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The impact of complex chronic diseases on care utilization among assisted living residents

Matthew K. McNabney, MD^{a,*}, Chiadi Onyike, MD^b, Deirdre Johnston, MD^b, Lawrence Mayer, MD^b, Constantine Lyketsos, MD, MHS^b, Jason Brandt, PhD^b, Adam Rosenblatt, MD^c, and Quincy Samus, PhD^b

^aDivision of Geriatric Medicine and Gerontology, Johns Hopkins University School of Medicine, 5200 Eastern Ave., MFL Bldg, 7th floor, Baltimore, MD 21224, USA

^bDivision of Geriatric Psychiatry, Johns Hopkins University, Baltimore, MD, USA

^cDepartment of Psychiatry, Virginia Commonwealth University, Richmond, VA, USA

Abstract

Purpose—Many residents of assisted living (AL) have chronic diseases that are difficult to manage, including congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD) and diabetes mellitus (DM). We estimated the amount and intensity of care delivered by the staff for residents with these conditions.

Methods—We performed a secondary data analysis from the Maryland Assisted Living (MDAL) Study (399 residents, 29 facilities). In-person assessments included measures of cognition, function, depression, and general medical health. Diagnosis of CHF, COPD, and DM, as well as current medications was abstracted from AL medical charts. Measures of care utilization were operationalized at the resident level as: 1) minutes per day of direct care (caregiver activity scale [CAS]), 2) subjective staff ratings of care burden, and 3) assigned AL “level of care” (based on state regulatory criteria).

Results—In best fit regression models, CHF and DM were not significant predictors of the evaluated care utilization measures; however, COPD was independently associated with increased minutes per day of direct care – 34% of the variance in the caregiver activity scale was explained by degree of functional dependency, cognitive impairment, age, and presence of COPD. Functional dependency, depressive symptoms, and age explained almost a quarter (23%) of the variance of staff care burden rating. For the AL level of care intensity rating, degree of functional dependency, level of cognition, and age were significant correlates, together explaining about 28% of the variance.

Conclusion—The presence of COPD was a significant predictor of time per day of direct care. However, CHF and DM were not correlates of care utilization measures. Functional and cognitive impairment was associated with measures of care utilization, reiterating the importance of these characteristics in the utilization and intensity of care consumed by AL residents. Further study of this population could reveal other forms and amounts of care utilization.

Keywords

Chronic diseases; Assisted living; care utilization

Introduction

Assisted living (AL) facilities provide care to a large number of older adults including many with complex health problems.^{1,2} Although the most common reasons for entering AL are dementia³ and functional impairment,⁴ most residents (94%) have at least one chronic medical condition, with over three quarters (76%) having two or more chronic conditions.^{5,6} Alzheimer's disease and other dementias (42%), heart disease (34%), depression (28%), diabetes (17%), and COPD (15%) are in the top 10 most common chronic conditions.⁶ These conditions complicate resident care, which is a significant consideration given the large variability of AL staffing practices and training requirements across states, and the emphasis on a social model of care delivery in AL (as opposed to a medical model).

The burden on the health-care system associated with chronic disease is well documented. For example, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD) and diabetes mellitus (DM), the conditions considered in this study, are associated with high rates of hospitalization and 30-day readmission.^{7–12} Moreover, the simultaneous presence of more than one chronic condition is recognized as a particularly complex and challenging aspect of patient care.^{13,14}

Evolving changes in the US health care system will impact care in assisted living facilities. New models of care delivery, such as accountable care organizations (ACO), place significant emphasis on the cost of patient care, particularly for those patients who heavily utilize services.^{15,16} These approaches will likely affect the decision-making of clinicians, or administrators, who care for AL residents, including whether or not to hospitalize a resident of the facility. Readmission to the hospital is now closely monitored since hospitals are reimbursed at a lower rate for a readmission within 30 days of discharge. The desire to avoid readmissions will affect the management of recently hospitalized AL residents with chronic disease.¹⁰ The ability of ALs to provide care to older adults with complex medical needs will be scrutinized at the caregiver level, and facilities will need data to prepare for this scrutiny.

Because of the expanding role of AL in the care of older adults, estimates of the amount of additional care required by those with complex medical conditions are needed to assist facilities to plan for staffing needs and the accessibility of health care providers. There are also non-clinical factors to be considered in managing these facilities. Since AL residents with chronic illness may be less likely to use the common space,¹⁷ and thus be less visible on a day-to-day basis to staff, it is not known how that might affect perceived care requirements. Estimating the additional care requirements imposed by chronic medical conditions would allow for better planning of staff needs by AL managers and would inform clinicians about the care needs of AL residents with these conditions; therefore, we designed this study to quantify care requirements within AL for residents with CHF, COPD and DM. We hypothesized that the presence of any of these 3 conditions would independently increase care utilization and we specifically evaluated the contribution of these conditions to the amount and intensity of care given by AL staff.

Methods

This is secondary analysis of data from the Maryland Assisted Living studies (Phase I and II). The primary aims of the original studies were to estimate the prevalence, incidence, detection, treatment, and consequences of dementia and other mental health conditions in a random sample of AL residents living in Maryland. Details of the design and implementation of both phases are described in prior work^{18,19} and the evaluation procedures used in both study phases were virtually identical. Phase I (2001–2003) was a

cross-sectional evaluation of 198 randomly-selected residents living in one of 22 randomly-selected AL facilities in Central Maryland. Phase II (2004–2006) was a longitudinal evaluation of 203 recently-admitted AL residents living in one of 29 randomly-selected AL facilities in Central Maryland and included 6 month follow-up evaluations for up to 3 years.

Sampling of facilities and recruitment of residents

In Phase I, AL facilities were randomly sampled from a list provided by the state of Maryland that included all AL facilities in the central Maryland region (Baltimore, Anne Arundel, Harford, Howard, Carroll, Prince George's and Montgomery counties, and the City of Baltimore) that were licensed or had applied for a license in 2001. This consisted of 1282 facilities, with a total of 12,253 beds (mean 9.5 [SD 21.4] beds per facility). The sample was stratified by the size of the facilities (larger vs. smaller) defined as ≥ 15 beds, consistent with prior studies (e.g., Collaborative Studies of Long-Term Care).²⁰ All residents from small facilities were invited to participate, and 15 permanent stay residents from each large facility were randomly-selected by room number to participate. In Phase II, all 22 facilities from Phase I were invited to join the longitudinal study, and 6 new large facilities (≥ 15 beds) in the region were randomly-selected to take part using the sample method described. Resident sampling in Phase II involved inviting all recently-admitted residents to enroll in the study. Recent-admission was defined as a permanent stay resident who had moved into the facility within the past 12 months. The analyses presented here combine the initial baseline evaluation data from 399 participants enrolled in either MDAL Phase I or MDAL Phase II from one of the 29 AL facilities (3 participants from the total sample of 402 were excluded due to missing data; all participants represented independent observations with no sampling overlap). All participants and/or their legally authorized representatives provided informed consent and the study protocol was reviewed and approved by the Johns Hopkins School of Medicine Institutional Review Board.

Procedures and measures

Data collection involved a comprehensive in-person evaluation by a geriatric psychiatrist, research nurse, and research associate. Data collected included: demographics, a detailed physician-directed examination, a psychometric battery, a narrative family history and review of present illness, current medical diagnoses and medications as recorded in the AL medical chart, and measures of functioning and mood as assessed by a member of the study team. Information was collected from the resident, a family member, and one of the professional caregivers (i.e., an AL staff member who worked with the participant on a daily basis).

The presence of any one of 3 specified medical conditions (CHF, COPD, DM) and total number of routine medications were ascertained from a review of the AL medical chart. Although it was very unlikely that a diagnosis was included erroneously, it was more plausible that an actual diagnosis was not included. The global "medical complexity" of the resident was operationalized by the clinician-rated General Medical Health Rating (GMHR), a validated tool that ranges from 1 (poor health) to 4 (excellent health).²¹

Other standardized quantitative measures included:

1. the Psychogeriatric Dependency Rating Scale (PGDRS),²² administered by the research nurse to the AL staff caregiver, to assess functional dependence in basic activities of daily living, with scores ranging from 0 (not at all impaired) to 39 (severely impaired);
2. the Cornell Scale for Depression in Dementia (CSDD),²³ administered by the research nurse using semi-structured interviews with the resident and AL staff

caregiver to assess depressive symptoms, with scores ranging from 0 to 38 (higher score indicating more depressive symptoms);

3. and the Mini-Mental State Exam (MMSE),²⁴ a global measure of cognitive function administered by the research associate to the resident, with scores ranging from 0 to 30 (higher scores indicating higher cognitive function).

We operationalized “care utilization”, our study outcome, using three measures:

1. the caregiver activity scale (CAS),²⁵ administered by the study nurse to the AL staff caregiver to who worked most closely with the resident on a daily basis to estimate the time per day (i.e., objective burden) he/she and other formal caregivers spent assisting the resident with six day-to-day care activities (i.e., communication, transportation, dressing, eating, grooming, and supervision);
2. a single-item caregiver Likert burden rating (1–5) administered by the study nurse that assessed the AL staff caregiver’s perception of the burden of the resident (“How difficult is it for you to care for this resident on a day-to-day basis? 1 = least difficult and 5 = most difficult”);
3. and the resident “Level of Care” score, which is assigned by Maryland State Licensing agency according the state-derived criteria for an individual’s care intensity that is required for the resident given his/her medical history, function, and cognition (1 = low care and service needs, 2 = moderate care and service needs, 3 = high care and service needs).

Descriptive statistics were calculated to examine the distribution of discrete variables and the location (i.e., mean, median), normality, and variance of the continuous variables. Multivariate simple linear regression models were used fit to the data to estimate the effect of CHF, DM, and COPD, after adjustment for a standard set of covariates (age, sex, race, year’s education, MMSE, PGDRS, CSDD, and GMHR), on each measure of “care utilization” (i.e., CAS, Likert burden rating, level of care). Polytomous Universal Model (PLUM) ordinal regression was also used to assess the relationship between patient characteristics and the caregiver burden scale (5-point, Likert) and the resident level of care measure (3-point scale). We used SPSS 19.0²⁶ to perform all analyses.

Results

Demographic and clinical information are shown in Table 1; findings on the 3 measures of care utilization, according to the medical diagnosis, are listed in Table 2. The first column shows results for those residents without any of the 3 chronic diseases and the other columns break these down by residents carrying the diagnosis of each of the 3 chronic diseases of interest: CHF, COPD and DM. Thirty-five percent (140/399) of residents had at least one of the 3 conditions. Twenty-eight percent had only one (112/399), 6% (25/399) had two, and less than 1% (3/399) had all three.

Results of multivariate linear regression models for each of the 3 measures of care utilization are listed in Table 3. Approximately 34% of the variance in the caregiver activity scale (CAS) was explained by MMSE, PGDRS, age, and presence of COPD. In this adjusted model, having COPD was associated with an estimated increase of about 105 min of staff care time per 24 h, compared to those residents without COPD. The presence of CHF or DM was not associated with CAS after adjustment for covariates. PGDRS, CSDD, and age were significant correlates of AL care staff’s subjective rating of burden, explaining almost a quarter of the variance (23%) after adjustment for covariates. Ordinal regression method showed that for a 1-unit increase in PGDRS and CSDD, we would expect an increase in the likelihood of having a higher staff burden rating (log odds = 0.075, 95% CI 0.046 – 0.105, *p*

< 0.001; log odds = 0.088, 95% CI 0.041 – 0.136, $p < 0.001$, respectively). A 1-unit increase of age was associated a reduced likelihood of having a higher staff burden level (log odds = -0.23, 95% CI -0.46 to 0.001, $p = 0.057$). None of the three chronic conditions were associated with the burden rating in either the multivariate linear regression or ordinal regression models. For the level of care rating, MMSE, PGDRS, and age were significant correlates together explaining about 28% with other covariates. Ordinal regression method showed that for a 1-unit increase in MMSE and age, we would expect a decrease in the likelihood of having a level of care rating (log odds = -0.59, 95% CI -0.093 to -0.024, $p = 0.001$; log odds -0.038, 95% CI -0.066 to -0.011, $p = 0.007$, respectively). A 1-unit increase of PGDRS was associated with an increased likelihood of having a higher level of care rating (log odds = 0.11, 95% CI 0.078 – 0.149, $p < 0.001$).

Discussion

Although all AL residents require some degree of assistance, a more specific understanding of the determinants of what (and how much) care each resident needs or consumes facilitates more direct planning by providers. This study estimates predictors of resident care utilization with special focus on chronic medical disease. Consistent with prior work,^{3,4} functional and cognitive impairment is associated with increased care utilization. However, our hypothesis that chronic medical conditions (represented by CHF, COPD and DM) are significantly associated with greater care utilization was, for the most part, not supported. The exception was that after adjustment for function, cognition, and other covariates, persons with COPD consumed almost two more hours of care time per day. This higher utilization might be attributed to supervision in the use of oxygen, provision of inhaler treatments, and longer time to complete daily tasks resulting from dyspnea and fatigue.

Our interest in the care needs for specific, high-risk chronic diseases stems from recognition that these diseases are associated with important health outcomes, including hospital readmission and polypharmacy.^{2,7-14} Because these clinical situations are under increasing scrutiny by health regulators, there will be more interest in the ability of AL to enhance care coordination and improve outcomes. This could lead to greater expectations for AL staff to monitor these conditions and alert providers when interventions are appropriate.

Although the focus of this study was to quantify the amount of care provided and care burden perceived by staff, we realize that there are many implications for chronic disease management in AL. Optimizing function for residents with specific chronic diseases should be a concern and priority for AL providers. This would likely necessitate the availability of therapeutic recreation as well as restorative and maintenance rehabilitation programs which target the needs of residents with disabling chronic diseases.

Management of multiple, co-morbid conditions (“multimorbidity”)¹⁴ poses special challenges for AL staff, particularly nurse and pharmacy consultants who might be involved in care. These aspects of care were not captured in our analysis, but certainly impact the quality of care received by AL residents with chronic diseases that we addressed. Furthermore, there are adverse outcomes associated with multimorbidity beyond care utilization, including costs associated with hospital readmission and polypharmacy. The chronic conditions we evaluated are also associated with increased risk of mortality, lower quality of life, increased functional impairment and need for palliative care (which is not typically part of AL).

There are important implications for AL facilities who are choosing to market to the population of frail, medically complex older adults. In particular, some facilities are choosing to market a “social model” of AL, rather than a focus on medical care capabilities.

If facilities are not designed or equipped to provide care (including some that were not captured in this study), adverse events will likely occur in residents with chronic disease but who otherwise seem appropriate for AL.

There are other important limitations to this study. Our results do not give information on “outcomes” that can reflect on the adequacy of care provided in the AL facilities. It is possible that actual care “required” by residents with certain conditions was higher than actually provided to AL residents. In particular, those residents with CHF, COPD or DM might actually have unmet needs that contributed to undesirable events (like hospitalization). It is also possible that because AL is structured less according to a medical model (compared to NH, for example), that such residents are admitted to AL without appreciation of the type or amount of care they will need. We plan to evaluate the longitudinal impact of CHF, COPD, and DM on length of stay and other important outcomes like quality of life in forthcoming analyses. We also did not have measures of disease severity and were therefore unable to differentiate those residents with end-stage from those with mild forms of disease. It is possible that the amount of care utilized by people with the same disease varies according to severity. It is also possible that the distribution of severity influences whether or not associations between the condition and care utilization are observed in a study. Further, the original study was not specifically designed to assess the concept of ‘care utilization’ thus the findings are based on operationalizing this concept with proxy measures (the limitations of secondary data analysis). More robust measures would offer the potential for granular analysis of the relationship between care needs, care utilization and chronic conditions. Finally, there are other conditions and diseases which likely contribute to the assessed outcomes, such as arthritis and incontinence.

In summary, this study provides preliminary information on the amount of direct care utilization by AL residents. This paper specifically examined the impact of 3 common medical conditions. After adjustments for demographic, functional and cognitive factors, the evidence suggests that only COPD had an independent association with amount of care utilized (minutes per day). There were no differences in care requirements among residents with CHF and DM compared to their counterparts who did not have these conditions. Rather, these data suggest that high care utilization is more likely to be driven by functional dependence in activities of daily living and impaired cognitive function.

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Table 1

Summary of descriptive statistics of variables used in multivariate analysis.

Variables	Count	Percent	M	SD	Minimum	Maximum
Demographics						
Age, years			85.4	8.6	49.68	104.02
Education, years			13.8	8.6	0	21
Female, no.	300	75.2				
White race, no.	338	84.7				
Specified chronic illnesses						
CHF	58	14.5				
DM	71	17.8				
COPD	42	10.5				
Two or more (CHF,DM, COPD)	28	7.1				
Other assessment variables						
Cognitive function (MMSE)			19.5	8.24	0	30
Functional status (PGDRS)			11.1	8.6	0	34
Depression (CSDD)			4.2	4.2	0	22
Medical complexity (GMHR)			2.9	0.7	1	4
Monthly AL cost, dollar			3073.40	1378.08	130	8000
Care utilization (outcome variables)						
Staff care time, min/day (CAS total)			190.2	358.0	2	2250
Staff Likert burden rating			2.1	1.3	1	5
Level of care rating			1.4	0.6	1	3

CHF, congestive heart failure; DM, diabetes mellitus; COPD, chronic obstructive pulmonary disease; MMSE, mini-mental state examination; PGDRS, Psychogeriatric Dependency Rating Scale; CSDD, Cornell Scale for Depression in Dementia; GMHR, General Medical Health Rating; CAS, caregiver activity survey.

Table 2

Care utilization, according to medical diagnosis.

Variables	Absence of COPD, CHF, DM diagnosis (<i>n</i> = 259)	CHF (<i>n</i> = 58)	DM (<i>n</i> = 71)	COPD (<i>n</i> = 42)
Care requirements				
CAS total, min/day, mean $\pm$ SEM (<i>n</i> = 396)	206.1 (382.7)	111.4 (210.2)	157.66 (260.7)	218.8 (453.5)
Staff Likert burden rating, mean $\pm$ SEM (<i>n</i> = 394)	2.2 (1.3)	1.9 (1.2)	2.0 (1.3)	1.9 (1.2)
Level of care rating, mean $\pm$ SEM (<i>n</i> = 398)	1.4 (0.6)	1.4 (0.6)	1.5 (0.7)	1.4 (0.6)

CHF, congestive heart failure; DM, diabetes mellitus; COPD, chronic obstructive pulmonary disease; CAS, caregiver activity survey.

Inferential statistics were not calculated as the groups were not independent samples (i.e., 28 participants were represented in more than one columns).

Table 3

Multiple regression coefficient estimates (and SE's) for models of amount of care given ($n = 399$).

	Caregiver activity scale	Staff Likert burden rating	Level of care rating
Age, years	-3.622 (1.778) *	-0.014 (0.007) *	-0.009 (0.003) **
Education, years	3.812 (4.782)	-0.001 (0.018)	0.002 (0.008)
Female, no.	34.037 (35.267)	-0.009 (0.136)	-0.003 (0.062)
White race, no.	-7.566 (45.345)	-0.165 (0.175)	0.048 (0.080)
MMSE	-7.486 (2.319) **	-0.017 (0.009)	-0.014 (0.004) **
PGDRS	21.635 (2.317) **	0.050 (0.009) **	0.030 (0.004) **
CSDD	-3.695 (3.728)	0.055 (0.014) **	0.008 (0.007)
GMHR	25.393 (24.210)	-0.059 (0.093)	0.021 (0.042)
CHF	-33.989 (43.771)	0.004 (0.168)	0.001 (0.076)
DM	-77.043 (40.822)	-0.291 (0.157)	0.019 (0.071)
COPD	105.717 (49.172) *	-0.206 (0.188)	0.052 (0.087)
Adjusted R ²	0.342	0.23	0.278

MMSE, mini-mental state examination; PGDRS, Psychogeriatric Dependency Rating Scale; CSDD, Cornell Scale for Depression in Dementia; GMHR, General Medical Health Rating; CHF, congestive heart failure; DM, diabetes mellitus; COPD, chronic obstructive pulmonary disease; CAS, caregiver activity survey.

Routine medications was excluded because of the large amount of missing data (only 204 cases had data e cohort 2 had this data).

*
 $p < 0.05$;

**
 $p < 0.01$.