing, transferring, toileting, bathing, eating, and other household tasks. In this study, functional limitations included the patients' reduced ability in grooming, dressing, bathing, toilet transferring, toileting hygiene, transferring, eating, meal planning, and phone use.

Social support status: the extent to which an individual's needs for support, information, and feedback are fulfilled within his/her social network (Caplan, 1974; Marsella & Snyder, 1981). In this study, social support was composed of social connections, such as the patient's family, friends, confiding partners, and the community (Lin & Dean, 1986).

Living condition: circumstance where the individual lives. It relates to the fundamental aspects of living. In this study, this variable referred to the living situation of patients and the availability of assistance at residence.

Mental health disorders (MHDs): Abbreviated as MHDs, include illness or diseases that are related to the patients' mental or psychological condition. Specifically, MHDs in this study include depression, anxiety, psychotic disorders, and other mental problems that were reported in the literature and also available in OASIS. Specifically, this scope of inquiry was focused on late-life common MHDs, such as depression and anxiety, instead of diseases that are caused by physical dysfunction, e.g., dementia and neurological diseases. Specifically, although dementia and neurological diseases are also associated with the patient's mental condition, these disorders are irreversible and characterized by cognitive dysfunction with its root cause in the degeneration of brain cells (Whitehouse et al., 1982). In this regard, dementia and neurological

diseases were not clear-cut mental illness but rather physical disorders, therefore not counted as MHDs. Instead, these conditions were identified by documented diagnosis in OASIS, and treated as mediators or confounders for the presence of MHDs.

Mental health services: screening, treatment, therapy or interventions that were provided specifically to detect and/or manage MHDs in patients. Of particular interest to this study was the recognition of the need for mental health services, including current receipt of psychiatric nursing services upon admission, a plan of care which states the need for depression intervention and its actual implementation during the 60-day home care period.

MHD-caused hospitalizations: hospitalizations due to acute onset or exacerbation of mental or behavioral problems in elderly patients during the 60-day home care stay.

MHD-caused emergent care events: emergent care events due to acute onset or exacerbation of mental or behavioral problems in elderly patients during the 60-day home care stay.

CHAPTER II: REVIEW OF THE LITERATURE

Scope of Literature Review

This chapter is a literature review of articles with a focus on MHDs in the elderly home care population. These include descriptive and epidemiological investigations on this topic, including studies examining specific MHDs, such as depression and anxiety, as well as those that studied MHDs as an inclusive category of mental disorders. Specifically, the literature is reviewed from two perspectives, including 1) the prevalence and incidence of MHDs in home care elders, and 2) the identified risk factors for MHDs in this population. In addition, interventional and psychometric studies that aimed to develop screening instruments and interventions for late-life MHDs in home care settings were also reviewed, but only with regard to their implications to the rates and correlates of MHDs in this population.

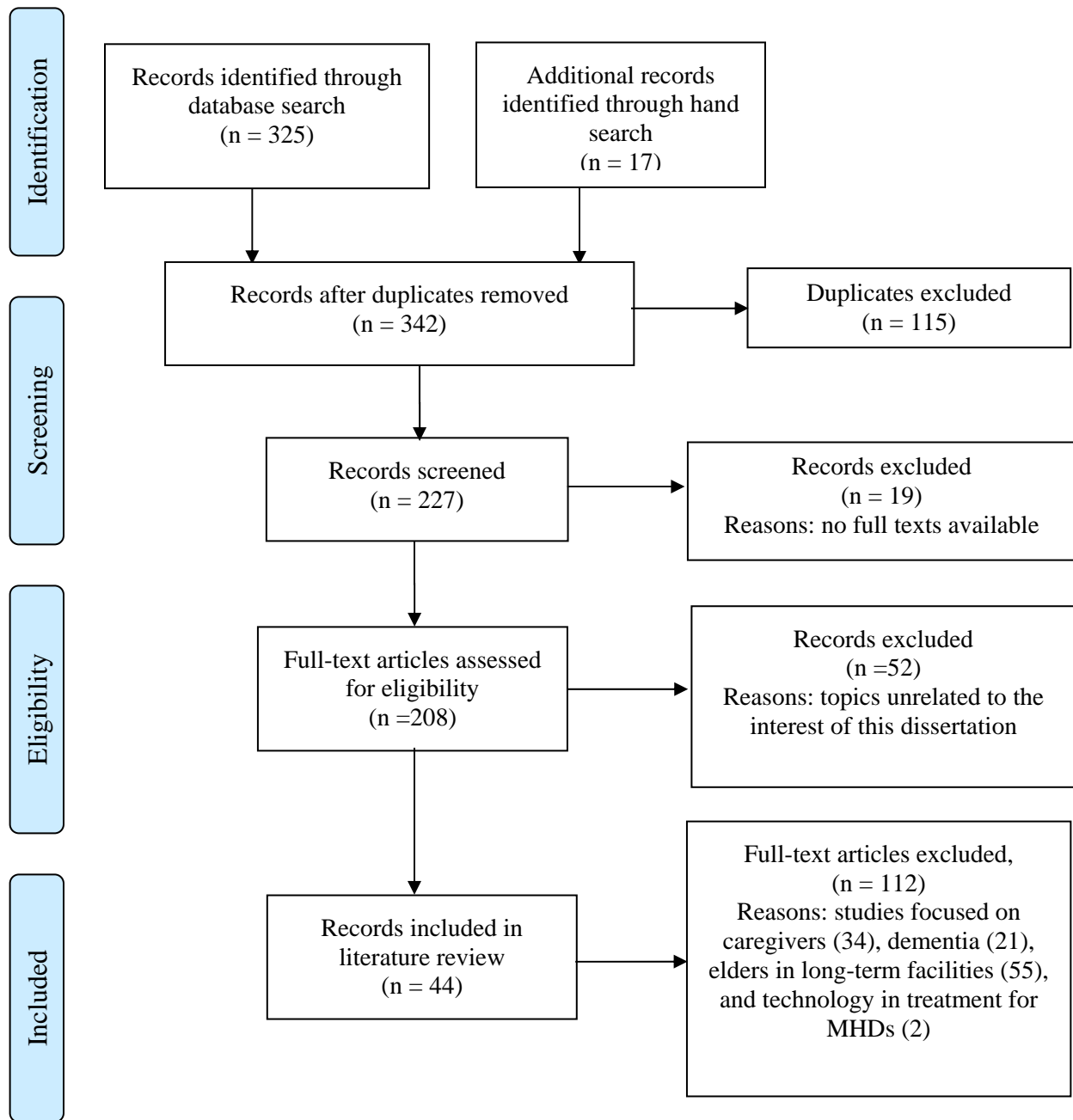
Search Strategy and Methods

A comprehensive search strategy was conducted in six electronic databases, including Ovid Medline (PubMed), PsycINFO, CINAHL, Cochrane Library, Scopus, and Web of Science. Stem search terms included mental health, home care, elderly population, and cancer. All terms were joined by Boolean operators as: (1) mental health, mental disorders, depression, anxiety, behavioral problems, behavioral disorders, psychiatric symptoms; (2) home care services, home health care, home care; (3) elderly population, aged, health services for the aged, geriatric patients, aging, elder care, geriatrics, searched as the subject heading, Mesh terms, or keywords. Searching areas included title, topic, and abstract with the language restricted to English and Chinese. In addition, there was no limitation on the time frame of studies. Following the search in databases on April 19th, 2014, hand search was also conducted as well as a snowball search of reference lists from articles identified. Primary research articles and reviews with a focus on the

MHDs of elderly home care population were included. Commentaries, editorials, opinion pieces, and policy documents were excluded.

The initial search strategy yielded a large amount of literature. However, title screening, abstract screening, and full-text review greatly reduced the number of articles and narrowed down the scope of this review specifically to MHDs of the elderly home care patients. 44 articles were included in the final selection. The literature search process is illustrated in Figure 2.

Figure 2. Literature search flowchart (PRISMA format)*



**Reference*

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G.; The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. *Journal of Clinical Epidemiology*, 62(10), 1606-1612. doi: 10.1016/j.jclinepi.2009.06.005.

Quality of the Reviewed Studies

The final review pool consisted of 44 articles, including 37 quantitative studies, two mixed method studies (Fyffe, Brown, Sirey, Hill, & Bruce, 2008; Robison, Shugrue, Porter, Fortinsky, & Curry, 2012), two qualitative studies (Brown et al., 2006; Zeltzer & Kohn, 2006), and three reviews (Ayalon, Fialová, Areán, & Onder, 2010; Brown, Kaiser, & Gellis, 2007; Qiu et al., 2010). Of the 37 quantitative and two mixed method studies, 27 were cross-sectional studies (Banerjee, 1993; Banerjee & Macdonald, 1996; Brown, McAvay, Raue, Moses, & Bruce, 2003; Brown et al., 2004; Bruce et al., 2002; Choi & McDougall, 2007; Dalby et al., 2008; Dalton & Busch, 1995; Diefenbach et al., 2012; Diefenbach et al., 2009; Ell, Unützer, Aranda, Sanchez, & Lee, 2006; Jayasinghe et al., 2013; Kivelä, Lehtomäki, & Kivekäs, 1986; Li & Conwell, 2007; Maranzan & Stones, 2013; Marc, Raue, & Bruce, 2008; McAvay et al., 2005; McAvay, Bruce, Raue, & Brown, 2004; Milstein et al., 2003; Nagatomo & Takigawa, 1998; Onder et al., 2005; Onder et al., 2007; Préville, Cote, Boyer, & Hebert, 2004; Raue, Weinberger, Sirey, Meyers, & Bruce, 2011; Szczerbinska et al., 2012), 10 were prospective studies (Byers et al., 2008; Gellis, 2010; Lewin et al., 2006; Li & Conwell, 2009; Martens et al., 2007; Miller & Rosenheck, 2007; Raue et al., 2003; Raue, Meyers, Rowe, Heo, & Bruce, 2007; Sheeran et al., 2010; Sheeran et al., 2004), and two were retrospective studies (Iglesias, 1998; Robison et al., 2012).

The comprehensive search strategy was aimed to collect evidence on a global scale. However, the 44 reviewed articles mainly focused on home care elders in three regions, including 29 articles in the U.S. (Brown et al., 2003; Brown et al., 2004; Brown, Raue, Mlodzianowski et al., 2006; Brown, Raue, Schulberg et al., 2006; Bruce et al., 2002; Byers et al., 2008; Choi & McDougall, 2007; Dalton & Busch, 1995; Diefenbach et al., 2009; Diefenbach et

al., 2012; Ell et al., 2006; Fyffe et al., 2008; Gellis, 2010; Iglesias, 1998; Jayasinghe et al., 2013; Li & Conwell, 2007; Li & Conwell, 2009; Marc et al., 2008; McAvay et al., 2004; McAvay et al., 2005; Miller & Rosenheck, 2007; Milstein et al., 2003; Raue et al., 2007; Raue et al., 2011; Raue, Brown, & Bruce, 2002; Robison et al., 2012; Sheeran et al., 2004; Sheeran et al., 2010; Zeltzer & Kohn, 2006), five articles in Canada (Dalby et al., 2008; Maranzan & Stones, 2013; Martens et al., 2007; Szczerbinska et al., 2012; Ward-Griffin et al., 2012), and five articles in Europe (Banerjee, 1993; Banerjee & Macdonald, 1996; Kivelä et al., 1986; Onder et al., 2005; Onder et al., 2007). In contrast, very few studies examined other locations, with only one study in Japan (Nagatomo & Takigawa, 1998), and one study in Australia (Lewin et al., 2006).

Using the grading criteria by Whittemore and Knafl (2005), all 44 articles were reviewed according to their “methodological rigor” and “data relevance”. In particular, assessment of methodological rigor includes sampling (specific eligibility criteria), sample size justification, attrition (60% as the reference level for “High” and “Low”), measurement (appropriateness, validity, and reliability of outcome measurement), threat to validity (control of confounders), statistical analysis (appropriateness and examination of 95% confidence interval), discussion (conclusion supported, limitations and biases addressed). Data relevance is rated based on the article’s relevance and contribution to this literature review. Overall, 30 articles were rated as “High” on methodological rigor, 14 articles were rated “Low” on this criteria; 39 articles were rated as “High” on data relevance, and 5 articles were rated as “Low” on this criteria. The following table (Table 1) shows a detailed assessment of these articles.

Table 1: Integrative Assessment of Reviewed Articles

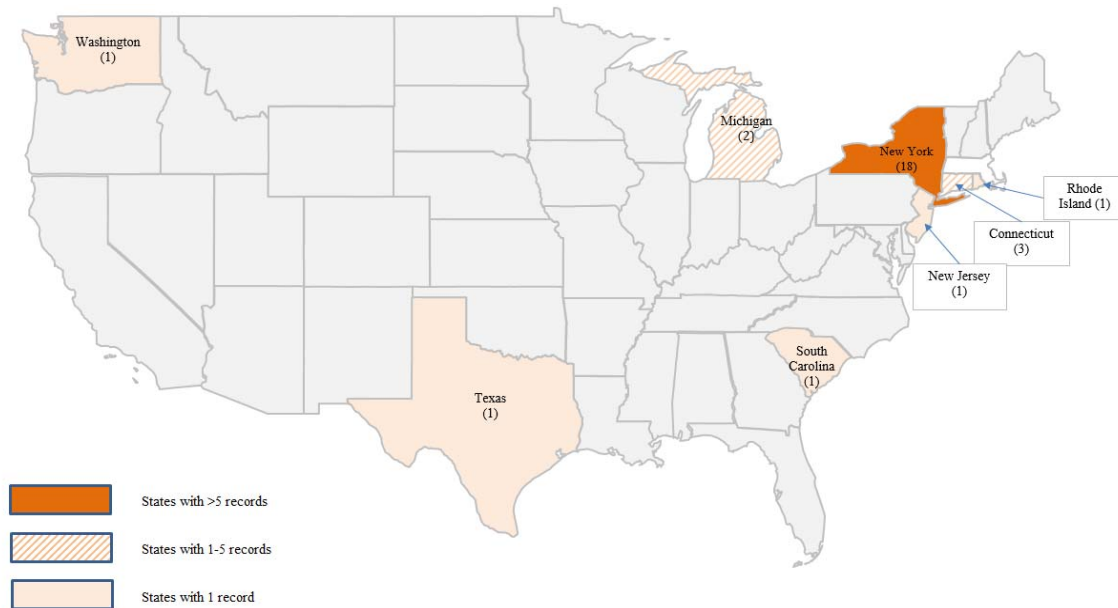
Article (First Author)	Year	Sampling	Sample size justification	Attrition	Measurement	Threat to validity	Statistical analysis	Discussion	Overall Methodological rigor*	Data relevance
Kivelä	1986	N	N			N		N	L	
Banerjee	1993		N					N		
Dalton	1995	N	N			N				
Banerjee	1996		N			N	N	N	L	
Inglesias	1998	N	N	N	N	N		N	L	L
Nagatomo	1998	N	N	N		N	N	N	L	
Bruce	2002		N							
Brown	2003		N		N			N		
Milstein	2003		N							
Raue	2003		N				N			
Brown	2004	N	N		N	N	N		L	
McAvay	2004		N			N		N		
Préville	2004		N	N		N		N	L	
Sheeran	2004	N	N							
McAvay	2005		N							
Onder	2005		N	N		N				
Brown	2006 (C)		N	N		N				
Brown	2006 (T)	N	N		N	N	N		L	
Ell	2006		N			N	N			
Lewin	2006	N	N			N		N	L	
Zeltzer	2006		N	N		N				
Brown	2007		N			N				
Choi	2007	N	N	N	N	N		N	L	
Li	2007	N	N	N	N	N	N	N	L	
Martens	2007		N				N			
Miller	2007		N			N				L
Onder	2007		N	N		N				
Raue	2007	N	N			N				
Byers	2008		N		N					
Dalby	2008	N	N	N		N			L	
Fyffe	2008		N	N		N	N		L	L
Marc	2008		N			N				L
Diefenbach	2009	N	N	N		N	N		L	
Li	2009		N							
Ayalon	2010		N			N				
Gellis	2010		N			N		N		
Qiu	2010		N			N				L
Sheeran	2010		N			N				
Raue	2011		N			N				
Diefenbach	2012		N	N						
Robison	2012	N	N		N	N			L	
Szczerbinska	2012		N							
Jayasinghe	2013		N			N		N		
Maranzan	2013	N	N		N					

*H=less than 3 “N” in the 7 specific methodological assessment criteria, L=more than 4 (including 4) “N” in the 7 specific methodological assessment criteria

Besides geographic limitation, the quality of these reviewed studies is also impacted by a number of methodological flaws. For example, only one of the studies was based on a stated theoretical foundation (Choi & McDougall, 2007). It is therefore unclear if other studies were designed and conducted with a theoretical foundation. Second, none of the reviewed studies provided a priori justification of their sample sizes or power. Without such information, it is unknown if the findings of these studies were statistically significant and reliable. Third, most of the studies were cross sectional in design, therefore couldn't clearly examine the temporal relationship between MHD screening and rates of identified MHDs. Specifically, most of the studies only used data that was collected at admission, without any longitudinal follow-up; while only one study examining the status of MHDs for a longer duration, i.e., one month after admission (Raue et al., 2003). Fourth, many of reviewed studies employed data that was collected more than ten years prior to the study period (Brown et al., 2003; Brown et al., 2004; Byers et al., 2008; Dalby et al., 2008; Marc et al., 2008; Martens et al., 2007; McAvay et al., 2005; McAvay et al., 2004; Raue et al., 2007; Sheeran et al., 2010). This use of older or outdated data significantly limits the applicability of these findings for current home care settings. Lastly, the use of local data in these studies limits the generalizability of the findings. For example, most of the studies used samples from only one home care agency or local home care agencies in one region, while only two European studies examined home care elders in a broader, but still limited geographical region (Onder et al., 2005; Onder et al., 2007). Of note, although the U.S. home care population is the most studied group on this topic (29 studies), these American studies are geographically scattered and locally based, e.g., sample recruitment in one state only. Specifically, in the pool of U.S. studies, 18 were conducted in New York State, three in Connecticut (Diefenbach et al., 2009; Diefenbach et al., 2012; Robison et al., 2012), two in

Michigan (Li & Conwell, 2007; Li & Conwell, 2009), one in New Jersey (Iglesias, 1998), one in Rhode Island (Zeltzer & Kohn, 2006), one in South Carolina (Ell et al., 2006), one in Washington (Dalton & Busch, 1995), and one in Texas (Choi & McDougall, 2007). Only one study in the U.S used national data from the Department of Veteran Affairs, however, this was limited to data on veterans using home care services (Miller & Rosenheck, 2007). *Figure 3* shows the geographical representation of reviewed articles.

Figure 3: Geographical representation of reviewed studies



The tabular form of detailed information about the reviewed articles is provided in Table 2, and a brief summary of these articles is presented in Table 3.

Table 2: Comparison between reviewed articles

No	Article (First Author)	Year	Region	Approach*	Design	Theoretical basis	Sample Size (Power)	Type of MHDs	Scale of data collection	Date of data collection
1	Kivelä	1986	Finland	Quant	Cross-sectional	N	419 (N)	Depression	One local region	1984
2	Banerjee	1993	UK	Quant	Cross-sectional	N	169 (N)	Depression Anxiety	One local region	unknown
3	Dalton	1995	US	Quant	Cross-sectional	N	40 (N)	Depression	One agency	unknown
4	Banerjee	1996	UK	Quant	Cross-sectional	N	169 (N)	Depression	One local region	unknown

No	Article (First Author)	Year	Region	Approach*	Design	Theoretical basis	Sample Size (Power)	Type of MHDs	Scale of data collection	Date of data collection
5	Inglesias	1998	US	Quant	Retrospective	N	121 (N)	Depression Anxiety	One agency	1994-1995
6	Nagatomo	1998	Japan	Quant	Cross-sectional	N	190 PT+72 RN (N)	Depression	One local region	unknown
7	Bruce	2002	US	Quant	Cross-sectional	N	539 (N)	Depression	One agency	1997-1999
8	Brown	2003	US	Quant	Cross-sectional	N	42 nurses, 403 pts	Depression	One agency	1997-1999
9	Milstein	2003	US	Quant	Cross-sectional	N	130 (N)	Depression	One agency	1997-1999
10	Raue	2003	US	Quant	Prospective	N	539/74 (N)	Depression	Data from (bruce,2002), one agency	1997-1999
11	Brown	2004	US	Quant	Cross-sectional	N	220 PT +64RN (N)	Depression	One agency	1999
12	McAvay	2004	US	Quant	Cross-sectional	N	355 (N)	Depression	Data from (bruce,2002), one agency	1997-1999
13	Préville	2004	Canada	Quant	Cross-sectional	N	177 (N)	Depression Anxiety	One local region	1997-1998
14	Sheeran	2004	US	Quant	Prospective	N	25+ 415 (N)	Depression	One agency	2001-2002
15	McAvay	2005	US	Quant	Cross-sectional	N	355 (N)	Depression	Data from (bruce,2002), one agency	1997-1999
16	Onder	2005	Europe	Quant	Cross-sectional	N	3976 (N)	Depression	11 European countries but overly restrictive sampling frame	2001-2003
17	Brown	2006 (C)	US	Qual	Survey	N	68 (NA)	Depression	One local region	Unknown
18	Brown	2006 (T)	US	Quant	Cross-sectional	N	243	Depression	One agency	1997-1999
19	Ell	2006	US	Quant	Cross-sectional	N	311 (N)	Depression	One local region: high refuse rates	unknown
20	Lewin	2006	Australia	Quant	Prospective	N	2542	Depression	One agency	2000-2001
21	Zeltzer	2006	US	Qual	Survey	N	53 (NA)	Depression	One local region	2003
22	Brown	2007	Review	Review	Review	Review	Review	Depression	Unclear search strategy	NA
23	Choi	2007	US	Quant	Cross-sectional	Y	81, 130 controls (N)	Depression	One local region (Choi)	2005
24	Li	2007	US	Quant	Cross-sectional	N	18939 (N)	Depression	One local region	1998-2003
25	Martens	2007	Canada	Quant	Prospective	N	265291 (NA: Population-based)	All MHDs combined	One local region	1997-2002
26	Miller	2007	US	Quant	Prospective	N	4411677 (NA: Population)	All MHDs combined	National VA data (not home care patients)	2002-2003

No	Article (First Author)	Year	Region	Approach*	Design	Theoretical basis	Sample Size (Power)	Type of MHDs	Scale of data collection	Date of data collection
							on-based study)			
27	Onder	2007	Europe	Quant	Cross-sectional	N	2718 (N)	Depression	11 European countries but overly restrictive sampling frame	2001-2003
28	Raue	2007	US	Quant	Prospective	N	400	Suicidal ideation	Data from (bruce,2002), one agency	1997-1999
29	Byers	2008	US	Quant	Prospective	N	54 +854 (N)	Depression	One agency	2001-2002
30	Dalby	2008	Canada	Quant	Cross-sectional	N	3321 (N)	Depression	One local region	1999-2001
31	Fyffe	2008	US	Mixed method	Cross sectional	Grounded theory	28	Depression	One agency	2003-2004
32	Marc	2008	US	Quant	Cross-sectional	N	526 (N)	Depression	Data from (bruce,2002), one agency	1997-1999
33	Diefenbach	2009	US	Quant	Cross-sectional	N	66 (N)	Anxiety	One agency (low participation rate 66/225)	unknown
34	Li	2009	US	Quant	Prospective	N	13129 (N)	Depression	One local region, overly represent low-income community elderly residents	1998-2003
35	Ayalon	2010	Review	Review	Review	NA	NA	Depression	Unclear search strategy	NA
36	Gellis	2010	US	Quant	Prospective	N	289 (N)	Depression	One agency, overly restrictive sample	2005-2006
37	Qiu	2010	Review	Review	Review	NA	NA	All MHDs combined	Only searched in PubMed	NA
38	Sheeran	2010	US	Quant	prospective	N	477 (N)	Depression	One agency	1997-1999
39	Raue	2011	US	Quant	Cross-sectional	N	256 (N)	Depression	Data from another study (TRIDAD)	2004-2005
40	Diefenbach	2012	US	Quant	Cross-sectional	N	66 (N)	Depression Anxiety	Data from (Diefenbach et al., 2009)	unknown
41	Robison	2012	US	Mixed method	Retrospective	N	1468 (N)	All MHDs combined	One local region (2008)	2008
42	Szczerbnska	2012	Canada	Quant	Cross-sectional	N	114497 (N)	Depression	One local region (2003-2004)	2003-2004
43	Jayasinghe	2013	US	Quant	Cross-sectional	N	256 (N)	Anxiety	One local region (2004-2005) (participants in another study)	2004-2005
44	Maranzan	2013	Canada	Quant	Cross-sectional	N	126423 (N)	Depression	One local region (2004-2005)	2004-2005

*Approach: Quant: quantitative, Qual: qualitative

Table 3: Summary of reviewed articles

Design	No.	Years	MHDs studied	Region	State (US)	Outdated data*
Quantitative	37	1986-1998 (6) 2002-2013 (31)	Depression (35) Anxiety (10)	Euro (5) Asia (2) Canada (5) US (25)	NY (16), Mich (2), Conn (2), NJ (1), Wash (1), Texas (1), South Carolina (1), National VA (1)	25 records (68%) 7 unknown (2%)
Qualitative	2	2006	Depression (1) MHD general (1)	US	NY(1) Rhode Island (1)	1 unknown
Mixed Method	2	2008, 2012	Depression (1) MHD general (1)	US	NY (1) Conn (1)	1 (50%)
Review	3	2007-2010	Depression (2) MHD general (1)	unspecified	unspecified	NA

*Outdated data= Data collection older than 5 years prior to the study period

Findings in the Existing Literature

Temporal trend of studies

Research investigations on MHDs in home care elders emerged in the late 1980's to the early 1990's, and blossomed in the 21st century when the care delivery location shifted from inpatient facilities to the communities. The earliest study of this kind was conducted in 1986 (Kivelä et al., 1986), where researchers examined the prevalence of depressive symptoms in a local sample of 419 Finnish home care elderly patients. In particular, this innovative study in Finland revealed that 26% of participants had heterogeneous depressive symptoms, among which chronic depression was the most common type and atypical depression was the most under-detected type.

In the 1990's, more studies were conducted with a broader geographical representation, e.g., the U.S. (Dalton & Busch, 1995; Iglesias, 1998), the U.K. (Banerjee, 1993; Banerjee & Macdonald, 1996), and Japan (Nagatomo & Takigawa, 1998). Similar to the earliest study in Finland (Kivelä et al., 1986), studies in the U.S. on this topic reported a comparably high prevalence of depression in home care elders, i.e., 27.5% (Dalton & Busch, 1995). However, despite the increasing prevalence of MHDs in the elderly home care population, only a small portion of MHDs cases were identified by home care agencies, and further, none of them were

documented. In addition, studies that examined a broader range of MHDs in this population reported even higher rates (Banerjee, 1993; Banerjee & Macdonald, 1996; Iglesias, 1998). Specifically, research has shown that approximately 40% to 44% of home care elders had at least one form of MHDs, including depression (26%), organic MHDs (12%), and anxiety (4%) (Banerjee, 1993; Banerjee & Macdonald, 1996).

In addition to the rates of MHDs, some of these earlier studies also examined factors associated with this group of disorders. For example, a Japanese study, the only Asian study on this topic, reported that living condition was related to home care elders' needs for mental health services. Specifically, researchers found that elders living with families had more physical limitations and greater mental health needs than those who lived alone or lived with their spouse (Nagatomo & Takigawa, 1998). Although these researchers weren't able to elucidate solid reasons for these relationships, they did, for the first time, draw attention to risk factors for MHDs in home care elders and informed future investigations in the research arena.

In the empirical literature, the most cited study was conducted in the United States by Bruce et al. (2002) at a local home care agency in Westchester, New York. Specifically, Bruce et al. reported that 13.5% of the participants had major depressive symptoms according to the DSM-IV criteria. In addition, of all depressed patients, only 22% were prescribed antidepressants and no one received professional psychiatric services. Inspired by these early-stage explorations, more efforts have been made during the past decade to further examine MHDs in home care elders. The following paragraphs summarize these studies as follows: epidemiological findings, risk factors for MHDs, detection and treatment of MHDs, consequences of under-treatment, and barriers to effective detection and treatment of MHDs in this population. In addition, a final note was made regarding the gaps in the current evidence base.

Finding 1: Epidemiology of MHDs in the home care elderly population

Prevalent and severe: MHDs are prevalent, severe, and persistent in the elderly home care population. As reported in the existing literature, there are anywhere from 40% to 51.9% elderly home care patients suffering from MHDs, at least twice the rates in the general elderly population (Li & Yeates, 2007; Martens et al., 2007; Miller & Rosenheck, 2007). In addition, MHDs are reported with greater severity in home care elders than in normal older adults. Specifically, while some home care elders have only mild to moderate MHDs, quite a few are identified with more severe MHDs, such as major depression (10% to 62%) and suicidal ideation (11.7%) (Bruce et al., 2002; Raue et al., 2007). Of note, these two types of MHDs are severe and sometimes even fatal. Further, both MHDs are expected to affect a larger number of elders in this group, as evidenced by an annual incidence of 5.4% (Raue et al., 2007).

Varied prevalence: Several reviewed studies examined the extent of MHDs in home care elders, but the rates reported in these studies were largely varied. For example, depression, the most common MHD in this group of elders, was reported in 12% of home care elders in Canada, 42% in the U.S., and 62% in Australia (Choi & McDougall, 2007; Lewin et al., 2006; Szczerbinska et al., 2012). In addition, anxiety, the second most common MHD in this population, was evidenced in 4.2% of home care elders in the U.K., and 18.8% of those in the U.S. (Banerjee, 1993; Li & Conwell, 2007). The reason for these variations remains unknown, although it may be related to the collection of small samples in different geographical locations.

Comorbidity: In the empirical literature, depression and anxiety are the two most studied MHDs in home care elders, whereas other MHDs, such as schizophrenia and organic mental disorders, receive relatively less attention. In addition, most reviewed studies focused on only one or two specific MHDs, while very few studies examined MHDs as an inclusive category of

disorders in this population. However, evidence has shown that late-life MHDs, rather than occurring in isolation are in fact more likely to be comorbid. For example, research reveals that in the elderly home care population, the presence of anxiety was strongly correlated with a co-occurrence of depression (Ell et al., 2006; Lenze et al., 2000). Further, even for patients with only one type of MHD, such as anxiety or depression, heterogeneous subcategories usually coexist in the same patient (Gellis, 2010).

Persistence: Besides the high prevalence and comorbidity, another characteristic of MHDs in the elderly home care population is related to their persistence, especially in cases of depression. Research has shown that out of all home care elders with major depression at admission, approximately 70% of these elders were still significantly depressed at the one-month follow up (Raue et al., 2003). This adds to the public health concern over MHDs as the average life expectancy in the U.S. increases. For example, Martens et al. found that after a five-year observation, the rates of MHDs increased from 32.4% to 45% in males, 42.6% to 51.9% in females, with an annual incidence of 10% to 13% (Martens et al., 2007).

Given the persistent, comorbid, and prevalent nature of mental illness, the extent of MHDs in home care elders will grow at a higher rate and with more complexity as the population's life expectancy increases.

Finding 2: Risk factors for MHDs in this population

Identified risk factors: Home care elders are more likely to develop MHDs than normal older adults due to a variety of risk factors. Some of these factors are intrinsic to the home care population, while others are related to the external environment. Some of the intrinsic factors include the patient's demographics, such as age, gender, race/ethnicity, marital status, and geographical location (Lewin et al., 2006; Li & Conwell, 2007; Maranzan & Stones, 2013;

Martens et al., 2007; Milstein et al., 2003; Onder et al., 2005; Qiu et al., 2010; Raue et al., 2011; Szczerbinska et al., 2012). Others of these factors have to do with the patient's physical and functional status, e.g., homebound status, medical complexity and comorbidity, cognitive impairments, neurological functions, functional limitations, sensory status, pain, and past history of MHDs (Banerjee & Macdonald, 1996; Bruce et al., 2002; Choi & McDougall, 2007; Li & Conwell, 2007; Maranzan & Stones, 2013; Martens et al., 2007; McAvay et al., 2005; Onder et al., 2005; Raue et al., 2003; Raue et al., 2011; Raue et al., 2007; Szczerbinska et al., 2012).

Identified external characteristics include the patient's socioeconomic status, such as education, living condition, and financial status (Banerjee & Macdonald, 1996; Brown et al., 2004; Choi & McDougall, 2007; Lewin et al., 2006; Li & Conwell, 2007; Maranzan & Stones, 2013; Szczerbinska et al., 2012); the patient's social support status, including communication and assistance from family members (Choi & McDougall, 2007; Dalby et al., 2008; McAvay et al., 2005); and recent adverse life events, such as the loss of a family member (Raue et al., 2003). In summary, risk factors for MHDs in the elderly home care recipients are multi-faceted and related to multiple internal and external dimensions.

Conflicting explanations: Although multiple risk factors have been identified, they were cited for inconsistent lines of reasoning in the existing literature. For instance, while one study found that advancing age was related to a higher risk for MHDs in home care elders (Martens et al., 2007), other studies reported that older age was instead a protective factor against MHDs in this home care population. Specifically, researchers of the latter group found that younger age, as opposed to older age, was associated with a higher incidence of MHDs (Li & Conwell, 2007; Szczerbinska et al., 2012). Further, even for those patients who had developed MHDs prior to beginning home care, the severity was higher in younger patients than in their older counterparts

(Maranzan & Stones, 2013). Similarly, evidence is also conflicting with regard to the relevance of living condition to MHDs in this specific group. Specifically, while some studies in the U.S. reported that living alone was associated with higher rates of depression in home care elders (Brown et al., 2004; Choi & McDougall, 2007), studies in Asia indicated that living with others, instead of living alone, was a predictor of MHDs in this population (Lewin et al., 2006; Nagatomo & Takigawa, 1998). Such variance is also reported in other factors, such as race/ethnicity, religion, and cognitive function. For example, although race/ethnicity and religion have been reported as correlates of MHDs in home care elders (Fyffe et al., 2008; Li & Yeates, 2007; Milstein et al., 2003), there is also evidence that race and cultural ancestry were irrelevant to MHDs in this population (Maranzan & Stones, 2013). Similarly, cognitive function is also identified with dual effects: a potential impact on the incidence of MHDs, or a relevance to the detection process. As many of these elders would not proactively report MHDs to their care providers, recognition by the elders' informants is therefore crucial for effective detection of these disorders. Evidence shows that informants reported more cases of MHDs than the elders themselves, especially if the informants were the elders' adult children. And further, on average, informants reported more MHDs in cognitively intact home care elders than in elders with cognitive impairments (McAvay et al., 2005). At first glance, it seems that cognitive impairments were a protective factor against MHDs. However, it is unclear if cognitive impairments added protective effects against MHDs, or rather indicated underreported MHDs due to the elders' lack of ability to report MHDs by themselves (McAvay et al., 2005). In the second scenario, the identified "protective" effects of cognitive impairments would not be protective, but rather a masking effect that results in under-detection of MHDs.

At this moment, it is still unknown what has caused these variations in the existing empirical literature. Possible explanations include 1) the different geographical locations of the studies, especially given that earlier studies mainly employed local data, and 2) the methodological flaws associated with inappropriate sampling frames and outdated data sources in many of these studies. Of note, the majority of earlier studies were cross-sectional, where data was collected only from newly admitted home care elderly patients at a single time point, i.e. when they were first admitted to home care (Bruce et al., 2002; Jayasinghe et al., 2013). Without longitudinal investigation, it would be difficult to project the long-term alteration in the mental condition of these frail elders, whose health and mental conditions often fluctuate. Also difficult would be to examine the confounding effect of screening time on the detection of MHDs in the long run, especially given that recent admission to home care services in itself could be a risk factor for transient mood changes, which might have been mistaken for MHDs in these reviewed studies (Beerens et al., 2014; Lewin et al., 2006; Szczerbinska et al., 2012). Lastly, more than half of these studies used data that was collected five years (or even longer) prior to the actual study period (n=26, 59%) (Brown et al., 2003; Brown et al., 2006; Brown et al., 2004; Bruce et al., 2002; Byers et al., 2008; Dalby et al., 2008; Fyffe et al., 2008; Gellis, 2010; Jayasinghe et al., 2013; Lewin et al., 2006; Li & Conwell, 2007; Li & Conwell, 2009; Maranzan & Stones, 2013; Marc et al., 2008; Martens et al., 2007; McAvay et al., 2005; McAvay et al., 2004; Miller & Rosenheck, 2007; Milstein et al., 2003; Onder et al., 2007; Prévaille et al., 2004; Raue et al., 2003; Raue et al., 2007; Raue et al., 2011; Sheeran et al., 2010; Szczerbinska et al., 2012). The lack of recent data greatly limits the generalizability of earlier findings to today's home care patients, who might present different mental health concerns than a decade ago. Therefore,

without large-scale, national investigation, it would be difficult to examine the status quo of MHDs in an increasingly diverse home care population in the U.S.

Finding 3: Under-detection and under-treatment of MHDs in home care elders

Under-detection

In spite of the high and ever increasing prevalence of MHDs in the elderly home care population, MHDs are still largely under-detected and under-treated in this group of patients (Banerjee, 1993). Evidence shows that admission information about older adults received by home care agencies was incomplete and inaccurate (Brown et al., 2006). Specifically, in the study by Bruce et al. (2002), none of the elders identified with major depression actually had depression listed as the primary diagnosis in their medical records. The lack of accurate documentation of mental status makes it difficult for home care staff to trace the patient's MHDs history prior to home care admission, and thus make detection more likely to be inaccurate.

Several characteristics relating to home care nurses and patients have also been noted to affect the accuracy of MHDs detection. For example, researchers found that patients who were female, living with others, cognitively intact, having two or more ADL disabilities, or not taking any psychiatric medications at the time of screening were more likely to be identified with MHDs (Brown et al., 2003). In contrast, patients who were male, living alone, cognitively impaired, having well-maintained ADL functions, or taking antidepressants at the time of MHDs screening were less likely to be detected. Evidence also shows that home care nurses with more geriatric and psychiatric nursing experiences were better at detecting MHDs in their elderly clients than their counterparts (Brown et al., 2003). This suggests that education on the etiology, symptoms, and indicators of MHDs could potentially improve the effectiveness of mental health

screening, as evidenced in several interventional studies that focused on such training programs (Brown, Raue, Roos, Sheeran, & Bruce, 2010; Bruce et al., 2007; Ell et al., 2007).

Another factor that could affect MHDs screening is the timing, which has not been studied in the empirical literature. As most reviewed studies only examined MHDs in newly admitted home care elders, very little is known about the mental health condition of elders who were receiving ongoing home care services (Lewin et al., 2006). This is important because by merely screening for MHDs when patients just started home care, the rates might have been inflated by not differentiating an ongoing MHD from a transient mood that in its core was associated with an elder's newly transition from independence to dependence when he/she started home care services. This is corroborated by the evidence that newly admission to home care agencies, in itself, could be a risk factor for MHDs in elderly patients (Lewin et al., 2006). Further studies, especially studies with a prospective design, are needed to identify the ideal timing for home care agencies to perform mental health screening in their elderly patients, and thus examine the extent of MHDs more accurately.

Under-treatment

Due to the lack of effective MHDs detection and inaccurate documentation, very few mentally ill elders in the home care settings were appropriately treated, especially in the rural area (Brown et al., 2003; Dalby et al., 2008; Ell et al., 2006; Qiu et al., 2010). Evidence shows that only 16% to 39.6% of mentally ill home care elders received medications for MHDs, such as antidepressants for depression (Banerjee & Macdonald, 1996; Li & Conwell, 2007; Reynolds et al., 1999; Reynolds et al., 2006). Further, none to merely 9% of these mentally ill elders received psychotherapy, despite effectiveness of these combined regimens (Banerjee & Macdonald, 1996; Bruce et al., 2002). This is critical because many late-life MHDs, such as depression and anxiety,

are essentially treatable in the cases of early detection and timely intervention (Roose & Schatzberg, 2005). However, if left untreated or under-treated, MHDs could result in critical consequences, as summarized in the following section: “Finding 4”.

Finding 4: Consequences of under-treated MHDs in home care elders

MHDs in home care elders, especially those which are under-treated, present a significant concern at both the individual level and in broader societal context. For patients, under-treated MHDs can lead to higher mortality rates, and lower quality of life associated with higher morbidity rates, poorer adherence to medical treatment, decreased ADL/IADL functions, more physical disabilities, and a greater dependency on family caregivers (Alexopoulos et al., 2009; DiMatteo, Lepper, & Croghan, 2000; Davitt & Gellis, 2011; Diefenbach et al., 2012; Gallegos-Carrillo et al., 2009; Landi et al., 2001; Prévaille et al., 2004; Raue et al., 2007; Russo et al., 2007; Thobaben & Kozlak, 2011; Thompson et al., 2008; van Hout et al., 2004). Specifically, home care elders with MHDs are more likely to develop secondary adverse events than their mentally healthy counterparts, including falls, nursing home admissions, hospitalizations, emergent care events, and further, unexpected death (Byers et al., 2008; Madigan, 2007; Miller & Rosenheck, 2007; Onder et al., 2007; Robison et al., 2012; Sheeran et al., 2004; Sheeran et al., 2011). Research on home care elders also reveals that the exacerbation of MHDs was associated with worsening cognitive impairments, both of which were independently related to deteriorating functional disabilities (Li & Conwell, 2009). Eventually, MHDs, when combined with these subsequent adverse events and consequences, can lead to even greater medical expenditure with an increasing economic burden to society (de Beurs et al., 1999; Madigan, 2007).

Benefits of early intervention

Due to the substantial negative consequences of under-treated MHDs, it is important to initiate targeted interventions early on before the illness progresses with increasing complexity and greater severity. Research has shown that improvements in MHDs are not only beneficial for the patients' mental status, but can also buffer the declining of cognitive functioning and functional abilities (Li & Yeates, 2007; Li & Conwell, 2009). In this regard, early detection and treatment for MHDs could improve the mental health of home care elders, and prevent the worsening of their cognitive impairments and functional limitations, therefore having a meaningful impact on their ability to live at home (Li & Conwell, 2009). Further, these improvements on cognitive and physical functions could also reduce the patients' need for ADL/IADL assistance, and thus control for the increasing medical expenses consumed by this population (Callahan et al., 2005; Li & Conwell, 2009). However, evidence shows that screening and intervention for MHDs are not well implemented due to a variety of barriers. A detailed description of these barriers is provided in the following section: "*Finding 5*".

Finding 5: Barriers to effective detection and treatment of MHDs in home care elders

Barriers to effective detection and treatment for MHDs have resulted in substantial unmet needs for mental health services in the elderly home care population. Specifically, barriers reported in the empirical literature are factors associated with patients, providers, and the healthcare system.

On the patient level

On the patient level, the stigma associated with MHDs, reluctance to report MHDs to health care providers, and a lack of ability to seek psychological counseling are identified barriers that could keep home care elders from early detection and appropriate treatment (Ayalon

et al., 2010; Gellis, 2010; Miller & Rosenheck, 2007). Specifically, the fact that many home care elders are not only mentally ill but also cognitively impaired largely limits the ability of these patients to clearly express their mental health needs (Ayalon et al., 2010). For instance, studies have found notable discrepancies between home care elders' self-reports of MHDs and their informants' reports of these disorders. Specifically, the discrepancies were larger for older and cognitively impaired patients compared with their younger and cognitively intact counterparts, suggesting an impact from cognitive deficits on oral expression of the former group (McAvay et al., 2005).

With regard to effective MHDs treatment, patients' preferences and their past experience with MHDs are also factors that could affect their receipt of appropriate mental health services. For example, research has shown that in the cases of MHDs, 50% of the elderly home care patients would refer to alternative methods, such as religious belief and prayer, as their major healing approach (Fyffe et al., 2008). This is especially true for patients who hadn't experienced MHDs before. In contrast, patients who had prior experience with MHDs had a stronger preference for evidence-based remedies, such as medications and psychotherapy, over complementary and alternative regimens (Fyffe et al., 2008). Subsequently, lack of knowledge about patients' treatment preferences and their past experience could potentially impact the effectiveness of MHDs treatment, and even become a barrier.

On the providers' level

For the providers, inadequate awareness of MHDs and preoccupation with other medical conditions in the home care setting are barriers that could prevent them from proactively offering psychiatric services to high-risk elderly patients. To begin with, MHDs detection in the elderly population is challenging for health care professionals. Even well-educated psychiatric nurses

with extensive mental health experience reported a need for new knowledge and support in decision-making when providing care for elderly patients (Magnusson, Severinsson, & Lützén, 2003). Moreover, the unique environment in home care setting presents additional challenges for providers to accurately screen for MHDs. That is, when the setting of providing care shifts from inpatient facilities to the patients' own home, the nature of care management changes as well, i.e. from nurse-controlled care to patient-centered care. On the one hand, this could mean less control of care management on the providers' part and a challenge for them to manage the delivery of care. On the other hand, the setting of home care also provides a unique opportunity for health care providers, particularly home care nurses, to better detect MHDs, as they have the chance to assess the patient more holistically (Lewin et al., 2006). For home care nurses, patient assessment starts from the moment they walk into the patient's home. In this regard, information about the patient's immediate surroundings could allow a better understanding of the patient's life style, value systems, and further, how these could affect their mental status and psychological rehabilitation in the cases of MHDs (Magnusson et al., 2003).

Nevertheless, most MHDs cases in home care elders were not accurately detected by home care personnel and protocols (Bruce et al., 2002; Prévile et al., 2004). This might be attributable to a lack of psychiatric training for home care staff, a lack of effective communication between home care nurses and the patient's treating physicians, and a lack of support from home care agencies (Brown et al., 2006; Zeltzer & Kohn, 2006). As noted, many home care providers, physicians and nurses, tend to mistake signs and symptoms of MHDs in elders for a normal part of aging (Dalton & Busch, 1995; Prévile et al., 2004; Unützer et al., 1997). As a consequence of this misconception, most cases of late-life MHDs went undiagnosed or at least under-diagnosed in home care settings (Brown et al., 2004; Thompson et al., 2008;

Zeltzer & Kohn, 2006). For example, it is shown that home care nurses were able to recognize depression in only 45.4% of depressed elders, meanwhile misdiagnosing 24.8% of non-depressed patients as being depressed (Brown et al., 2003). Given that the delivery of psychiatric services in home care settings largely depends on the nurses to inform the patient's treating physicians, the inability of home care nurses to identify MHDs poses a significant barrier to effective treatment of MHDs in this high-risk, elderly home care population (Brown et al., 2003).

On the level of the healthcare system

On a higher level of the healthcare system, existing barriers include incomplete referral information provided to home care agencies, a lack of psychiatric nurses working in home care settings, and a reluctance on the part of home care agencies to address mental and behavioral problems (Brown et al., 2006; Davitt & Gellis, 2011; Robison et al., 2012; Zeltzer & Kohn, 2006).

Evidence has shown that the referral information of older adults received by home care agencies was incomplete and inaccurate. Specifically, data about psychological assessment and depression were absent in 94.3% of mentally ill elders who were presenting significant depressive symptoms. In addition, 73.1% of cognitively impaired elders were admitted to home care agencies without relevant data about their cognitive status (Brown et al., 2006). Research also reveals that most home care agencies were hesitant to admit patients with mental health-related diagnoses in the first place (Zeltzer & Kohn, 2006). Further, for mentally ill patients who had already started home care, most agencies neither provided internal mental services, nor referred these patients to professional psychologists (Zeltzer & Kohn, 2006). This phenomenon might be attributed to the time constraints on providing home care services, the lack of psychiatric nurses at home care agencies, and the lack of psychological referral sources available

for home care patients (Brown et al., 2007; Gellis, 2010; Robison et al., 2012). Also contributing to this phenomenon is the restricted reimbursement policy for home care agencies to provide mental health services, either internally or externally (Brown et al., 2007; Dalton & Busch, 1995; Gellis, 2010; Hewitt & Rowland, 2002; Robison et al., 2012; Zeltzer & Kohn, 2006).

Implications of interventional and psychometric studies

For many MHDs such as depression and anxiety, early diagnosis and treatment are the best means of secondary prevention (Dalton & Busch, 1995). However, as stated previously, there are multiple barriers to effective MHDs detection and treatment in the elderly home care population. Among these barriers, a major one is related to the lack of training and ability of home care nurses to accurately detect MHDs. Therefore, unless home care nurses are able to effectively identify mental health-related signs and symptoms, MHDs will remain a significant problem for elderly home care patients, result in negative health consequences, and lead to higher medical expenses (Brown et al., 2003; Brown et al., 2007; Diefenbach et al., 2009).

In response to this challenge, several instruments have been developed for the use of mental health screening in the elderly home care population. Although some of these instruments have shown promising psychometrics thus far (Diefenbach et al., 2009; Marc et al., 2008), none of them have been widely employed by home care agencies in the U.S. This is probably due to the lack of training of home care nurses to administer professional psychological instruments, and also the time constraints on providing home care services (Brown et al., 2006). Therefore, it is necessary that MHDs screening be integrated into the routine assessment process of the home care system (Banerjee & Macdonald, 1996; Brown et al., 2004; Diefenbach et al., 2009; Lewin et al., 2006).

Advantages of using OASIS: Implications of psychometric studies

In the U.S., the most commonly used assessment in home care agencies is the Outcome and Assessment Information Set (OASIS). OASIS is a routine, mandatory, administrative assessment for adult patients in Medicare-certified home care agencies, which represent more than 85% of all home care agencies in the U.S. (National Center for Health Statistics, 2007). The advantages of using OASIS to examine MHDs in the elderly home care population are listed as follows.

First, OASIS is a comprehensive measurement of patients' outcomes with high-quality data items. These include items about the patient's socioeconomic status, living environment, support system, health status, functional status, and health service utilization. As has been noticed in previous studies, a patient's mental health condition is related to multi-dimensional factors and in return, these factors have multifactorial impacts on the patient's mental health condition. In this regard, the comprehensive scale of assessment in OASIS helps to accurately examine the status quo of MHDs in home care elders, which in itself is a comprehensive and multi-dimensional problem. In addition, the quality and accuracy of OASIS data items are well established through the rigorous development, testing, and refinement of a national research program (Shaughnessy, Crisler, & Schlenker, 1998). In fact, suggestions have already been made to incorporate routine mental health screening of the elderly into OASIS, with the aim to inform the development of preventive strategies for adverse events in home care settings, and thus improve the overall health outcome in the elderly home care population (Brown et al., 2007; Byers et al., 2008; Madigan, 2007).

Another advantage of OASIS is related to the longitudinal nature of its data. OASIS data is usually collected by a registered nurse at multiple time points, including 1) start of care (SOC): within 24 hours of admission to home care, 2) follow up (FU): periodically throughout care

(every 60 days), 3) resumption of care (ROC): within 24 hours of resuming home care services after inpatient stay, 4) discharge (D/C), 5) transfer (T/F): when home care patients are transferred to emergency rooms, the community, and inpatient facilities, including hospitals, nursing homes, rehabilitation facilities, and hospice agencies. The use of longitudinal OASIS data provides recurrent opportunities for effective MHDs detection, and thus more accurately examine the status quo of MHDs in the target population (Brown et al., 2007).

To date, there have been multiple versions of OASIS, with gradual improvements. The most recent version is OASIS-C, which has been used since 2009 with an expansion of mental health-related items (Cabin, 2010). Specifically, the mental health-related items in OASIS-C, such as those related to depression and anxiety, have been tested with promising results for MHDs detection in home care settings. In this regard, the use of OASIS-C allows for an accurate examination of the current extent of MHDs in the elderly home care population, and therefore warrants its use in this dissertation study (Brown et al., 2010; Bruce et al., 2007; Cabin, 2010; Ell et al., 2007; Ell et al., 2006; Kroenke, Spitzer, & Williams, 2003; Li, Friedman, Conwell, & Fiscella, 2007; Raue et al., 2002).

The last advantage of using routinely administrative data, such as OASIS, as the major data source is associated with superior applicability to real-life situations. Although it is ideal to screen for MHDs using professional psychological instruments, since home care nurses are already occupied with providing basic care services, it is neither favorable nor feasible to add more instruments to their practice, especially those that require additional training. In this regard, a better alternative is to rely on a routine assessment tool that is already in place, such as OASIS (Brown et al., 2003). Given that OASIS is currently used in more than 85% of all home care

agencies in the U.S., the findings of this dissertation study could be easily applied to the mental health care management of home care elders in this country (Byers et al., 2008).

Potential of OASIS: Implications of interventional studies

Due to the homebound status, physical and functional limitations, as well as a lack of access to healthcare services, home care elders are presented with an elevated level of risk for MHDs. However, evidence suggests that most home care elders either lack the ability to report their MHDs to care providers, or hesitate to do so due to the social stigma related to mental illness. Therefore, home care nurses, as the frontline providers of these elders, have a significant role in early recognition of MHDs in these elders (Lewin et al., 2006; Thompson et al., 2008). However, research has shown that the a priori judgment of home care nurses is insufficient to identify late-life MHDs in these patients (Préville et al., 2004). Further, as evidenced in some home care nurses' self-reports, most of them have difficulty identifying MHD symptoms, which might be attributable to the lack of psychological training and awareness of MHDs in these nurses (Brown et al., 2004). In response to this challenge, several interventional studies have been conducted to better screen for MHDs in home care elders. In particular, research has shown that OASIS can be very powerful for accurately detecting MHDs in this population, granted it is used appropriately (Bruce et al., 2007).

However, the potential of OASIS for detecting MHDs and further improving mental health clinical care for home care elders remains unfulfilled (Brown et al., 2004). Although a few studies have been conducted to improve the detection of MHDs using OASIS, these studies were based on the outdated versions of OASIS, and only accounted for a limited scope of MHDs, i.e. depression. In addition, most of these studies were cross-sectional, making it difficult to apply their findings to continuous care services for home care elders. This is crucial because most

MHDs reported in this population are persistent, lasting for at least one month after their occurrence (Raue et al., 2003). Moreover, as home care elders' health and functional status fluctuate frequently, it is imperative that longitudinal investigations be conducted in order to accurately assess the extent of MHDs in this frail, elderly home care population (Sheeran et al., 2010).

Contribution to Knowledge

This dissertation study has made a significant contribution to the knowledge base on the mental health of home care elders. By examining the extent of MHDs using recent OASIS data, this dissertation study provided a better assessment of these disorders in the elderly home care population. In addition, this study also identified risk factors for MHDs and the relevant service use, which would potentially increase the effectiveness of mental health screening in home care settings as home care nurses and staff would be prompted to look more carefully for the presence of MHDs in patients who exhibited these factors. In this regard, this dissertation study can further inform a better care delivery and management for MHDs in U.S. home care elders. Of importance, this study closed three specific gaps in the literature, as shown in Table 4.

Table 4: Closing gaps in the literature

Gaps in literature	How this study addresses these gaps
<p>1. It is unclear what the <u>national prevalence</u> of MHDs in the elderly home care population is as well as those <u>risk factors</u> which are related to MHDs in this group. Therefore, it is difficult to develop targeted interventions that are applicable in large scale across different geographical locations.</p>	<p>A. By using the <u>national database (OASIS)</u>, an established and comprehensive measurement of patient outcome that covers 85% of home care agencies in US, the dissertation study is able to examine the prevalence of MHDs among home care elders, a high-risk population for MHDs, on a national level.</p> <p>B. The failure of home care nurses to recognize MHDs among home care elders is the major reason for under-recognition and under-treatment of this group. <u>By examining the risk factors for MHDs in this particular population, this study will be able to provide indicators and educational resources for home care nurses when identifying MHDs in their elderly clients.</u></p> <p>C. This study will inform the development of targeted clinical interventions by describing the risk factors associated with MHDs in the elderly home care population. This is critical especially considering that early intervention could significantly benefit elders presenting with</p>

Gaps in literature	How this study addresses these gaps
	mental health disorders (Cole, Elie, McCusker, Bellavance, & Mansour, 2001).
<p>2. Methodological flaws in previous studies:</p> <p>A. Low power: Evidence based on a smaller sample size collected in a single local agency (Thompson et al., 2008), with low power and not generalizable to other regions</p> <p>B. Study design: Mostly cross sectional no longitudinal, it is therefore difficult to predict or project the usage of data</p> <p>C. Poor feasibility: Most screening studies used professional psychological instrument as the primary assessment tool for MHDs. However, these tools are not commonly used in home care agencies and are beyond the abilities of home care nurses to administer in their everyday work.</p>	<p>This study uses the largest national database of home care information in US. It employs a longitudinal design, and robust methodology that is hypothesis driven and based on an established theoretical framework.</p> <p>A. Power-Large population-based study: OASIS covers all federal home care agencies (>85% of all home care agencies) in the U.S.</p> <p>a. Comprehensive patient outcome measurement: includes data items about socioeconomic status, environment, support system, health status, functional status, and health service utilization.</p> <p>b. Accuracy: Data items in OASIS were developed, tested, and further refined in a national research program (Shaughnessy et al., 1998).</p> <p>c. MHD items: Two depressive items in OASIS-B1 have already been shown as useful to improve care and referral for patients with depression (Bruce et al., 2007).</p> <p>d. Improvement in OASIS-C: On the basis of OASIS-B1, Patient Health Questionnaire-2 (PHQ-2) were added to OASIS-C to improve the screening and assessment of mental health disorders (Cabin, 2010). PHQ-2 is a brief version of PHQ-9, which has been shown as effective to accurately detect depression in home care patients (Ell et al., 2006; Kroenke et al., 2003; Li et al., 2007).</p> <p>B. Longitudinal nature of OASIS: data is usually collected by a RN within 24 hours of <u>admission</u> to home care services, or resumption of home care services after inpatient stay, periodically throughout care (<u>follow up</u>), and upon discharge or when patient is to be transferred to inpatient facilities.</p> <p>C. Immediate availability to real-world application by home care agencies: using administrative routine data (Byers et al., 2008).</p>
<p>3. The highest-risk and largest subgroup in this population, i.e. elderly cancer patients receiving home care services, is not well studied. It is unclear if cancer poses additional risks for MHDs in this population.</p>	<p>Comparison: Specifically, we will conduct a comparative analysis between home care elders with cancer and home care elders without cancer (neither current cancer patients nor cancer survivors).</p>

CHAPTER III: METHODOLOGY/RESEARCH DESIGN

Research Design

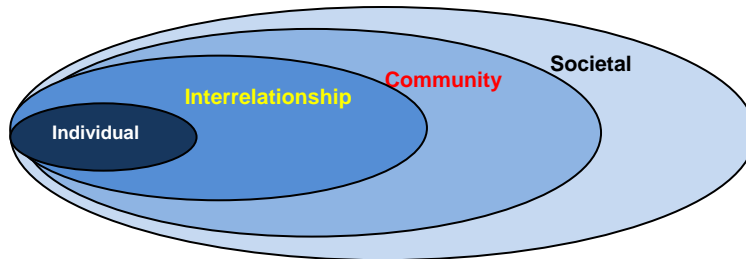
This study was a descriptive secondary analysis of the national Outcome and Assessment Information Set (OASIS) of 2010. This exploratory study used a prospective design to examine the extent and correlates of MHDs and related service use in U.S. home care elders, and to explore proposed relationships among target variables using longitudinal data spanning a 60-day home care episode. Specifically, this dissertation study aimed to describe the prevalence of MHDs and MHD-caused medical events (hospitalizations and emergent care events), and to examine factors associated with MHDs and these MHD-caused medical events in elders receiving skilled care services from Medicare-certified home care agencies during the year 2010. Through the use of a recent, standard, and widely used administrative dataset (OASIS), the dissertation study was designed to provide an accurate assessment of MHDs in the target population. Additionally, it was thought that potential risk factors for MHDs, once identified, could inform a more efficient mental health screening process (Brown et al., 2004). This was considered a possible significant contribution to the field since it has been found that better mental health screening occurs when it is integrated into the regular administrative process in home care settings (Diefenbach et al., 2009). Further, knowledge about these risk factors provides foundational knowledge for future development of targeted interventional programs with this vulnerable population (Byers et al., 2008).

Theoretical Framework

This dissertation study was guided by the Social Ecological Framework, as shown in Figure 1. The Social Ecological Framework was developed based on the evidence that no single factor can explain why some people or groups are at higher risk of certain health outcomes,

whereas others are more protected from these outcomes (Stokols, 1996). According to the World Health Organization (WHO, 2014a), the Social Ecological Framework is well suited for studies

Figure 1. Conceptual Model from the Social Ecological Framework



concerned with community health outcomes, such as those related to mental health disorders in community-dwelling and

home care elders, the target population in this dissertation study.

According to the Social Ecological Framework, the two specific outcomes of interest in this study, i.e., MHDs and MHD-caused medical events, might be viewed as the consequence of interaction among multiple factors, including individual characteristics, personal relationships, community contextual factors, and factors related to the society (Stokols, 1996). This study does not test these interactions but rather provides an exploratory foundation for systematic examination of variables related to such factors.

In this particular investigation, risk factors on the individual level included the patients' intrinsic characteristics that could influence their probabilities of developing MHDs. Specific components on this level were the patient's demographics, medical status, health risks, sensory status, and functional limitations. The second level, interpersonal relationships, referred to factors associated with the patient's social network, i.e., family, friends, and peers, in particular relevance to their influence on the patient's risks for MHDs. Factors on this level included the patients' social network support status, such as caregiving and ADL/IADL assistance. The third level, community context, consisted of factors pertinent to the circumstance in which patients developed MHDs, such as the patients' living condition and their receipt of mental health

services at residence. Lastly, the society level was composed of factors that influenced the patient's risk for MHDs on a broader scale. In particular, components at this level included the patient's socioeconomic status, such as financial condition or payment sources, as these factors were related to the patients' financial wellbeing and accessibility to necessary mental health services.

Population and Sample

All records in the 2010 OASIS dataset that met the eligibility criteria were included. Eligibility criteria were: 1) patient was in the elder age category: age of 65 years or over, and 2) home care recipient: received services from Medicare-certified home health care agencies in the U.S. during 2010. Both newly admitted home care elders and elders receiving ongoing home care services were included in the sample. Due to the extremely large sample size eligible for analysis, 5% of the eligible OASIS records were randomly selected and used as the final sample for data analysis (n=28,475).

Variables of Interest

Dependent Variables

There were two category of dependent variables in the dissertation study, including: 1) MHDs in the elderly home care population, and 2) MHD-caused medical events (hospitalizations and emergent care events) in this population. Specifically, the extent of MHDs was measured as the rates (i.e., prevalence) of MHDs in this population; the extent of MHD-caused medical events was measured as time-to-event variables, defined as days from the start of a 60-day home care episode to the time when the event of interest occurred. That is, 1) the time from the start of a 60-day home care episode to the occurrence of hospitalizations due to acute mental health problems, or 2) the time from the start of a 60-day home care episode to the occurrence of

emergent care events due to acute mental health problems. If these MHD-caused hospitalizations and MHD-caused emergent care events did not occur during the 60-day home care episode, the patient was considered as censored, as illustrated in Table 5.

Table 5: Censoring situations

Censoring Situations	Outcomes
Death	Time to the date of death
Hospitalizations or emergent care events due to other reasons	Time to the date of hospitalizations or emergent care events of other reasons
No occurrence of hospitalizations or emergent care events	60 days (the complete home care episode)

The assessment of these dependent variables was in alignment with the priority of home care quality control in the U.S., according to the Centers for Medicare and Medicaid Services (CMS, 2014). Specifically, the occurrence of MHDs at discharge, MHD-caused hospitalizations, and MHD-caused emergent care events are all considered avoidable adverse events that can negatively affect the quality of home care services (CMS, 2014). Therefore, the investigation of these variables is necessary to understand the prevalence and associated risk factors of MHDs among home care elders and also valuable in increasing our knowledge with regard to home care quality control at the national level.

Independent Variables

Potential correlates or risk factors examined in the dissertation study included variables related to the patient’s demographics, medical status, health risks, sensory status, functional limitations, recognition of the need for mental health services, social support status, living condition, and financial status, which were all assessed in the OASIS data set. These independent variables were primarily selected based on their reported empirical associations with the outcomes, as stated in Chapter Two. In particular, some of these variables, such as depression screening and depression interventions, were closely monitored process measures of the home

care quality control program, further warranting their inclusion in this study (CMS, 2014). Table 6 is an overview of key variables in this study and their related data items in OASIS.

Table 6: Overview of Concept, Variables, and Related Data Items in OASIS

Concept in the Social Ecological Framework	Variables	OASIS data items* which operationally define variables of interest
<i>Outcomes</i>		
MHD-caused medical events		MHD-caused hospitalizations
Mental Health Disorders (MHDs)		MHD-caused emergent care events Anxiety Depression Psychotic Disorders Substance Abuse: Drug dependence, alcohol dependence Aggression: Verbal disruption, physical aggression Socially inappropriate behaviors: Disruptive, infantile or socially inappropriate behaviors
<i>Correlates and Risk Factors</i>		
Individual characteristics	Demographics	Age
		Gender
		Race/Ethnicity
		Geographical location
	Medical status	Primary diagnosis
		Secondary diagnosis
		Admission sources in the past 14 days
		Inpatient diagnosis in the past 14 days
		Diagnoses required regimen change in the past 14 days
		Medical Comorbidity (Charlson Comorbidity Index)
		Risk for Hospitalization
		Overall health/prognosis status
	Health Risks	Smoking
		Obesity
	Cognitive status	Current level of cognitive functioning
		Memory deficit
		Impaired decision making
		Dementia diagnosis
	Sensory Status	Vision
		Hearing ability
		Ability to understand verbal content
		Ability of oral expression in one's own language
	Functional Limitations	Grooming
Ability to dress upper body		
Ability to dress lower body		
Bathing		
Toilet transferring		
Toileting hygiene		
Transferring		
Ambulation/locomotion		
Feeding or eating		
Ability to plan or prepare light meals		
Ability to use telephone		
Interpersonal relationship	Social Support	The level of caregiver's ability and willingness to provide ADL assistance
		The level of caregiver's ability and willingness to provide IADL assistance
		The level of caregiver's ability and willingness to provide assistance for medication administration
		The level of caregiver's ability and willingness to provide assistance for medical procedures

		The level of caregiver's ability and willingness to provide assistance for equipment management
		The level of caregiver's ability and willingness to provide assistance for supervising safety
		The level of caregiver's ability and willingness to provide assistance for supervising patient's participation in appropriate medical care
Community Context	Mental health services	Qualified psychiatric nursing services at home
		Depression interventions
	Living condition	Alone, with others at home, congregate situation
Society	Financial status	Payment sources: Medicare, Medicaid, other governmental programs, private insurance, and self-pay

* OASIS= the Outcome and Assessment Information Set

Operational Definitions of Variables

Table 7 provides specific operational definitions for each variable in this dissertation study, as outlined in the components of OASIS dataset (2010).

Table 7: Operational Definitions of Variables

Variables	OASIS Code*	OASIS Data Items* which operationally define variables of interest	Type of data	Range of data	Time Points**					
					S O C	R O C	F U	T /	D /	
Outcomes										
MHDs	Anxiety	M1720	Frequency of being anxious during the past 14 days	Categorical	0-3	Y	Y			Y
	Depression	M1730	Depression screening (PHQ-2)	Categorical	0-3	Y	Y			
		M2250	d. Plan of care: Depression interventions	Categorical	0/1/NA	Y	Y			
	Psychotic disorders	M1740	Delusional hallucinatory or paranoid behaviors (demonstrated at least once/week)	Categorical	0/1	Y	Y			Y
	Substance Abuse	M1036	Alcohol dependency	Categorical	0/1	Y	Y			
			Drug dependency	Categorical	0/1	Y	Y			
	Aggression	M1740	Physical aggression (demonstrated at least once/week)	Categorical	0/1	Y	Y			Y
Verbal disruption (demonstrated at least once/week)			Categorical	0/1	Y	Y			Y	
Socially inappropriate behaviors	M1740	Disruptive, infantile or socially inappropriate behaviors (demonstrated at least once/week)	Categorical	0/1	Y	Y			Y	
MHD-caused hospitalizations	M2410	1. Admitted to which inpatient facility: hospital	Categorical	0/1				Y	Y	
	M2430	17. Hospitalization due to acute mental or behavioral problem	Categorical	0/1				Y		
MHD-caused emergent care events	M2300	Emergent care usage	Categorical	0-2				Y	Y	
	M2310	17. Use of emergent care due to acute mental or behavioral problem	Categorical	0/1				Y	Y	
Correlates and Risk factors										
Demographics	M0066	Age	Continuous	0-100	Y					
	M0069	Gender	Nominal	F/M	Y					
	M1040	Race/Ethnicity	Nominal	6 options	Y					
	M0050	Geographical location: state ID	Nominal	All states	Y					
Medical status	M1020	Primary diagnosis (ICD-9)	Nominal	N/A	Y	Y	Y			
	M1022	Secondary diagnosis (ICD-9)	Nominal	N/A	Y	Y	Y			

	M1010	Inpatient diagnosis for any inpatient stay in the past 14 days		Nominal		Y	Y			
	M1016	Diagnoses requiring medical or treatment regimen changes in the past 14 days		Nominal		Y	Y			
	Medical Comorbidity (Charlson Comorbidity Index)			Continuous	0-9	Y	Y	Y		
	M1032	Risk for hospitalization		Nominal	7 options	Y	Y			
	M1034	Overall health/prognosis status		Categorical	0-3, UK	Y	Y			
	M1000	Admission source in the past 14 days		Nominal	7 options	Y	Y			
Health risks	M1036	Smoking		Categorical	0/1	Y	Y			
		Obesity		Categorical	0/1	Y	Y			
Sensory Status	M1200	Vision		Categorical	0-2	Y	Y	Y		
	M1210	Hearing ability		Categorical	0-2, UK	Y	Y			
	M1220	Ability to understand verbal content		Categorical	0-3, UK	Y	Y			
	M1230	Ability of oral expression in one's own language		Categorical	0-5	Y	Y			Y
Cognitive Status	M1700	Current level of cognitive functioning		Categorical	0-4	Y	Y			Y
	M1740	Memory deficit		Categorical	0/1	Y	Y			Y
	M1740	Impaired decision making		Categorical	0/1	Y	Y			Y
Functional limitations (ADL & IADL)	M1800	Grooming		Categorical	0-3	Y	Y			Y
	M1810	Ability to dress upper body		Categorical	0-3	Y	Y	Y		Y
	M1820	Ability to dress lower body		Categorical	0-3	Y	Y	Y		Y
	M1830	Bathing		Categorical	0-6	Y	Y	Y		Y
	M1840	Toilet transferring		Categorical	0-4	Y	Y	Y		Y
	M1845	Toileting hygiene		Categorical	0-3	Y	Y			Y
	M1850	Transferring		Categorical	0-5	Y	Y	Y		Y
	M1860	Ambulation/locomotion		Categorical	0-6	Y	Y	Y		Y
	M1870	Feeding or eating		Categorical	0-5	Y	Y			Y
	M1880	Ability to plan or prepare light meals		Categorical	0-2	Y	Y			Y
Social support status	M2100	The level of caregiver's ability and willingness to provide assistance in the following areas:	ADL	Categorical	0-5	Y	Y			Y
			IADL	Categorical	0-5	Y	Y			Y
			medication administration	Categorical	0-5	Y	Y			Y
			medical procedures	Categorical	0-5	Y	Y			Y
			equipment management	Categorical	0-5	Y	Y			Y
			supervising safety	Categorical	0-5	Y	Y			Y
			supervising patient's participation in appropriate medical care	Categorical	0-5	Y	Y			Y
Mental Health Services	M1750	Psychiatric nursing services at home		Categorical	0/1	Y	Y			
	M2400	Depression interventions		Categorical	0/1/NA				Y	Y
Living condition	M1100	Living alone/with others at home/congregate situation		Categorical	A-C	Y	Y			
Financial Status	M0150	Payment sources		Categorical	0-11, UK	Y				

* OASIS= the Outcome and Assessment Information Set; **Time points: time points of OASIS assessment, including SOC (start of care), ROC (resumption of care), F/U (follow up or recertification), T/F (transferal to inpatient facility), D/C (discharge to the community)

Most of these variables were assessed in OASIS, while medical comorbidity was measured using a separate instrument, i.e., Charlson Comorbidity Index, a weighted index that accounted for the number and the seriousness of comorbid disease. Specifically, this index categorizes comorbidities of patients based on the International Classification of Disease, 9th version (ICD-9) codes of 17 selected comorbid diseases, in order to predict the risk of death over

a one-year period (Charlson, Pompei, Ales, & MacKenzie, 1987; Deyo, Cherkin, & Ciol, 1992). Each comorbidity category has an associated weight, based on the adjusted risk of mortality or resource use, and the sum of all the weights results in a single comorbidity score for a patient. A score of zero indicates that no comorbidities were found; the higher the score, the more likely the predicted outcome will result in mortality or higher resource use.

This measure was originated in inpatient settings, but have been validated in a large range of health care settings, including both primary care and long-term care settings (Bravo, Dubois, Hébert, De Wals, & Messier, 2002; Buntinx, Niclaes, Suetens, Jans, Mertens, & Van den Akker, 2002; Charlson, Charlson, Peterson, Marinopoulos, Briggs, Hollenberg, 2008). Specifically in this study, the score of this index was calculated based on the ICD-9 codes of diagnoses extracted from OASIS, including primary and secondary diagnoses of the current home care admission (M0230 & M0240), and inpatient diagnosis as well as diagnoses requiring medical or treatment regimen change in the past 14 days (M1010 & M1016), as listed in Table 8.

Table 8: Charlson Comorbidity Index

Reported ICD-9 CM Codes	Comorbid Diseases	Charlson Score
410 – 410.9	Myocardial Infarction	1
428 – 428.9	Congestive Heart Failure	1
433.9, 441 – 441.9, 785.4, V43.4	Peripheral Vascular Disease	1
430 – 438	Cerebrovascular Disease	1
290 – 290.9	Dementia	1
490 – 496, 500 – 505, 506.4	Chronic Pulmonary Disease	1
710.0, 710.1, 710.4, 714.0 – 714.2, 714.81, 725	Rheumatologic Disease/Connective Tissue Disease	1
531 – 534.9	Peptic Ulcer Disease	1
571.2, 571.5, 571.6, 571.4 – 571.49	Mild Liver Disease	1
250 – 250.3, 250.7	Diabetes without Chronic Complications	1
250.4 – 250.6	Diabetes with Chronic Complications	2
344.1, 342 – 342.9	Hemiplegia or Paraplegia	2
582 – 582.9, 583 – 583.7, 585, 586, 588 – 588.9	Renal Disease	2
140.0 – 172.9, 174.0 – 195.8, 200.0 – 208.9	Any malignancy, including lymphoma and leukemia, except malignant neoplasm of skin	2
572.2 – 572.8	Moderate or Severe Liver Disease	3
196.0 – 199.1	Metastatic Solid Tumor	3
042 – 044.9	AIDS	6

Plan for Data Management and Analysis

The student investigator (JW) was responsible for the management and analysis of data, which was conducted using STATA 13.1 (StataCorp, College Station, TX). Raw data from the OASIS dataset were checked for completeness through visual inspection and comparison with the list of target variables, and maintained in compliance with relevant requirements of Columbia University Medical Center (CUMC) Institutional Review Board (IRB).

Missing Values

There were no missing values in the dependent variables, both MHDs and MHD-caused medical events. In terms of the independent variables, most did not have missing values. The only group of independent variables with missing values were related to the diagnosis, including secondary diagnoses of current home care stay (code M0240: 0.67% - 34.99%), inpatient diagnosis of the last hospital stay within the past 14 days (code M1010: 32.72% - 95.02%), and conditions requiring medical or treatment regimen change in the past 14 days (code M1016: 11.33% - 95.19%). The reason for these missing values may be related to the incomplete medical records in OASIS and the fact that some patients did not have multiple secondary diagnoses. Overall, missing values were minimal with respect to the key variables of this study.

Data Analyses

Data analyses moved from descriptive (aim1) to bivariate and through to multivariate exploratory inferential techniques (aim 2 & 3) designed to examine associations among the variables of interest. First, descriptive statistics were calculated for each variable. Second, bivariate analyses were conducted between each independent variable and the outcomes using two sets of inferential analytical technique. Specifically, logistic regression analysis was used to

identify the bivariate correlates of MHDs; and survival analysis was used to identify the bivariate risk factors for MHD-caused medical events. Those significantly related to the outcomes were added to the multivariate models of MHDs (aim 2) and MHD-caused medical events (aim 3) in order to construct the final multivariate models.

Survival analysis is a method of statistical analysis that deals with the time-to-event data from the starting point to the occurrence of the event of interest, which is the same type of data as MHD-caused medical events in this study. This analytical technique was used in this study for two major reasons: 1) to account for the variations in the timing of outcomes, and 2) to adjust for incomplete information in the outcomes, which could be caused by missing values, patient death (0.39%), or medical events caused by other reasons.

Specific aim 1

In keeping with the first descriptive aim of this study, the prevalence of MHDs and MHD-caused hospitalizations as well as MHD-caused emergent care events were assessed. Specifically, the rates of all MHD symptoms identified in OASIS were calculated, including anxiety, depression, psychotic disorders, substance abuse, aggression, and socially inappropriate behaviors. All of these MHD symptoms were assessed at admission. In addition, anxiety, psychotic disorders, aggression, and socially inappropriate behaviors were also assessed at discharge (only available for patients who were discharged to the community). These rates entered the analyses separately as well as in combination (i.e., aggregated MHDs).

Discrete independent variables were used to stratify subjects for exploratory purposes, including: 1) demographic information, such as gender and race/ethnicity, 2) medical status: primary and secondary diagnoses, admission source in the past 14 days, inpatient diagnoses in the past 14 days, diagnoses requiring regimen change in the past 14 days, overall health status,

risk for hospitalizations, and 3) mental health services, including depression interventions and qualified psychiatric nursing services. To examine the distribution and skew, variables were described using mean and standard deviation (continuous), or frequency and proportion (discrete). Histograms were generated to examine the distribution and range of each variable.

Specific aim 2

The dependent variable in this aim was MHDs. Specifically, bivariate and multivariate logistic regression analysis was conducted using log likelihood test to examine the correlates of MHDs. First, a scatter plot was drawn to inspect for linear relationships and outliers. Then, all the independent variables were analyzed for their bivariate relationship with MHDs in bivariate logistic regression analysis using log likelihood test. Those in significant associations with MHDs were selected to construct the final multivariate model of MHDs.

Specific aim 3

The dependent variable in this aim was MHD-caused medical events. Specifically, bivariate and multivariate survival analyses were conducted using the Cox proportional hazard model to examine the risk factors for MHD-caused medical events, which were time-to-event measured data. This analytical technique was used in this study to examine the hazard of MHD-caused medical events, i.e. given that a patient is not hospitalized or receiving emergent care at day $t-1$, the probability of this patient being hospitalized or receiving emergent care at day t due to MHDs. The Cox proportional hazard model of day t is structured as follows:

$$h(t, x_i) = h_0(t) \exp(\beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots + \beta_i x_i), \text{ where } x_1, x_2, x_3, \dots, x_i \text{ are a set of}$$

covariates identified in this patient. If MHD-caused hospitalizations and emergent care events

occurred, the outcomes were measured by the time-to-event data of these events. If these events did not occur, the outcome was censored as illustrated in Table 5.

For both aim 2 and aim 3, independent variables that evidenced a strong bivariate correlation with the outcomes were added to the modeling procedure, both based on the statistical significance and theoretical relevance of the associations. In order to facilitate the selection of the final multivariate model, model fit indicator Bayesian Information Criterion (BIC) was used, with a smaller BIC indicating a better fit of model when the number of parameters stays the same. All analyses were conducted at the level of patient using Stata Version 13.1 (StataCorp, College Station, TX). In summary, Table 9 lists the specific aims, variables of interest, and related analyses.

Table 9: Specific Aims, Variables, and Analytical Plan

Specific Aims	Variables of Interest	Analytical Plan
<p><u>Aim 1:</u> To describe the national prevalence of MHDs and MHD-caused medical events (hospitalizations and emergent care events) during a 60-day home care period in the U.S. elderly population receiving services through Medicare-certified home care agencies.</p>	<ol style="list-style-type: none"> 1. MHDs 2. MHD-caused medical events 	<p><u>Descriptive statistics:</u> Continuous -mean, SD; Categorical-frequency, proportion</p>
<p><u>Aim 2:</u> To identify the correlates of MHDs among the variables related to individual characteristics, interpersonal relationships, community context, and societal factors in this population, with a particular attention to a diagnosis of cancer.</p>	<p><u>Outcomes:</u> MHDs <u>Potential correlates:</u></p> <ol style="list-style-type: none"> 1. Demographics 2. Medical status 3. Health risks 4. Sensory status 5. Functional limitations 6. Social support status 7. Recognition of the need for mental health services 8. Living condition 9. Financial status 10. A diagnosis of cancer 	<ol style="list-style-type: none"> 1. <u>Bivariate analysis:</u> Bivariate logistic regression (log likelihood test) 2. <u>Multivariate analysis:</u> Multivariate logistic regression (log likelihood test) 3. <u>Model fit indicator:</u> Bayesian Information Criterion (BIC)

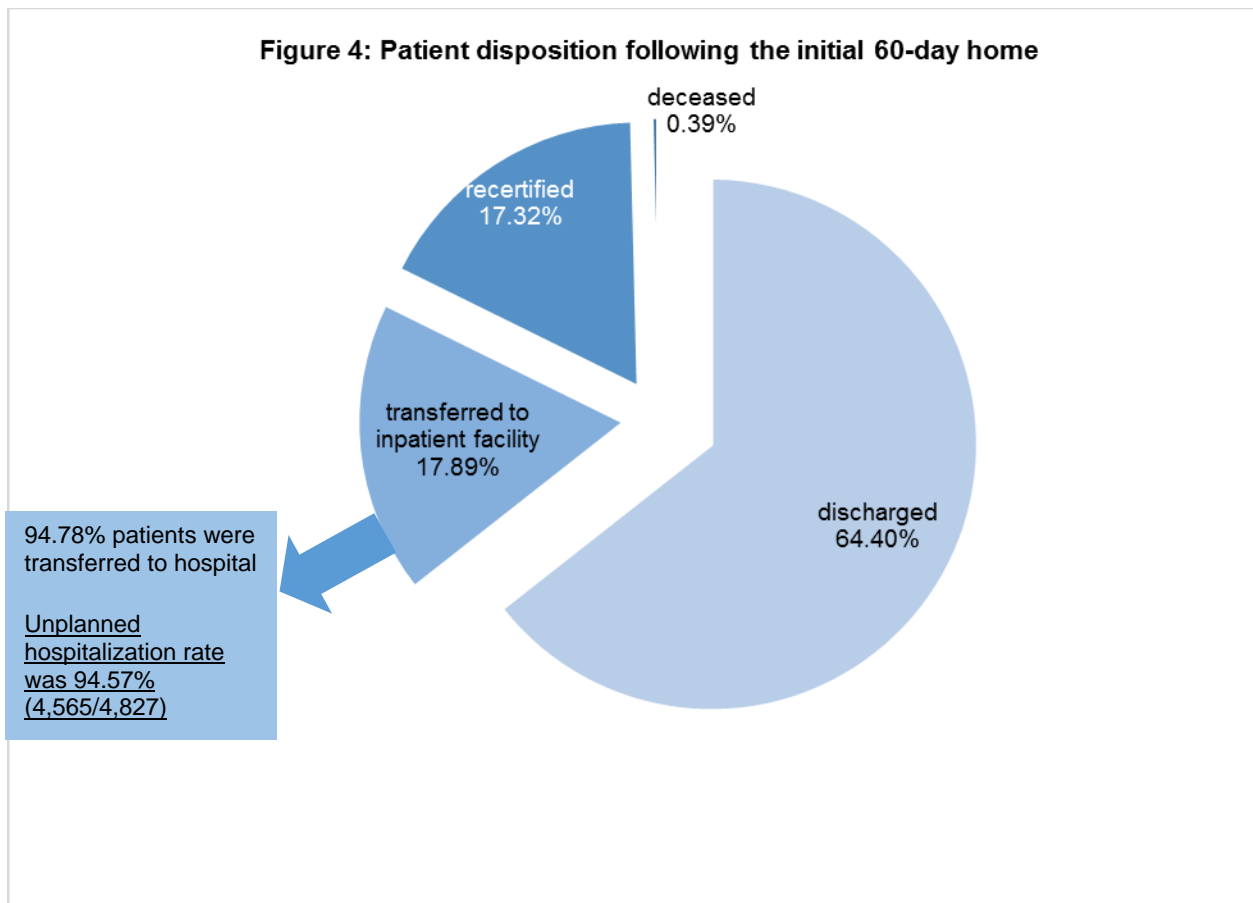
<p><u>Aim 3:</u> To identify the risk factors for MHD-caused medical events (hospitalizations and emergent care events) in this population, with particular attention to a diagnosis of cancer.</p>	<p><u>Outcome:</u> Time-to-event data of MHD-caused medical events <u>Potential risk factors:</u></p> <ol style="list-style-type: none"> 1. Demographics 2. Medical status 3. Health risks 4. Sensory status 5. Functional limitations 6. Social support status 7. Recognition of the need for mental health services 8. Living condition 9. Financial status 10. A diagnosis of cancer 	<ol style="list-style-type: none"> 1. <u>Bivariate analysis:</u> Bivariate survival analysis (Simple Cox proportional Hazard model) 2. <u>Multivariate analysis:</u> Multivariate survival analysis (multivariate Cox proportional Hazard model) 3. <u>Model fit indicator:</u> Bayesian Information Criterion (BIC)
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Statistical Power

A power calculation was conducted for the multivariate survival analysis. Based on a projected sample size of 28,745 elderly patient records, a significance level of 0.05 and using a two-tailed test, there was greater than 80% power to detect a hazard ratio of 1.19 or greater, which provided a high level of power to detect a small effect size.

CHAPTER IV: RESULTS

A total of 28,475 elderly patients randomly selected from the 2010 national OASIS data set were included in the analysis. During the 60-day home care episode, 37.94% of these patients evidenced at least one MHD. Approximately one fifth (19.14%) of these patients experienced subsequent hospitalizations and emergent care events, including 0.45% that were directly caused by MHDs. Figure 4 provides a detailed disposition of these patients following the initial 60-day home care stay.



Sample Characteristics

Patient Demographics

The average age of U.S. home care elders in this study was 79.41 (range: 65-110, S.D.=8.19). Most of these patients were female (62.48%), white (79.68%), and admitted from short-stay acute hospitals before the current home care stay (43.42%). Two thirds of the patients lived with others, one third lived alone at home, and only 9% resided in assisted living facilities. With regard to the payment sources, the majority of these patients were Medicare (90.42%) or Medicaid (3.7%) beneficiaries, while a small number of patients paid through private insurance (4.4%) or out of their own pockets (0.82%). More information about these patients' demographics is shown in Table 10.

Table 10: Patient Demographics

Variable	n (N=28,475)	%
Age	Mean= 79.41, SD=8.19, Min=65, Max=110	
Gender	Female	18078 63.48%
	Male	10397 36.51%
Race/Ethnicity	White	22690 79.68%
	Black	2988 10.49%
	American Indian/Alaska Native	108 0.38%
	Asian	605 2.12%
	Hispanic	2010 7.06%
	Native Hawaiian or Pacific Islander	74 0.26%
Admission Sources in the past 14 days	Short-Stay Acute Hospital	12868 43.42%
	Skilled Nursing Facility	4461 15.05%
	Inpatient Rehab Hospital or Unit	1985 6.70%
	Long-term Care Hospital	358 1.21%
	Psychiatric Hospital or Unit	74 0.25%
	Long-Term Nursing Facility	436 1.47%
	Unknown/NA	9318 31.44%
	Other	136 0.46%
Living Condition	Living Alone at Home	7609 26.72%
	Living with Others at Home	18291 64.24%
	Assisted Living Facilities	2575 9.04%
Payment Sources	Medicare	28173 90.42%

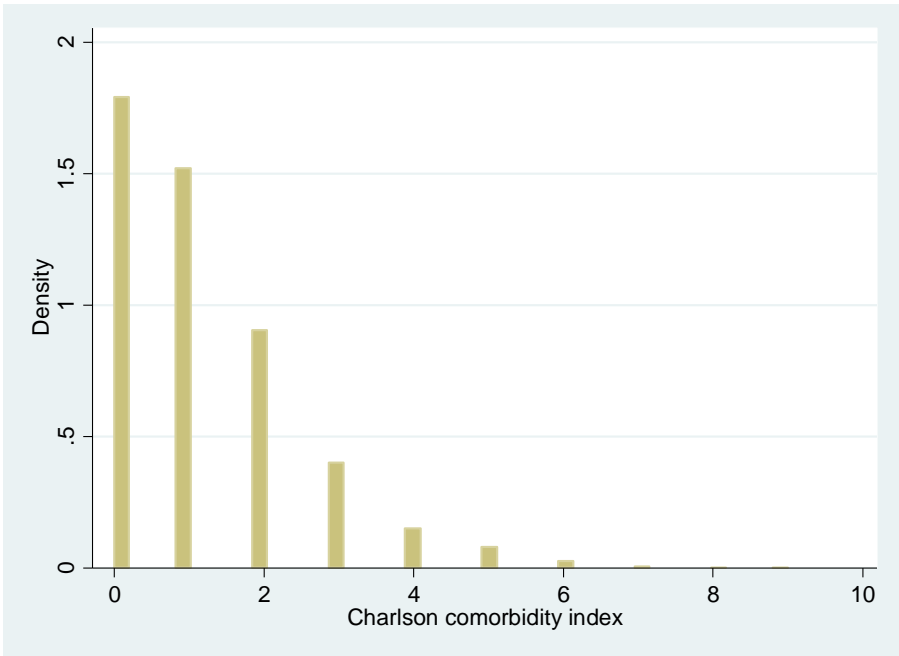
	Medicaid	1154	3.70%
	Private	1252	4.02%
	Self-Pay	256	0.82%
	Other Sources	324	1.04%

Medical Status

Medical diagnoses in this group were largely related to respiratory, circulatory and metabolic disorders. Specifically, the most common diseases in this population were diabetes (n=7,629, 26.79%), chronic pulmonary disease (n=4,989, 17.52%), and congestive heart failure (n=4,526, 15.89%). In addition, almost one tenth (9.33%) of these patients had cancer, and 3.03% of these patients had dementia. On average, the severity of these home care elders' medical status was from medium to high (m =13.81; range: 0-24 in the aggregate on the severity

of diagnosis score in OASIS), with

Figure 5: Distribution of Medical Comorbidities



substantial risk for deteriorating prognosis evidenced in most of these patients (81.37%). According to the Charlson Comorbidity Index (Charlson et al., 1987), the 1-year mortality rate was 12% for 36.5% of these

patients (score=0), 26% for 49.65% of these patients (score=1-2), 52% for 11.29% of these patients (score=3-4), and 85% for 2.41% of these patients (score=5 or more) (Figure 5).

Health Risks

With regard to health risks and life style, 16.19% of these patients were obese and 10.08% smoked. As many as 80.4% of patients were taking more than five medications, 23.54% had a history of recent multi-hospitalizations, 27.63% had a history of falls, 26.7% reported frailty indicators such as weight loss and self-reported exhaustion, and 14.9% had a recent decline in their mental, emotional, or behavioral status.

Sensory Impairments

In addition, sensory impairments were also very common in this population. Specifically, 37.46% had difficulty with speech and oral expression, 38.4% were unable to understand verbal content even in their own languages, approximately 40% had impaired hearing ability, and as much as 75.5% of this group had varied levels of impaired vision. A large number of these patients also had cognitive dysfunction, including memory deficit (17.69%), impaired decision making (19.81%), and confusion (43%). Table 11 reports patients' medical and health status in more detail.

Table 11: Medical and Health Status

Variables	n (N=28,475)	%
Medical Illness		
Diabetes without Chronic Complications	7140	25.07%
Chronic Pulmonary Disease	4989	17.52%
Congestive Heart Failure	4526	15.89%
Cerebrovascular Disease	2501	8.78%
Cancer (except malignant neoplasm of skin)	2251	7.91%
Cancer (total)	2657	9.33%
Renal Disease	1994	7.00%
Peripheral Vascular Disease	988	3.47%
Dementia	864	3.03%
Rheumatologic Disease/Connective Tissue Disease	669	2.35%
Myocardial Infarction	557	1.96%
Diabetes with Chronic Complications	557	1.96%
Metastatic Solid Tumor	393	1.38%

	Peptic Ulcer Disease	163	0.57%
	Hemiplegia or Paraplegia	114	0.40%
	Mild Liver Disease	101	0.35%
	Moderate or Severe Liver Disease	46	0.16%
	AIDS	2	0.01%
Severity of Medical Condition	Mean=13.81, SD=3.23, Min=0, Max=24		
Prognosis of Medical Condition	Stable	5219	18.33%
	Lower Risk	15366	53.96%
	High Risk	6701	23.53%
	Fatal Risk	1104	3.88%
	Unknown	85	30.00%
Charlson Comorbidity Index (risk for death in the next year)	<u>Score</u>	<u>1-year mortality rate</u>	
	0	12%	10,435
	1	26%	8,858
	2	26%	5,280
	3	52%	2,334
	4	52%	881
	5	85%	471
	6	85%	164
	7	85%	41
	8	85%	10
9	85%	1	
Risk for hospitalizations	Recent decline in mental, behave, emotional status	4,243	14.90%
	Frailty Indicators	7,540	26.48%
	History of falls	7,868	27.63%
	Two or more hospitalizations in the past 12 months	6,702	23.54%
	Taking five or more medications	22,893	80.40%
Health Risks	Smoking	2,871	10.08%
	Obesity	4,609	16.19%
Sensory Status	Vision Impairment	6963	24.45%
	Hearing impairment	11,104	39.00%
	Difficulty with understanding of verbal content	10,830	38.03%
	Difficulty with oral expression	10,582	37.16%
Cognitive Function	Impaired cognitive functioning	13,296	46.69%
	Memory Deficit	5,036	17.69%
	Impaired decision making	5,641	19.81%
	Dementia Diagnosis	864	3.03%

Functional Limitations

Most home care elders in the study sample had functional limitations, such as difficulties with dressing (74.37%-81.13%), grooming (66.33%), ambulation (82.73%-91.74%), bathing (95.07%), toilet hygiene (58.76%), toilet transferring (53.86%), eating (46.94%), preparing light meals (77.28%), and phone use (32%), as shown in Table 12.

Table 12: Functional Limitations and need for ADL/IADL assistance

Domains of functional limitations	n (N=28,475)	%
Dressing upper body	21,176	74.37%
Dressing lower body	23,102	81.13%
Grooming	18,887	66.33%
Ambulation/locomotion	26,122	91.74%
Transferring	23,556	82.73%
Bathing	27,072	95.07%
Toilet Hygiene	16,732	58.76%
Toilet Transferring	15,336	53.86%
Feeding or eating	13,366	46.94%
Preparing light meals	22,005	77.28%
Phone use	9,113	32.00%

In alignment with their high level of functional limitations, most patients in this population reported the need for additional caregiver assistance from their social network. These included ADL or IADL assistance with: 1) equipment management, such as oxygen, IV or infusion equipment, enteral or parental nutrition, ventilator therapy equipment of supplies (23.25%); 2) medical procedures or treatments, such as changing wound dressing (35.07%); 3) medication administration (68.81%); 4) supervision and safety due to cognitive impairment (60.39%); and 5) advocacy or facilitation of patient's participation in appropriate medical care, such as transportation to or from appointments (90.2%). During the 60-day home care episode, most patients with the need for this additional caregiver assistance were provided with adequate support (96.46%-99.27%).

Primary Findings

Findings were organized around the specific aims, including 1) the national prevalence of MHDs and MHD-caused medical events in U.S. home care elders, 2) correlates of MHDs in this population, and 3) risk factors for MHD-caused subsequent medical events in this population. In addition, there were two separate findings which were unexpected from the onset of this study, including 4) the allocation of psychiatric services in this population, and 5) the relationship between mental health-related variables and the occurrence of subsequent medical events due to all causes, including hospitalizations, emergent care events, and nursing home admissions.

Finding 1: National Prevalence of MHDs and MHD-caused Medical Events in the U.S. Elderly Home Care Population

In this 5% random sample that consisted of 28,475 U.S. elderly home care patients, 10,802 (37.94%) of them had MHD symptoms. These MHDs included common mood disorders, such as anxiety and depression, and less common symptoms, such as psychotic disorders and substance abuse. However, very few of these disorders were documented as such in the patients' formal diagnoses, as shown in Table 13.

Table 13: National Prevalence of MHDs (N=28,475)

Type of MHDs	Symptoms		Formal Diagnosis	
Anxiety	4,957	17.41%	974	3.42%
Depression	7,984	28.04%	2,668	9.37%
Substance Abuse	707	2.48%	207	0.73%
Aggression	413	1.45%	N/A	N/A
Psychotic Disorders	307	1.08%	190	0.67%
Socially Inappropriate Behaviors	178	0.63%	N/A	N/A
Total	10,802	37.94%	4,039	14.18%

Depression

Depression was the most common MHD in these home care elders, as evidenced in up to 28.04% (n=7,984) of these patients. Most (n=25,158, 88.35%) of the home care elders were screened by PHQ-2, a standard assessment tool for depression. According to a cut-off point of “2” in PHQ-2 (Zuithoff et al., 2010), 16.57% (n=4,717) of these patients were depressed. In addition, there were another two groups of patients who, although were not determined to be depressed in PHQ-2, were most likely also depressed, as indicated by a documented diagnosis of depression in their medical records (n=2,668), and prescription of depression interventions in their care plan (n=6,359). Table 14 illustrates a detailed composition of all depressed cases identified in this study.

Table 14: Depression (N=28,475)

Diagnosis of depression	PHQ-2 assessment				Prescription of depression interventions
	No	Missing			
994	No	Missing	3,317	66.55%	2,121
226		0	17	5.25%	596
635		1	1,496	10.10%	1,746
96	Mild	2	2,875	1.09%	250
209		3	309	2.13%	514
44		4	607	0.41%	97
186	Moderate-Severe	5	117	1.58%	402
0		6	451	0.02%	5
27		7	5	1.22%	78
251		8	347	11.65%	550
Total depression diagnosis = 2,668 (9.36%)	Total depression in PHQ-2 (score>=2)		4,717	16.57%	Total depression intervention prescription=6,359 (22.33%)
Total Depression (without overlapped cases) = 7,984 (28.04%)					

Anxiety

Following depression, the second most common MHD in this population was anxiety, reported in 17.41% (n=4,957) of these patients. Anxiety symptom was defined in this study as patient report of anxiety “*daily but not constantly*” or “*all the time*”. Reports of anxiety “*less than daily*” were not included as anxiety occurring from time to time is not considered atypical

and not characteristic of or sufficiently present to warrant consideration at a diagnostic level. Most of these patients had mild to moderate anxiety symptoms (“*daily but not constantly*”: 16.07%, n=4,576), with a small percentage of them having severe anxiety symptoms (“*all the time*”: 1.34%, n=381), as shown in Table 15.

Table 15: Anxiety Symptoms

Severity of Anxiety	Frequency of Symptoms	n (N=28,475)	Percentage
N/A	Nonresponsive	63	0.22%
No	Never	16,028	56.29%
	Less than daily	7,427	26.08%
Mild to Moderate	Daily but not constantly	4,576	16.07%
Severe	Constantly/all the time	381	1.34%
Total Anxiety Symptoms		4,957	17.41%

Other types of MHD Symptoms

In addition to these common mood disorders, depression and anxiety, these older home care patients were found with other MHD symptoms, including substance abuse, psychotic disorders, aggression, socially inappropriate behavior, although with significantly lower rates (Table 16).

Table 16: Other MHD Symptoms

Other types of MHDs		n (N=28,475)	%
Substance Abuse	Alcohol dependence	591	2.08%
	Drug dependence	140	0.49%
	Total Substance Abuse	707	2.48%
Psychotic Disorders	Delusional, hallucinatory, or paranoid behaviors	307	1.08%
Aggression	Verbal Disruption	354	1.24%
	Physical Aggression	169	0.59%
	Total Aggressive Disorders	413	1.45%
Socially inappropriate behaviors		178	0.63%

Comorbidity or MHDs

The analyses in this study have revealed that these disorders were not only prevalent, but also interrelated, as shown in Table 17. In particular, the strength of correlation was, as expected, higher in the following dyads, including depression – anxiety, psychotic disorders – anxiety, aggression – anxiety, socially inappropriate behaviors – anxiety, psychotic disorders – aggression, psychotic disorders - socially inappropriate behaviors, and aggression - socially inappropriate behaviors.

Table 17: Correlation Matrix among MHDs (N=28,475)

Correlation Coefficient	Depression	Anxiety	Psychotic Disorders	Substance Abuse	Aggression	Socially inappropriate behaviors
Depression	1.000					
Anxiety	0.254	1.000				
Psychotic Dis.	0.077	0.107	1.000			
Substance abuse	0.035	0.043	0.018**	1.000		
Aggression	0.079	0.135	0.225	0.011*	1.000	
Socially inappropriate behaviors	0.056	0.098	0.195	0.017**	0.2936	1.000

Significance level: *0.05, **0.01, otherwise 0.00

MHD-caused Medical Events

Over the course of the 60-day home care episode, 16.95% (n=4,827) of the sample were hospitalized and 12.72% (n=3,621) had emergent care events. Among these subsequent medical events, 2.34% (n=128) were directly caused by MHDs (Table 18).

Table 18: MHD-caused Medical Events

Subsequent Medical Events	n (N=28,475)	%
All-cause Hospitalizations	4,827	16.95%
All-cause Emergent Care Events	3,621	12.72%
All-cause Medical events (without overlapped cases)	5,451	19.14%
MHD-caused hospitalizations	107	0.38%
MHD-caused emergent care events	76	0.27%
MHD-caused medical events (without overlapped cases)	128	0.45%
Proportion of MHD-caused medical events	128/5,451	2.34%

Finding 2: Correlates of MHD symptoms

Factors associated with MHDs and MHD-caused medical events were examined in two steps, including: 1) an examination of the correlates of MHD symptoms, to gather an initial understanding about the characteristics of patients who started home care services with MHDs, and 2) an identification of risk factors for MHD-caused medical events, to gain a deeper understanding about the variables that precipitated home care elders' mental status and led to negative consequences in medical events.

Correlates of Specific MHD symptoms

Significant correlates of specific MHD symptoms were examined using bivariate logistic regression, and varied among different symptoms. Specifically, there were factors positively associated with certain MHD symptoms but inversely related or totally unrelated to other symptoms. For example, older age was negatively associated with depression, anxiety, substance abuse, and socially inappropriate behaviors, but was not related to aggression or psychotic disorders. Another demographic factor, gender (female vs. male), was also found to have differing associations with different MHD symptoms. Specifically, female patients were more likely to develop depression and anxiety, but less likely to have aggression or substance abuse disorders than their male counterparts. More detail about these correlates was illustrated in Table 19.

Table 19: Correlates of Specific MHDs

Significant Correlates (P<0.05) (Odds Ratio)	Depression	Anxiety	Substance abuse	Aggressi on	Psychotic Disorders	Soc_ina pp
Age	0.966**	0.966**	0.947**			0.951*
Gender (Female vs. Male)	1.341**	1.770**	0.373**	0.643**		
Race: White		2.112**				
Race: Black	0.641**					
Race: Hispanic		1.438*				

Living condition: Alone at home	1.268**					
Living condition: Assisted living	1.384**					2.110*
Payment source: Private insurance						
Smoking	1.388**	1.418**	6.133**			
Obesity	1.168**					
Admission source: Acute short-stay hospitals	0.788**					
Admission source: Skilled nursing facilities			1.723**		0.612	
Admission source: Psychiatric hospitals	3.978**	2.598			13.098**	5.960*
Admission source: Long-term nursing facility						
Admission source: Rehab unit or hospitals					0.379	
Severity		1.046**	1.038			1.089
Charlson Comorbidity Index	1.026	0.932**				
Cancer					0.500	
Frail indicators	1.556**	1.255**		0.785		
History of falls	1.328**	1.179*				
Multiple hospitalizations (two or more) in the past 12 months	1.349**	1.154				
Recent decline in emotional, behavioral, or behavioral status		1.647**	1.697**	2.707**	2.856**	2.507**
Sensory impairment	1.109**	1.082**				
Cognitive dysfunction	1.169**	1.215**		2.187**	2.084**	2.408**
Functional limitation					0.971**	
Need for additional assistance from social network	1.120**	1.047				
Provision of additional assistance from social network	0.937**					

Level of significance: *p<0.01, ** p<0.001;

Abbreviations: “soc_inapp”: socially inappropriate behaviors

Correlates of Aggregated MHDs

In addition to the correlates of specific MHD symptoms, a separate cluster analysis was conducted to examine the correlates of all MHDs in aggregate. As shown in this analysis, variables related to the patients’ age, gender, race, living condition, medical status, health risks, recent decline in emotional and behavioral status, sensory and cognitive functionality, and social support status were all correlates of aggregated MHDs. Specifically, the rates of MHDs were lower in patients who were older, black, Asian, American Indian, or Native Hawaiian, living with others at home, referred from acute short-stay hospitals or provided with adequate social support, whereas higher in patients who were female, smoking, referred from psychiatric

hospitals, in poor medical status, having sensory impairments, cognitive dysfunction, recent history of falls or multiple hospitalizations, or a need for additional caregiver assistance (Table 20).

Table 20: Correlates of Aggregated MHDs

Correlates of Aggregated MHDs	Odds Ratio	95% Confidence Interval		P-value
Age	0.964	0.961	0.968	0.000
Gender (Female vs. Male)	1.355	1.282	1.432	0.000
Race: Black	0.626	0.573	0.684	0.000
Race: Asian/American Indian/Native Hawaiian	0.703	0.600	0.824	0.000
Living condition: With others at home	0.784	0.740	0.830	0.000
Risk for deteriorating medical prognosis	1.190	1.146	1.235	0.000
Smoking	1.715	1.577	1.866	0.000
Admission source: Acute short-stay hospitals	0.842	0.798	0.889	0.000
Admission source: Psychiatric hospitals	2.996	1.651	5.436	0.000
Frailty indicators	1.365	1.285	1.451	0.000
Recent decline in mental/emotional/behavioral status	1.800	1.665	1.946	0.000
History of falls	1.260	1.189	1.336	0.000
Multiple hospitalizations (2 or more) in the past year	1.277	1.200	1.358	0.000
Sensory impairment	1.100	1.079	1.121	0.000
Cognitive dysfunction	1.228	1.195	1.261	0.000
Need for additional caregiver assistance from social network	1.114	1.093	1.135	0.000
Provision of additional caregivers assistance from social network	0.939	0.901	0.978	0.002

In particular, admission source from psychiatric hospitals was the strongest correlate of MHDs, followed by variables pertinent to the patient’s recent emotional and behavioral status, life style and health risks (smoking), medical status, and cognitive as well as sensory function. Specifically, the odds of MHDs in home care elders referred from psychiatric hospitals were 2.996 times the odds in patients who referred from other admission sources. Among these correlates, which increased the risk for MHDs, there was one variable that was inversely related to this risk, i.e., status of social support. It was shown that having adequate social support was related to the 7% lower odds of having MHDs for home care elders.

Finding 3: Risk Factors for MHD-caused Medical Events

According to the results in bivariate survival analysis, bivariate correlates ($p < 0.05$) of MHD-caused hospitalizations and MHD-caused emergent care events included variables regarding the patients' demographics, financial status, medical condition, sensory and cognitive function, social support status, and the extent of MHDs as well as psychiatric resources allocation, as shown in Table 22. Specifically, the risk for MHD-caused medical events was higher in patients who were white, residing in assisted living facilities, using private insurance as the major payment source, admitted from long-term care or psychiatric hospitals, having frail indicators, having a history of recent multi-hospitalizations, cognitively impaired, having sensory or functional disabilities, in need of additional caregiver assistance, having MHD symptoms or using psychiatric services.

Most mental health-related items in OASIS were associated with increased risk for these MHD-caused events (hazard ratio > 1), as italicized in Table 21. In particular, the variables "admission source: psychiatric hospitals", "MHD symptom: socially inappropriate behaviors", and "MHD symptom: psychotic disorders" were the strongest correlates, increasing the patient's risk for these events by 12.587, 9.117, and 8.423 times respectively.

Table 21: Bivariate Correlates of MHD-caused Medical Events

Category	Bivariate Correlates of MHD-caused Medical Events	Hazard Ratio	95% Confidence Interval		P-value
Demographics	Race: white	1.952	1.154	3.302	0.013
	Living condition: alone at home	*0.614	0.390	0.966	0.035
	Living condition: assisted living facilities	1.862	1.166	2.971	0.009
	<i>Payment source: Private insurance</i>	2.282	1.194	4.361	0.013
Medical and Health Status	<i>Admission source: long term care hospitals</i>	3.378	1.380	8.266	0.008
	<i>Admission source: psychiatric hospitals</i>	13.587	5.549	33.267	0.000
	<i>Recent decline in mental and behavioral status</i>	4.849	3.407	6.901	0.000
	Frailty indicators	1.491	1.032	2.154	0.033
	Two or more hospitalizations in the past 12 months	1.832	1.268	2.647	0.001
	Dementia	2.538	1.329	4.845	0.005
	Sensory impairments	2.154	1.416	3.274	0.000
	<i>Cognitive dysfunction</i>	4.775	3.010	7.573	0.000
	Functional limitations	1.644	1.316	2.054	0.000
Mental Health Disorders (MHDs) and services	Anxiety	2.485	1.720	3.591	0.000
	Depression	3.025	2.012	4.313	0.000
	<i>Psychotic disorders</i>	9.423	5.194	17.095	0.000
	Aggression	3.072	1.959	4.816	0.000
	Socially inappropriate behaviors	10.117	4.941	20.717	0.000
	<i>Depression interventions</i>	5.198	3.647	7.410	0.000
	Qualified psychiatric nursing services	7.295	3.925	13.557	0.000
Social Support	<i>Need for additional caregiver assistance</i>	1.483	1.291	1.703	0.000

* Hazard ratio<1: protective factor against MHD-caused medical events

A few of these bivariate correlates (italic in Table 21) entered the final multivariate model for MHD-caused medical events (Table 22), whereas most correlates, especially those with respect to the patient’s demographic and medical status, were no longer significant once other correlates were added to the multivariate model. In particular, variables regarding depression interventions and admission from psychiatric hospitals had the strongest predictive relationship with these MHD-caused medical events (italic in Table 22). Specifically, at any given day during the 60-day home care episode, the risk for MHD-caused hospitalizations and

MHD-caused emergent care events in patients receiving depression interventions was 320.1% higher than those who were not receiving these interventions. Likewise, at any given day during the 60-day home care episode, the risk for these MHD-caused events in older home care patients admitted from psychiatric hospitals was 488.9% higher than others who were not admitted from these psychiatric hospitals.

Table 22: Multivariate Predictive Model for MHD-caused Medical Events

Identified Risk Factors	Hazard Ratio	95% Confidence Interval		P>value
Payment source: Private insurance	2.518	1.314	4.827	0.005
Admission source: long term care hospitals	3.150	1.280	7.749	0.012
<i>Admission source: psychiatric hospitals</i>	5.889	2.356	14.723	0.000
<i>Recent decline in mental and behavioral status</i>	2.029	1.351	3.047	0.001
Cognitive dysfunction	1.349	1.202	1.515	0.000
<i>Depression interventions</i>	4.201	2.934	6.016	0.000
Social support need: additional caregiver assistance	1.260	1.079	1.472	0.003

The previous paragraphs reported results in correspondence to the three specific aims: the national prevalence and correlates of MHDs, and the risk factors for MHD-caused medical events in the population of U.S. home care elders. In addition, this study came across another two unexpected but noteworthy findings, including 1) MHDs as an independent risk factor for the total occurrence of medical events (finding 4), and 2) discrepancies in the allocation of psychiatric resources for these patients (finding 5).

Finding 4: MHDs as independent risk factors for all-cause subsequent medical events

In addition to the examination of hospitalization and emergent care events that were directly caused by MHDs, the investigator also examined the relationship between MHDs and all-cause subsequent medical events, including hospitalizations, emergent care events, and nursing home admissions. This group of analyses revealed that although a small percentage (2.34%) of these medical events were directly caused by MHDs, the broader array of variables

related to MHDs and associated psychiatric services were significant risk factors for the total occurrence of medical events due to all causes, including hospitalizations, emergent care events, and nursing home admissions. And this risk was independent of the patients' demographic, medical, functional, and social support status (Table 23 & Table 24).

Table 23: Bivariate Correlates of Total Medical Events

Category	Code	Hazard Ratio	95% Confidence Interval		P-value	
Demographics	Gender: Female vs. Male	0.781	0.740	0.824	0.000	
	Race: White	1.261	1.178	1.350	0.000	
	Race: Black	0.877	0.804	0.955	0.003	
	Race: Hispanic	0.719	0.642	0.806	0.000	
	Living condition: Alone at home	0.857	0.806	0.912	0.000	
	Living condition: With others at home	1.176	1.112	1.244	0.000	
	Payment source: Medicaid	0.810	0.704	0.931	0.003	
	Payment source: Private insurance	1.228	1.083	1.392	0.001	
Medical and Health Status	Admission source: Acute short-stay hospitals	1.457	1.381	1.536	0.000	
	Admission source: Long-term care facilities	1.420	1.186	1.702	0.000	
	Admission source: Long-term care hospitals	1.314	1.066	1.621	0.010	
	Admission source: Skilled nursing facilities	1.094	1.019	1.175	0.013	
	Recent decline in emotional, mental, or behavioral status	1.330	1.244	1.422	0.000	
	Frailty indicators	1.445	1.367	1.527	0.000	
	History of falls	1.083	1.022	1.146	0.006	
	Multiple hospitalizations (two or more) in the past year	1.814	1.716	1.917	0.000	
	Taking more than 5 medications	1.359	1.262	1.464	0.000	
	Smoking	0.301	1.200	1.409	0.000	
	Myocardial infarction	1.571	1.340	1.842	0.000	
	Congestive heart failure	1.511	1.419	1.609	0.000	
	COPD	1.354	1.271	1.443	0.000	
	Liver disease	1.744	1.251	2.432	0.001	
	Severe liver disease	3.047	2.040	4.550	0.000	
	Diabetes	1.133	1.068	1.201	0.000	
	Renal disease	1.473	1.348	1.610	0.000	
	Cancer	1.754	1.625	1.892	0.000	
	Severity of medical condition	1.018	1.005	1.032	0.006	
	Prognosis of medical condition	1.457	1.410	1.506	0.000	
	Charlson comorbidity Index	1.223	1.202	1.246	0.000	
		Anxiety	1.210	1.134	1.291	0.000

MHDs and psychiatric services	Depression	1.223	1.157	1.294	0.000
	Psychotic disorders	1.401	1.132	1.734	0.002
	Substance abuse	1.296	1.123	1.495	0.000
	Aggression	1.258	1.094	1.446	0.001
	Use of depression interventions	2.062	1.940	2.191	0.000
Functional status & Social Support	Sensory impairments	1.040	1.027	1.054	0.000
	Cognitive dysfunction	1.060	1.041	1.079	0.000
	Functional limitations	1.027	1.023	1.031	0.000
	Need of caregiver assistance from social network	1.136	1.116	1.158	0.000

Table 24: Identified Risk Factors for Total Hospitalizations, Emergent Care Events, and Nursing Home Admissions

Identified Risk Factors for All Medical Events	Hazard Ratio	95% Confidence Interval		P-value
Gender (Female vs. Male)	0.849	0.804	0.896	0.000
Race: White	1.162	1.084	1.245	0.000
Payment source: Private insurance	1.143	1.008	1.296	0.038
Admission source: Acute short-stay hospitals	1.336	1.261	1.416	0.000
Admission source: Long-term care facilities	1.404	1.169	1.687	0.000
Admission source: Skilled nursing facilities	1.106	1.025	1.194	0.009
Multiple hospitalizations (two or more) in the past year	1.403	1.323	1.488	0.000
Smoking	1.151	1.061	1.248	0.001
Charlson comorbidity Index	1.104	1.079	1.131	0.000
Myocardial infarction	1.203	1.023	1.414	0.026
Congestive heart failure	1.208	1.126	1.297	0.000
Cancer	1.346	1.229	1.473	0.000
<i>Use of depression interventions</i>	1.952	1.835	2.075	0.000
Functional limitations	1.169	1.122	1.219	0.000
Need for caregiver assistance from social network	1.056	1.034	1.078	0.000

As shown in Table 24, the risk for total hospitalizations, emergent care events, and nursing home admissions in the population of older home care patients was higher for those who were male, white, using private insurance, referred from acute short-stay, long-term care, or skilled nursing facilities. This risk was also higher for patients who smoked, had recent multiple hospitalizations, more medical comorbidities (particularly cancer and congestive heart failure), functional limitations, a need for additional caregiver assistance from their social network, or using depression interventions. In particular, the use of depression interventions was the

strongest risk factor for these medical events, even stronger than those related to the patient’s medical condition and previous history of multi-hospitalizations. Specifically, at any given day during the 60-day home care episode, the risk for all-cause hospitalizations, emergent care events, and nursing home admissions in home care elders receiving depression interventions was respectively 95.9% higher than those who were not receiving these interventions.

Finding 5: Gaps in the Allocation of Psychiatric Services

The OASIS dataset provided information on two types of psychiatric services, i.e., depression interventions and qualified psychiatric nursing services. In total, 317 (1.11%) of these home care elders received qualified psychiatric nursing services, and 4,459 (15.65%) patients received depression interventions. An in-depth examination about the recipients revealed that the provision of these psychiatric services was substantially inconsistent in this population, as indicated by the large gaps between the demand for, and supply of these services (Table 25).

Table 25: Gaps in Psychiatric Resource Allocation

Psychiatric services	Total	MHDs	non-MHDs	depressed	non-depressed	With prescription	Without prescription
Psychiatric nursing services	317	268 (85.54%)	49 (15.46%)				
Depression intervention prescription	6,359			3,092 (48.62%)	3,267 (51.37%)		
Depression intervention implementation	4,459	3,304 (74.09%)	1155 (25.90%)	3,030 (67.95%)	1,429 (32.04%)	2,806 (62.92%)	1,653 (37.07%)

The first gap was the one between the presented symptoms of MHDs and the documented diagnoses of these disorders. As these data show, a large number of older home care patients presented with MHD symptoms (n=10,802), whereas very few of them were diagnosed as such in their medical records (n=4,039, 14.18%).

Second, there was an incongruity in the demand for, and the supply, of psychiatric services in this population. On the one hand, not all patients who presented with MHD symptoms or were prescribed psychiatric services actually received these services. In total, 268 (2.48%) out of all patients with MHDs (n=10,802) received psychiatric nursing services; within the subgroup of 7,984 depressed patients, 3,030 (37.95%) of them received depression interventions. In addition, out of all patients who were prescribed depression interventions (n=6,359), a major type of psychiatric services for these patients, less than half (n=2,806, 44.12%) of these prescriptions were carried out by the end of the 60-day home care episode.

Secondly, not all recipients of mental health services had a documented justification for these services, i.e., the presence of MHD symptoms, a written diagnosis of MHDs, or a prior prescription of mental health services. Among the 317 recipients of psychiatric nursing services, 268 (84.54%) of them had MHD symptoms. Of all patients who were prescribed depression interventions (n=6,359), less than half of them (n=3,092, 48.62%) met depression criteria on the PHQ-2 assessment. It is significant that a larger group of these patients (n=3,267, 51.38%) did not present with any depressive symptoms. Within the group of recipients of depression interventions (n= 4,459), 46.47% (n=2,072) of them had depressive symptoms, and 62.92% (n=2,806) of these recipients had a prior prescription of such interventions. In total, 74.22% of these psychiatric services were provided with a clear demand, and 31.83% of the patients with MHDs received appropriate mental health services. In contrast, the majority of the patients with documented MHDs did not receive psychiatric services, and almost one third of the psychiatric resources were allocated in an inconsistent manner, i.e., to those without documentation of MHDs. The inadequate supply of mental health services, combined with the inconsistent

provision of these services, contributed to the under-treatment and lack of clear understanding of MHDs and their associated service demands in this population.

Ad Hoc Analysis Results

In addition to the planned analyses, ad hoc analyses were also conducted to further examine the characteristics of patients receiving depression interventions (Table 26) and to compare the rates of subsequent medical events across groups, i.e., MHD versus non-MHDs (Table 27).

Table 26: Characteristics of depression intervention recipients

Variables	Odds Ratio	95% Confidence Interval		P-value
Patient age	0.991	0.987	0.995	0.000
Gender (Female vs. Male)	1.183	1.106	1.266	0.000
Race: White	1.399	1.284	1.524	0.000
Race: Black	0.637	0.565	0.717	0.000
Race: Hispanic	0.864	0.759	0.984	0.027
Living condition: With others at home	0.825	0.772	0.881	0.000
Living condition: Assisted living facilities	1.442	1.302	1.596	0.000
Severity of medical condition	1.023	1.006	1.040	0.007
Prognosis of medical condition	1.342	1.288	1.398	0.000
Dementia diagnosis	1.424	1.205	1.685	0.000
Cancer diagnosis	1.168	1.043	1.309	0.007
Admission source: Acute short-stay hospitals	0.908	0.851	0.968	0.003
Admission source: Psychiatric hospitals	2.758	1.702	4.469	0.000
Admission source: Skilled nursing facilities	1.247	1.147	1.356	0.000
Recent decline in emotional, mental, or behavioral status	2.127	1.968	2.300	0.000
Frailty indicators	1.499	1.400	1.606	0.000
History of fall	1.381	1.290	1.479	0.000
Multiple hospitalizations (two or more) in the past year	1.433	1.335	1.539	0.000
Taking more than 5 medications	1.411	1.293	1.540	0.000
Smoking	1.156	1.062	1.257	0.001
Recent decline in general emotional and behavioral status	1.302	1.179	1.438	0.000
Anxiety	2.416	2.246	2.600	0.000
Psychotic disorders	2.332	1.823	2.984	0.000

Aggression	1.754	1.498	2.054	0.000
Substance abuse	1.518	1.280	1.800	0.000
Socially inappropriate behaviors	2.237	1.617	3.095	0.000
Receipt of psychiatric nursing services	4.540	3.630	5.677	0.000
Sensory impairments	1.077	1.060	1.094	0.000
Cognitive dysfunction	1.162	1.138	1.187	0.000
Functional limitations	1.017	1.012	1.022	0.000
Need of caregiver assistance from social network	1.111	1.087	1.135	0.000
Provision of caregiver assistance from social network	0.923	0.882	0.967	0.001

Table 27: Medical Events Comparison

	Reference Group (General)	Depression intervention=0	Depression intervention=1
Hospitalizations	16.95%	14.97%	27.63%
Emergent care events	12.72%	11.16%	21.08%
Nursing home admissions	0.52%	0.45%	0.92%

CHAPTER V: DISCUSSION

To our knowledge, this is the first investigation on the national prevalence and correlates of MHDs in American home care elders. This is also the first study on the national level to examine the relationship among MHDs, psychiatric services, and the total occurrence of common medical events in this population. Results in this study have shown that the national prevalence of MHDs was alarmingly high in older American home care patients, with 37.94% of this population evidencing these disorders in the year 2010. Correlates of MHDs were also identified, providing a backdrop for targeted screening and management of these disorders. During the 60-day home care episode, 16.95% of these home care elders were hospitalized, and 12.72% of these patients had emergent care events.

Although only 2.34% of these hospitalizations and emergent care events were directly caused by MHDs, it is perhaps more significant that the presence of these disorders and the use of related psychiatric services were associated with increased risk for the total occurrence of common medical events, irrespective of direct cause. Moreover, this predictive relationship was independent of the patients' demographics and differences in their medical, physical, functional, and social status. These results raise the concern that as important as psychiatric services appear to be in this population of older home care patients, such services were lacking or inconsistently provided. This chapter discusses findings in the current study as compared with those in the literature, explores reasons for the discrepancies, and provides implications for clinical practice as well as directions for future research.

Finding Category 1: National prevalence of MHDs in the U.S. elderly home care population

This dissertation study revealed a high national prevalence of MHDs in this population with more than one third of older home care recipients evidencing MHDs (37.94%). Notably,

this national prevalence number is close to the rates reported in previous studies, utilizing predominantly local data (38.6% to 40.5%) (Diefenbach et al., 2009; Li & Yeates, 2007; Miller & Rosenheck, 2007). In addition, the examination in this study went beyond the most commonly identified MHDs, such as anxiety and depression, to a larger group of symptoms and disorders that were not well noted before. These included psychotic disorders, substance abuse, aggression, and disruptive, infantile or socially inappropriate behaviors. Furthermore, these MHD symptoms were also highly comorbid and strongly inter-related in this population, which highlights the importance of viewing MHDs as an inclusive group of disorders, instead of a composition of mutually exclusive symptoms.

In agreement with earlier evidence, this study has shown that depression and anxiety were the most common MHDs in this population. However, a discrepancy with the previous literature exists with respect to specific rates of these disorders. The prevalence of depression in the current study was 28.12%, an approximate average of all rates reported in previous studies (10% - 42%) (Brown et al., 2003; Brown et al., 2004; Brown et al., 2006; Bruce et al., 2002; Byers et al., 2008; Choi & McDougall, 2007; Dalton & Busch, 1995; Diefenbach et al., 2009; Ell et al., 2006; Fyffe et al., 2008; Gellis, 2010; Iglesias, 1998; Li & Conwell, 2007; Li & Conwell, 2009; McAvay et al., 2004; McAvay et al., 2005; Milstein et al., 2003; Raue et al., 2003; Raue et al., 2011; Sheeran et al., 2010). However, the prevalence of anxiety as identified here, 17.41%, was at the lower level in the range of anxiety prevalence reported in prior literature (11.6% - 36%) (Diefenbach et al., 2009; Ell et al., 2006; Iglesias, 1998; Li & Conwell, 2007).

Most cases of anxiety in the elderly population are subclinical and difficult to screen for (Ayalon, 2010; Jayasinghe et al., 2013; Prévaille et al., 2004; Zeltzer & Kohn, 2006), therefore one possible reason for the discrepancy in findings may be related to measurement issues. In the

OASIS dataset, depression was measured using a standardized screening tool (PHQ-2), while anxiety was measured using a non-standardized scale that has not been validated in the older home care population. According to this scale, patients were rated based on a simple frequency of felt anxiety, including “*at all times*”, “*more than daily*”, and “*less than daily*”. This lack of a well normed, standardized anxiety measurement in OASIS not only presents problems regarding general validity of such a limited assessment but also with specific issues of sensitivity and specificity.

Of note, the lack of standardized anxiety assessment is not unique to this study. Very few studies in the literature have employed professional instruments to screen for anxiety in home care elders. In the U.S., only two studies have examined the status of anxiety among home care elders using standardized instruments (Diefenbach et al., 2009; Jayasinghe et al., 2013), whereas most of the earlier studies used a similar approach to that of the current study (Ell et al., 2006; Iglesias, 1998; Li & Conwell, 2007; Martens et al., 2007; Miller & Rosenheck, 2007; Robison et al., 2012; Zeltzer & Kohn, 2006). This highlights the need for standardized psychiatric assessment in the home care setting (Diefenbach et al., 2009), presenting a unique opportunity for improvement of MHD screening (Lewin et al., 2006). However, this would require additional psychiatric training for home care staff, which, unfortunately has been, and is still lacking in U.S. home care agencies.

Another reason for this discrepancy may be related to the severity assessment of identified MHD symptoms. Most cases of MHDs identified in this study were characterized by mild or moderate symptoms, however, information regarding level of severity was largely lacking in prior literature. Of the 44 studies reviewed previously, the severity of identified MHDs was measured in only one third of these studies (14/44, 31.81%). Only two of the 14 studies

assessed severity using additional dedicated measurements (Milstein et al., 2003; Raue et al., 2007), while the remainder addressed severity in various ways as embedded in general outcome measurements (Banerjee, 1993; Banerjee & Macdonald, 1996; Brown et al., 2003; Dalton & Busch, 1995; Ell et al., 2006; Gellis, 2010; Jayasinghe et al., 2013; Li & Conwell, 2009; McAvay et al., 2004; McAvay et al., 2005; Raue et al., 2011; Sheeran et al., 2010). Due to the variability in outcome measurement across these studies, the reports of severity were highly varied. This included varied designations such as subcases vs. cases, major depression vs. minor depression, and probable versus sub-threshold psychiatric symptoms. Therefore, it is difficult to directly compare the prevalence found in the current study with that found in the extent literature.

Nevertheless, these results highlight the significance of MHDs as a major health concern in the growing elderly home care population. Due to the chronic nature of MHDs, the addition of new MHDs every year in this increasing population (Martens et al., 2007; Raue et al., 2003), and homebound status as a risk factor for worsening MHDs (Choi & McDougall, 2007), the actual current magnitude of MHDs in this population is very likely higher than what was identified in this 2010 dataset (Brown et al., 2004).

Since the 1990's there has been evidence regarding the under-detection and under-treatment of MHDs among home care elders (Bruce et al., 2002; Dalton & Busch, 1995). Unfortunately, however, the status quo for management for these disorders is still far from adequate in this population. Despite the high and ever growing rates of MHDs, only a small percentage of these disorders have been documented as such in the patients' medical records. Further, although the nature of home care is patient-centered and holistic, thus providing a unique opportunity for better mental health screening in home care settings (Lewin et al., 2006), such opportunity remains unrealized in large part. To some degree, this is very likely related to

the lack of specialized psychiatric training and usage patterns of OASIS among home care staff (Brown et al., 2004). This is discussed in further detail later in this section.

Finding Category 2: Correlates of MHDs in U.S. Home Care Elders

In the population of older home care patients, a number of factors were correlated with MHDs, including variables such as patient age, gender, race, financial status, medical and functional status, health risks, sensory and cognitive function, social support status, and the use of psychiatric services.

In agreement with findings from earlier studies, rates of MHDs were higher in patients who were younger, female (Szczerbinska et al., 2012), white (Li & Conwell, 2007; Maranzan & Stones, 2013), living alone at home (Brown et al., 2004; Choi & McDougall, 2007), cognitively impaired (Brown et al., 2003; Li & Conwell, 2007; Li & Conwell, 2009; McAvay et al., 2005), sensory impaired (Szczerbinska et al., 2012), having a history of falls (Byers et al., 2008; Jayasinghe et al., 2013; Sheeran et al., 2004; Robison et al., 2012) and recent multiple hospitalizations (Sheeran et al., 2010), or receiving a low level of social support (Choi & McDougall, 2007; Gellis, 2010; Raue et al., 2007). In particular, patients with less social contact or poorer social support status were more likely to have MHDs, while those with adequate social support available to them were less likely to evidence these disorders (Choi & McDougall, 2007; Gellis, 2010; Raue et al., 2007). This is an important finding, as social support is often modifiable through targeted social interventions, and may be amenable to modification in this population as a strategy to address MHDs.

In contrast, some results from this investigation were not concordant with the prior literature or investigator expectations. Specifically, it was hypothesized that the presence of MHDs in home care elders would be differentially associated with the patient's demographics,

such as age, gender, race/ethnicity, and geographical location (hypothesis 2.1). It was also expected that the presence of these disorders in home care elders would be positively associated with the severity of their medical status, health risks, sensory impairments, functional limitations, lower level of social support, inadequate recognition of the need for mental health services, poorer living conditions and financial status (hypothesis 2.2). However, many of these variables were not related to MHDs as expected, such as medical comorbidity, functional limitations, and financial status (Banerjee & Macdonald, 1996; Brown et al., 2004; Bruce et al., 2002; Brown et al., 2003; Choi & McDougall, 2007; Gellis, 2010; Lewin et al., 2006; Li & Conwell, 2007; Maranzan & Stones, 2013; Szczerbinska et al., 2012). To some degree, this may be due to the relative lack of variance in these variables, i.e., a great majority of these patients were Medicare beneficiaries (98.94%), most of them had functional limitations, and the Charlson comorbidity index showed a constricted range from 0 to 2 (Figure 5).

There are diverse findings in the existing literature with respect to the relationship between age and MHDs (Li & Conwell, 2007; Martens et al., 2007; Maranzan & Stones, 2013; Szczerbinska et al., 2012). The present study is the first attempt, at the national level, to systematically test the purported positive relationship between these two variables. Specifically, data have shown that even within the elderly population, the rates of MHDs were still lower in the older patients, especially the oldest old, than those in the general population of home care elders.

The reason for this is still unknown; however, it may be related to a few issues. For example, the social expectations about life in advanced age may be related to this phenomenon. For the relatively young members in the elderly population, being homebound and receiving home care services may be perceived as a negative sign of deteriorating health status and earlier-

than-expected age-related role impairments (Kessler et al., 2010), which may increase their vulnerability for MHDs. However, for the oldest old, the fact that they remain at home despite their advancing age and clinical comorbidities may have a positive effect on their psychological wellbeing and lessen the likelihood of MHDs (Szczerbinska et al., 2012). Another possible contributor to this finding is related to *survivor bias*. That is, the fact that the oldest old patients were able to survive to an advanced age may be, to some degree, related to their positive psychological traits, such as better subjective self-perception, optimism and resilience. Importantly, these psychological traits may as well be characteristics of better mental status, and thus lowering these oldest old survivors' risk for MHDs (Botwinick, 1973; Diener & Chan, 2011; Palmore, 1969).

It is also noted in the general oncology literature that cancer is a risk factor for mental disorders and also related to a higher need for psychiatric services (Hewitt & Rowland, 2002; Konig et al., 2014; Lee et al., 2010; Sherif et al., 2001; Song et al., 2013). However, with an exception for the bivariate association between cancer and psychotic disorders, these associations were not significant in our analysis. This may be due to a number of reasons outlined below.

First, diagnoses documented in OASIS are directly related to the services rendered by the home care agency, especially the most acute conditions and those requiring the most intensive services, which may or may not include all the diagnoses of these patients. Given that home care elders usually have multiple medical conditions, as data in this study have shown, cancer may not be as significant as some of the other comorbidities, including acute conditions that require home care services. In fact, when patients get older with a number of serious or acute medical conditions, cancer may not be the most emergent problem. As a result, the diagnoses of cancer may not be well documented in OASIS, as may be reflected in the lower rates of cancer

diagnoses (9.33%) in this sample compared with those in the general elderly population that range from 9.43% to 17.89% (National Cancer Institute, 2015).

Another possible reason may be related to the mediational effects of age and coping style as previous research shows that younger cancer patients have higher levels of psychological distress and poorer mental health status compared with those who are older. This is especially true for long-term cancer survivors, as seen in this study (Cassileth et al., 1986; Deimling, Bowman, Sterns, Wagner, & Kahana, 2006; Keating, Nørredam, Landrum, Huskamp, & Meara, 2005). Specifically, oncological patients who cope by using positive strategies, such as acceptance and positive reframing, tend to evidence lower levels of psychological distress, higher levels of motivation, and better general mental status; whereas those who display negative coping strategies, such as denial and behavioral disengagement, are subject to increased psychological distress and poorer general mental status (Carver et al., 1993; Dunkel-Schetter, Feinstein, Taylor, & Falke, 1992). Given that certain types of patients' psychological experiences and coping strategies may be quite varied with respect to cancer and that current cancer patients and cancer survivors or those who were in remission were not differentiated in OASIS, this may well have impacted the findings. Since all the patients in this current study were older than 65 years, and their particular coping strategies were not assessed, these mediational effects could not be tested. Future research on the relationships among cancer, coping approach and mental health status in the population of older home care patients is necessary in this regard.

In addition to these discrepancies, this study also uncovered new relationships that were not noted in the literature. For example, it was found in this study that patients who smoked, were obese, or had sensory impairments tended to have higher rates of MHDs, whereas no prior studies in the literature have reported these relationships. This is an important finding as a large

number of these home care elders were indeed smoking (10.08%), obese (16.19%), and also suffering from a number of sensory impairments (24.45%-39%), and thus subject to an elevated level of risk for MHDs.

Potential confounders for identified correlates

Despite the rich knowledge generated in this study, caution is in order regarding the interpretation of identified MHD correlate findings, due to potential confounders. One such confounder concerns the effectiveness of the mental health screening process in the home care setting, and the other is related to the relatively low severity of identified MHDs in this population.

Of note, some correlates were not only related to the risk for MHDs, but also the effectiveness of mental health screening for these disorders. In addition to the current findings, other studies have determined that living condition, gender (female vs. male), cognitive function, and functional limitations are included in this category (Brown et al, 2003; Szczerbinska et al., 2012). For example, evidence shows that home care elders living alone report higher rates of MHDs than those living with others. Variability in the mental health screening process has also been demonstrated, in that the process was more effective for patients who lived with others than those living alone, suggesting that home care nurses might have used informants (when available) to inform their detection of MHDs, or that perhaps there is an inappropriate assumption among home care nurses that the depressive symptoms evidenced in elders living alone is a normal reaction to isolation and loneliness instead of depression (Brown et al., 2003; McAvay et al., 2004). It is therefore reasonable to suspect that the variance in the rates of MHDs across patients in different living conditions might not be merely or solely due to the varied levels of risk inherent in these conditions, but associated with the effectiveness of the screening process. In

other words, it is possible that patients in different living conditions actually had equivalent rates of MHDs but in some groups, these disorders were not detected as effectively as in other groups, leading to different prevalence findings. In order to further establish the validity of the MHD correlates evidenced in this study, future research needs to examine the procedures, protocols, and consistency of the mental health screening process in OASIS and any resulting variability in outcomes related to these programmatic variables. This type of variability might then be addressed by the development of an electronic algorithm to identify high-risk patients for MHDs in the home care settings.

Another possible confounder for these relationships is the lack of variability in the severity of MHD symptoms reported in this study. Specifically, most cases of MHDs reported in this study, particularly depression and anxiety, were mild or moderate. In contrast, most of the earlier studies (29 out of 44) in the literature do not specify the severity of identified MHDs (Ayalon et al., 2010; Banerjee et al., 1993; Banerjee et al., 1996; Brown et al., 2004; Brown et al., 2006; Brown et al., 2007; Bruce et al., 2002; Byers et al., 2008; Iglesias, 1998; Onder et al., 2005; Li & Conwell, 2007; McAvay et al., 2005; Miller & Rosenheck, 2007; Marc et al., 2008; Maranzan & Stones, 2013; Nagatomo & Takigawa, 1998; Kivelä et al., 1986; Raue et al., 2003; Robison et al., 2012; Sheeran et al., 2004; Szczerbinska et al., 2012; Qiu et al., 2010; Zeltzer & Kohn, 2006). Further, even within the few studies that assessed the severity of MHDs (n=14, 31.81%), such information was reported in diverse ways. Of these studies, the severity of MHDs was primarily assessed as part of the outcome measurement, a measure which was highly varied across these studies. As a result, the information on severity, not surprisingly, was also largely inconsistent and ranged anywhere from a continuous score to a wide array of categorical levels, such as major vs. minor, probable vs. sub-threshold, and cases vs. subcases. Without systematic

information on severity, it cannot be determined if the observed associations between MHDs and identified correlates were mediated by the severity of MHDs as supported by data from other investigations. It is also unknown if some of the identified correlates have a differential threshold of symptom severity at which they exert an effect, as found in some of the earlier studies (Raue et al., 2007). Given this lack of systematic examination, it is not unreasonable to assume that the lack of variability in severity of MHD symptoms found in this study impacted the association between correlates and MHDs, contributing to the discrepancies between the correlates identified in this study and those reported in the literature.

Finding Category 3: Risk Factors for MHD-caused Medical Events in U.S. Home Care Elders

In order to further examine the variables associated with MHDs, the investigator also identified risk factors for MHD-caused medical events, including hospitalizations and emergent care events. Identified risk factors for these MHD-caused events were related to the patient's financial/insurance status (Medicare/Medicaid/self-pay versus private insurance), medical condition (admitted from psychiatric or long-term care hospitals), cognitive function, social support status; and not surprisingly, the presence of MHDs and the use of psychiatric services.

According to these results, earlier hypotheses for these risk factors were not fully supported. Specifically, in hypothesis 3.1, it was expected that “the presence of MHDs, the patient's age, gender, race/ethnicity, geographical location, the severity of medical status, severity of health risks, sensory impairment, severity of functional limitations, lower levels of social support status, recognition of the need for mental health services, living conditions, and financial status will differentially predict MHD-caused hospitalizations and MHD-caused emergent care events in this population.” However, with the exception of depression intervention

use and demand for social support conferring higher risk for MHD-caused events, very few of these proposed associations were found. Additionally, in hypothesis 3.2, it was proposed that “the number of MHD diagnoses, MHD-caused hospitalizations and MHD-caused emergent care events will be higher in home care patients who are diagnosed with cancer when compared with those who do not have a cancer diagnosis”. However, the results show that having a diagnosis of cancer was not related to any of these MHD-caused medical events.

In addition, only a few variables were related to both MHD symptoms and MHD-caused medical events. These common correlates include psychiatric admission source, change in general emotional and behavioral status, cognitive function and social support status. Compared with the correlates of MHD symptoms, risk factors for MHD-caused medical events were primarily related to the patients’ financial wellbeing, overall health status, and the status of service use. In particular, the psychiatric admission source and the use of depression interventions were the strongest risk factors for these medical events, even after adjusting for the patients’ demographics, medical condition, and other differences. These discrepancies might be attributed to a number of reasons as outlined below.

First, regarding the relatively low severity of MHDs identified in this population, it is possible that only the most severe MHD symptoms directly lead to subsequent medical events such as hospitalizations and emergent care events. In contrast, most of the mild or moderate MHD symptoms may have been less likely to do so. If this hypothesis is correct, the impact of MHDs on older American home care patients, as measured by the rates of MHD-caused hospitalizations and MHD-caused emergent care events, might have been underestimated in the current study due to the constricted range of MHD symptom severity.

Another possible explanation for this discrepancy in risk related variables is related to the difference the measurement time points for MHD symptoms and for MHD-caused medical events. In the OASIS data set, MHD symptoms were measured primarily at admission, whereas medical events, whether caused by MHDs or not, were measured at discharge. Of note, the time of discharge could be as much as 60 days later than the time of admission. Since it is unknown if there was varied fidelity to the screening protocol across different time points due to differences in home care personnel and procedures, it is unclear if this temporal difference in measurement contributed to the discrepancy in the risk factors profile for MHDs.

Lastly, limitations in organizational structure and resources in hospitals may also be related to this discrepancy. According to the literature on hospitalizations, there are insufficient beds allocated for psychiatric admissions, and the inpatient resources assigned for mental health are also largely inadequate (Foley et al., 2004; Saxena, Thornicroft, Knapp, & Whiteford, 2007; Sharfstein & Dickerson, 2009). Given that most of the older patients in home care settings had physical, medical, and functional comorbidities, it is reasonable to suspect that their admission diagnoses for hospitalizations and emergency care events were more likely related to their medical or physical disorders rather than psychiatric disorders. As a result, the impact of MHDs on patient outcome, as measured by the rates of MHD-caused medical events, may have been underestimated. With these concerns in mind, the investigator also examined the relationship between MHDs and the total occurrence of common medical events, including hospitalizations, emergent care events, and nursing home admissions, as a way to gather a complete understanding of the impact of these disorders. These interesting results point to a large effect of MHDs on most of these subsequent medical events, and are fully discussed later in this chapter.

Despite discrepancies in some findings between this dissertation study and the empirical literature, this early knowledge on possible MHD correlates and risk factors can provide a springboard for further study that can lead to improved clinical screening for MHDs in the elderly, particularly in the context of home care nursing. Knowledge in this regard could also inform future improvement in the management of MHDs in the U.S. home care setting. Specifically, information about these variables, especially the modifiable ones, can be used to develop targeted interventions that aim to alleviate the symptoms of MHDs and to reduce the impact associated with these disorders. For example, given that better social support status was a protective factor against both MHDs and MHD-caused medical events, attention might be paid to social support enhancement for home care elders, especially for those who exhibit such need. Such interventions may have potential for reducing rates of MHDs, as well as the impact of these disorders on medical events.

Finding Category 4: Discrepancies in the Psychiatric Service Allocation for U.S. Home Care Elders

In OASIS, there were two types of psychiatric services, i.e., psychiatric nursing services and depression interventions, of which the prescription information was only available for depression interventions. However, a number of discrepancies were revealed in the process of psychiatric service allocation for older U.S. home care patients, including 1) the discrepancy between the symptoms and documented diagnoses of MHDs in U.S. home care elders, and 2) the discrepancy between the demand for and supply of psychiatric resource in this population.

Prevalent MHDs Symptoms vs. Few Documented Diagnoses

As in the prior literature, this study again raised the concern over the paucity of accurate mental health diagnoses in the home care setting (Dalton & Busch, 1995; Bruce et al., 2002). Notably, a large number of U.S. home care elders had MHDs (37.94%), which were reflected in a number of symptom clusters related to depression, anxiety, general psychiatric disorders, and substance abuse. However, very few of these disorders were diagnosed as such in the patients' medical records, which might have created a barrier to effective management of MHDs in this population. Specifically, of all patients with MHDs, only 37.93% of these patients had a documented diagnosis of these disorders in their medical records.

Furthermore, this lack of documentation of MHDs is not a singular problem, but embedded in the widespread phenomenon of incomplete admission information received by home care agencies. Of concern, this problem has long been noted in the literature but very few improvements have been made in practice (Bruce et al., 2002; Brown et al., 2006). Incomplete documentation of MHDs points to the need for thorough and accurate mental health screening in U.S. home care settings, as it relates to the under-detection and under-treatment of these disorders (Dalton & Busch, 1995; Dalby et al., 2008; Gellis, 2010; Kivelä et al., 1986). However, given that a large number of home care providers and workers are lacking psychiatric training, using professional psychological screening and diagnostic instruments might not be feasible at the present time. One promising alternative is to improve the accuracy and quality of the OASIS data set, as it has already been implemented in all Medicare-certified home care agencies in the U.S. This is especially desirable, given that a large number of mental health-related items in the OASIS data set have shown high correlations with the presence of MHDs. These items could be used as indicators to facilitate the mental health screening process in U.S. home care settings,

places where the psychiatric workforce is already scarce (Brown et al., 2004; Dalby et al., 2008; Li & Conwell, 2009).

Substantial Demand vs. Inadequate Supply of Psychiatric Resource

Beyond the lack of accurate documentation, another incongruity in the psychiatric resource allocation for the older home care patients is related to the substantial demand for psychiatric services in the face of an inadequate supply of these services. This may be due to 1) the gap between the need for psychiatric services and the prescription of these services, and/or 2) the mismatch between the prescription and actual implementation of these services.

To begin with, not all home care elders with a recognizable need for psychiatric services were offered these services. In contrast to the high prevalence of MHDs in this population, the provision of appropriate psychiatric services was very limited. In total, 317 (1.11%) patients received psychiatric nursing services, and 4,459 (15.65%) received depression interventions during their 60-day home care stay. Only 268 out of the 10,802 patients with MHDs received psychiatric nursing services, and only 3,030 out of the 7,984 depressed patients received depression interventions. Based on the low receipt rates of appropriate psychiatric services (2.48% and 37.95%), it is evident that MHDs were largely under-treated in these home care elders. Unfortunately, this finding is in keeping with previous results in the extant literature, which revealed that of all elderly home care patients with MHDs, only 9% to 17% of them received appropriate psychiatric services (Banerjee, 1996; Ell, 2006). Most (64.5%) of the depressed patients in this population were either not treated at all, or received inappropriate medications (Dalby et al., 2008). These data support the fact that treatment and service provision for MHDs in this frail population is far from adequate.

In addition to the limited supply of psychiatric services in this population, another problem, perhaps more interesting, was that this limited supply may not have been provided in an accurate and targeted fashion. There were two major problems found in this supply-demand chain, including 1) incongruity between MHD symptoms and the prescription of psychiatric services, and 2) incongruity between the prescription and actual implementation of these services. Specifically, 6,359 elderly home care patients in the sample were prescribed depression interventions. However, only 3,092 (48.62%) of these patients were depressed, as indicated by the diagnosis of depression or the presence of depressive symptoms, whereas a larger proportion of these patients were not (n=3,267, 51.37%). Moreover, among the total of 4,459 patients who received depression interventions, only two thirds (62.93%) of them had a prior prescription of these interventions in their plan of care, while the other patients received depression interventions in absence of a prescription.

It is surprising that very few of the MHD identified home care elders received psychiatric nursing services and depression interventions. It is also surprising that not all patients prescribed with depression interventions actually received these services during their home care stay. So far, it is unclear what caused these discrepancies, although they may be attributable to the incomplete medical record received by home care agencies, and the on-site undocumented judgments made by home care staff (Bruce et al., 2002; Brown et al., 2004; Prévillie et al., 2004). Further investigations are necessary to untangle this in order to improve the management of MHDs in older home care patients.

Finding Category 5: MHDs as Risk Factors for All-cause Subsequent Medical Events

Are MHDs a significant health concern for U.S. home care elders? Some may argue that since most MHDs in this population were presented mild or moderate symptoms, and that only a

small percentage of subsequent hospitalizations and emergent care events were directly caused by these disorders, MHDs might not be as significant a problem as their prevalence indicates (37.94%).

However, an in-depth examination revealed that the presence of MHDs and the use of psychiatric services were, in fact, significant risk factors for a large range of medical events, including hospitalizations, emergent care events, and nursing home admissions, irrespective of the direct causes. And this risk was independent of the patient's demographic, medical, functional and social support factors. For any day during the 60-day home care episode, the risk for total occurrence of hospitalizations, emergent care events, and nursing home admissions was 95.9% higher for patients receiving depression interventions than those who were not receiving these interventions, even after adjusting for the patients' demographics, and medical, functional, as well as social support factors.

This finding echoed earlier evidence in that depression was associated with an increased risk for adverse events in older home care patients, such as short-term hospitalizations (two weeks post home care admission), nursing home admissions, and adverse falls (Byers et al., 2008; Onder et al., 2007; Sheeran, et al., 2004 & 2010; Robison et al., 2012). In addition, the relationship observed in this study further validated the risk-increasing effect of depression on another type of medical event, i.e., emergent care events. Furthermore, these associations were verified with longitudinal data collected in an extended period of time, i.e. 60 days after home care admission versus two weeks post home care admission, and thus expanded our knowledge base in this regard.

The higher risk for medical events observed in patients receiving depression interventions may be attributable to a number of reasons. The first is associated with the close correlation

between psychological status and somatic symptoms, in that physical health concerns may be probably amplified in depressed patients, as associated with health deterioration and medical events (Katon, 1996). This is supported by the associations found in this study between depression and a number of indicators for poor health, including medical comorbidities, obesity, sensory impairments, cognitive dysfunction, functional limitations, frailty, a history of falls, and a recent history of multiple hospitalizations.

The second reason for this increased risk is related to the poorer quality of life among these depressed patients. Research has shown that depressive symptoms including diminished interest, energy level, and physical activity may lead to non-compliance with medical treatment (Blazer, 2003; DiMatteo et al., 2000), resulting in poorer patient outcomes and higher risk for subsequent medical events. This proposition was supported in the exploratory analysis of depression intervention cases which showed that rates of smoking, substance abuse, obesity and subsequent medical events were higher in depression intervention recipients than in other patient groups (Tables 27 & 28).

Another potential reason for this phenomenon may be related to the mediating effects of cognitive impairment on mental health service use. As research has shown, the use of mental health services in home care settings, including psychopharmacological interventions such as antipsychotic medications, occurs for MHDs as well as cognitive impairments. This suggests that the use of mental health treatments in some home care patients may be for neuropsychiatric symptoms of cognitive impairment such as in dementia (Byers et al., 2008). In addition, research has also shown a strong association between cognitive impairment and poorer patient outcomes, including deteriorating physical ability and increasing loss of independence (Barry, Allore, Bruce, & Gill, 2009; Li & Conwell, 2009; McConnell, Pieper, Sloane, & Branch, 2002).

Therefore, the greater risk for subsequent medical events observed in depression intervention recipients may not only be attributed to depressive disorders, but may relate to the presence of cognitive impairment as well. Our finding regarding the strong correlation between depression interventions and higher rates of cognitive impairments in these patients (Table 27) supports this.

It is surprising that while depression intervention use is the strongest predictor of subsequent medical events, depression symptoms didn't enter the final predictive model for these events, even while depression was found at a higher rate (28.04%) than depression interventions (15.65%) in this population. This may be related to the low severity of symptoms identified in depressed patients, which was mostly mild or moderate. In the population of older home care patients, most cases of depression were evidenced by only mild or moderate symptoms. Given that the impact of depression grows as the severity increases (Onder et al., 2007), it is reasonable to expect that only the most severe depressive symptoms might directly lead to these medical events. It is also possible that patients with these severe depressive symptoms were the most likely to receive psychiatric services, including depression interventions. Therefore, the link between depression interventions and the increased risk for medical events may be mediated by the severity of depressive symptoms and certain consequences of the most severe symptoms.

Another possible explanation for these findings may be related to the lack of documentation on MHDs and the inconsistent allocation of psychiatric resources in the home care setting. As seen in the OASIS data set, mental health services such as depression screening, depression interventions, and psychiatric nursing services are not mandatory procedures in U.S. home care settings, but voluntary items to inform self-management abilities (CMS, 2011). Further, even if such services are provided to patients, the process of delivery is still lacking standardization and documentation. For example, depression interventions for newly diagnosed

depressed patients may include new medications, adjustments to already-prescribed medications, or referrals to agency resources and specialty providers, such as social workers. Further, if the patient is already under physician care for a diagnosis of depression, interventions may include monitoring medication effectiveness, teaching regarding the need to take prescribed medications, and so on (CMS, 2011). However, information regarding these services was largely lacking in this OASIS data set. Based on available data in OASIS, it is unknown what specific services were delivered to a patient under the category of depression interventions; it is also unknown who delivered such services or in what manner, thus making it difficult to evaluate the effectiveness of mental health treatment and to monitor the mental health status of patients in these settings.

Also unknown is the factors that led home care providers and nurses to offer depression interventions to the elderly, especially when the patients' medical records and service prescription did not necessarily indicate this need. The decision making process for the allocation of psychiatric resources in this elderly home care population, although seemingly inconsistent, may not have been inconsistent at all. However, the decision making criteria have not been clarified and bear close study. Clarification of this decision making process and the screening criteria used by front-line home care providers and nurses could greatly facilitate our understanding of MHDs as well as the link between MHDs and the risk for medical events in this population. This is a question that has long been raised in the literature but still unanswered (Onder et al., 2007; Sheeran et al., 2004; Sheeran et al, 2010). At this point, because most MHDs are not documented with consistent diagnoses, the receipt of psychiatric services might be used as an incompletely explained indicator for MHDs as a way to immediately improve the effectiveness of mental health screening in home care settings.

The fact that recipients of depression interventions presented with substantially higher risk for all-cause major medical events, although still unexplained, underscores the importance of reasonable psychiatric resource allocation for U.S. home care elders, not only as a means to improve their mental health status, but also to reduce the occurrence of medical events, as to improve the quality of home care services in this population (CMS, 2014). Unfortunately, these data support the reality that these psychiatric services for the older home care patients are still largely inadequate and inconsistent with the substantial need in this population.

Strengths and Limitations

Strengths

To our knowledge, this dissertation study was the first attempt to describe the national prevalence of MHDs and to systematically examine related factors in the elderly home care population using the largest national home care dataset in the U.S. (OASIS). By doing so, this study contributes to the knowledge base regarding MHDs in older home care patients, one of the most understudied populations in the U.S with respect to mental health. In addition, this investigation on the correlates of MHDs was also critical in informing more streamlined mental health screening procedures and improved care quality in the home care setting (Byers et al., 2008; CMS, 2014; Flaherty et al., 1998). The prospective design and use of longitudinal data in this dissertation study were also novel for this area of inquiry, allowing the researchers to examine the impact of MHDs on medical events. This contributes to the development of programs that aim to reduce the occurrence of these events and to improve the health outcomes of this population. Of note, the survival analysis used in this dissertation study allowed for an investigation of time-to-event relationships between the occurrence of MHDs and MHD-caused medical events. Lastly, this was the first study on this topic to be guided by an established

theoretical framework, which was developed specifically for studies related to multi-factorial influences on community health outcomes. The solid theoretical basis of this study was particularly suitable to the research questions posed in this study as they addressed a complex issue.

Limitations

This dissertation study also had a few limitations. Due to the nature of the OASIS data, the investigator only examined the patients in Medicare-certified home care agencies. However, given that Medicare-certified home care agencies make up over 85% of all home care agencies in the U.S., the studied sample was representative of the target population of U.S. home care elders. The second limitation is related to the potential bias in the data collection of OASIS. In rare occasions, home care nurses who complete the OASIS assessment might not be able to choose the correct item in OASIS either due to a lack of information or training, leading to potential data collection bias. (Madigan, Tullai-McGuinness, & Fortinsky, 2003). Another limitation was related to the fact that OASIS did not employ professional psychiatric diagnostic instruments or guidelines (e.g., SCL-90; DSM-V) (Brown et al., 2004; Ell et al., 2006; Tullai-McGuinness, Madigan, & Fortinsky, 2009). However, with modification of mental health-related items in the new version (OASIS-C), it was expected that the current item composition of the OASIS data set was sufficient for the purpose of this study, which was to gain a basic understanding on MHDs in the target population of home care elders. Further, the breadth of assessment in OASIS and multiple assessments at different time points were also beneficial for such an epidemiological investigation. Therefore, the strengths of OASIS, including the breadth of measurement, the longitudinal nature of data, the relevance for general practice and ease of use outweighed its

disadvantage regarding highly specific diagnostic measurement, thus warranting its use in this study.

Conclusions and Implications

In summary, there are five primary findings in this dissertation study, including the prevalence of MHDs, correlates of MHDs, risk factors for MHD-caused medical events, management of MHDs, and the impact of MHDs on all-cause subsequent medical events in the national U.S. home care population.

First, with over one third (37.94%) of home care elders in the U.S. evidencing MHDs, this study echoed a large number of local studies in that these disorders are indeed prevalent in this population, even at the national level. This study also revealed a moderate level of psychiatric comorbidity in these home care elders, thus emphasizing the importance of viewing MHDs as an inclusive group of disorders and adjusting the mental health screening as well as interventional approaches accordingly.

Second, it was demonstrated that identified correlates of MHDs would be an asset in this screening process. These include variables with respect to the patient's demographic, clinical, functional, sensory, cognitive, and social support status. Further, risk factors for MHD-caused medical events were also recognized, supporting the need for development of mental health informed interventions to reduce the occurrence of these events.

More importantly, current findings revealed that the influence of MHDs and related psychiatric services extend beyond psychological status to a larger range of patient outcomes in this population, such as acute care hospitalizations, emergent care events, and nursing home admissions. Of note, variables pertinent to MHDs and its related services were the strongest risk factors for the total occurrence of these subsequent medical events, although these events were

not necessarily directly caused by MHDs. And this predictive relationship between MHDs and subsequent medical events was significant even after adjusting for the patients' demographics and other potential confounders related to their clinical, functional, cognitive, and social support status.

Of concern, it appears that mental health disorders have received insufficient attention and inconsistent management in this population, as indicated by the scarcity and discrepancy in the allocation of psychiatric resource among this group of patients. This indicates the need for increased efforts by health care professionals, agency administrators, and policy makers to improve the screening, documentation, follow up, and management of MHDs in home care elders.

Clinical Implications

Given the high and rising prevalence of mental health disorders in the population of American home care elders, it is important at this juncture for home care agency administrators and providers to turn attention and resources to the programmatic detection and management of these disorders, especially for patients who have already presented some of the identified risk factors or correlates. In light of the knowledge generated in this study, especially that regarding the correlates and risk factors for MHDs in home care elders, attention should be paid to improvement and effectiveness of the mental health screening protocols and related interventional programs in home care settings. Specifically, the development of an electronic algorithm based on identified correlates of MHDs in OASIS can assist front-line home care nurses to detect these disorders among the elderly in an efficient fashion, especially considering the time constraints in the provision of care in home care settings.

Psychiatric training and decision making support are also necessary for front-line home care providers and workers, in order to improve their awareness of geriatric MHDs and confidence while working with mentally health challenged elders. Lastly, in order to facilitate effective communication in home care settings, interdisciplinary collaboration and information sharing among home health care professionals including physicians, nurses, social workers, and attendants is also necessary.

Policy Recommendations

In terms of health policy, efforts should be made to enforce the implementation of standardized mental health screening procedure in U.S. home care settings, with an emphasis on high risk patients who are referred from psychiatric and acute short-stay hospitals or long-term care facilities. For example, a standardized anxiety assessment should be implemented and, if possible, developed into a brief version for use in the home care context, known for its high volume of patients and limited psychiatric workforce.

Advocacy is also needed to increase reimbursement rates for psychologists or psychiatric nurses who provide mental health services or treatment for older home care patients while expanding psychiatric referral options for these patients. Mandatory psychiatric training sessions for home care nurses can also be introduced as part of the required continued education package for health care professionals and workers in home care settings. In particular, since a large portion of the basic home care services (excluding skilled nursing services) are delivered by home care attendants, who are mostly in lack of psychological knowledge, the provision of free psychiatric training and easy-to-use brochures for these attendants may also prove its use and improve the quality of home care to some extent.

Additionally, given the widespread lack of accurate admission information noted in the U.S. home care population, policies or guidelines should be made to streamline the home care admission process in order to ensure the completeness and accuracy of medical documents received by home care agencies. In this regard, the introduction of a nationwide electronic health record (EHR) system across geriatric care settings would also be helpful to build a seamless care system for the growing population of frail elders in the U.S. Lastly, in order to improve the quantity and quality of psychiatric work force in home care settings, policy makers in relevant governing body should consider legislations or recommendations to financially incentivize home care agencies to recruit more providers and nurses who specialize at geriatric psychiatry or at least have experience working with elders on their mental issues.

Direction for Future Research

Given the high prevalence of MHDs among home care elders, the under-detected and under-treated status of these disorders, and the gaps in psychiatric resource allocation, it is important for researchers to develop targeted mental health screening protocols and interventions to improve the management of these disorders. Knowledge generated in the present study with respect to the correlates and risk factors for MHD would be especially useful in this regard. These identified MHD correlates include type of living condition (alone or assisted living facilities), life style characteristics (smoking), admission source (acute short-stay or psychiatric hospitals), frailty indicators, a history of falls or multiple hospitalizations within one year, sensory impairments and cognitive dysfunction. In addition, those elders who are admitted from psychiatric or long-term care hospitals, cognitively impaired, suffering psychotic disorders or receiving depression interventions, should be considered high risk for further hospitalizations or emergent care events due to acute deterioration of these disorders. The development of an

electronic algorithm aimed at accurate detection of geriatric MHDs in the home care setting would be an important achievement which could incorporate all such significant variables.

Another valuable future research endeavor should be aimed at linking information from OASIS with other datasets such as Medicare Claims data, for a more complete understanding of patient' outcomes and service use. Additionally, those findings regarding modifiable correlates of MHDs, such as the initiation of psychiatric services and availability of social support, offer initial support for the future development of targeted interventions, which aim to alleviate the symptoms of MHDs and to reduce the impact of these disorders on medical service use. Central to this is the role of advanced practice psychiatric nurses in the early detection of geriatric MHDs and referral of high-risk patients to appropriate psychological providers, as well as provision of multidisciplinary social support interventions for those at high risk for MHDs.

These findings emphasized the value of OASIS dataset in mental health screening for home care elders, as the one and only comprehensive nationwide dataset that is currently used in all Medicare-certified home care agencies of this country. However, the potential of OASIS to improve the care quality of home care patients has been, and is still, under-realized. This is most likely related to the lack of standardized mental health assessment in OASIS and the fact that most mental health-related items in OASIS are not mandatory to complete. Therefore, more efforts should be made by home care researchers to 1) incorporate more standardized mental health assessment into OASIS, and 2) to improve the current composition of OASIS data into a brief and easier-to-use format in order to promote better use of this data set in home care settings by simplifying and streamlining the workflow process for front-line home care nurses and workers.

One limitation in this study is that we do not know what the factors are that influence the relationship between depression interventions and all-cause subsequent medical events. In particular, given that cognitive, physical, and mental health status is usually interrelated among elders, it is possible that the cognitive and physical changes of these patients are key moderators in this relationship. However, we need more information toward validating this hypothesis. This is important in the development of interventions that aim to reduce subsequent medical events in this frail elderly population. This is an urgent problem in that the occurrence of these events exacts a large toll on patients as well as the cost burden of the geriatric health care system in the U.S. Quantitative studies using current, large-scale, longitudinal data and qualitative explorations from the perspective of home care providers would be particularly necessary to develop our knowledge base in this regard.

Another limitation in this study is the lack of examination of agency-level variables, since most the identified MHD correlates and risk factors for MHD-caused medical events were at the individual level. In particular, the availability of psychiatric care protocols, referral procedures, in-service psychiatric training for front-line home care providers and dedicated psychiatric personnel may vary substantially across agencies. Importantly, these variables are related to the readiness and competency of home care nurses in caring for the mental health related issues in patients, thus affecting the screening and management of MHDs in home care. Future research is necessary to examine agency-level MHD correlates and those associated with the management of MHDs in the home care setting. Such research should include a national survey among home care providers, in order to identify and expand best practices.

Albeit the limitations discussed here, this exploratory foundational study has contributed to the field in specific ways that allow us to move the science forward systematically. It does so

by providing us with a strong empirical foundation for further work in the area of mental health disorders in the US home care elderly population. The findings here allow for future examination of some of the key issues highlighted in these data along with the questions raised. It will serve as a springboard for the next steps in informing our understanding of and intervention with these disorders. Methodological recommendations such as the use of diverse sampling strategies and implementation of pragmatic approaches which access and examine current clinical practices across various regions and agencies are examples of this. Spurred by this study, such future work holds clear promise for effective change in policies and intervention strategies with respect to mental health disorders in home care elders. This need is urgent as we address a growing public health concern among one of the most vulnerable groups in our society.

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