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Exploring Indicators of Use of Costly Health Services in Community-Dwelling Adults With Multiple Chronic Conditions

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ABSTRACT

Although experts recognize that including patient functional and social variables would improve models predicting risk of using costly health services, these self-reported variables are not widely used.

Purpose of Study: Explore differences in predisposing characteristics, enabling resources, patient-perceived need for care and professionally evaluated need for care variables between patients receiving primary care within a Health Care Home who did and did not use hospital, emergency department, or skilled nursing facility services in a 3-month period of time.

Primary Practice Setting(s): Primary care.

Methodology and Sample: Guided by the Behavioral Model of Health Service Use, a secondary analysis was conducted on data from a study that included 57 community-dwelling older adults receiving primary care in a Health Care Home. Because of the exploratory nature of the study, group differences in the use of costly care services were compared at the 0.10 level of statistical significance.

Results: Seventeen patients (29.8%) experienced costly care services. The greatest number of differences in variables between groups was in the category of patient-perceived need for care (functional impairments, dependencies, difficulties).

Implications For Case Management Practice: Targeting case management services using evidence-based decision support tools such as prediction models enhances the opportunity to maximize outcomes and minimize waste of resources. Patient-perceived and clinician-evaluated need for care may need to be combined to fully describe the contextual needs that drive the use of health services. Difficulty with Activities with Daily Living and Instrumental Activities of Daily Living should be considered in future studies as candidate predictor variables for need for case management services in primary care settings.

Key words: *care coordination, case management, chronic disease, outcomes research, predictive modeling, risk assessment*

Meeting the health care needs of the growing number of older adults with multiple chronic health conditions is one of the major challenges facing the U.S. health care system. Approximately one in four Americans has more than one chronic health condition (Anderson, 2010). People with multiple chronic conditions are more likely to suffer from frailty, disability, and poor functioning. Poor functioning may limit one's ability to seek health care, inhibit self-management, and lead to increasing dependency upon caregivers. The more chronic conditions an individual has, the more likely they are to experience costly care (hospitalizations, emergency department [ED] visits, and skilled nursing facility [SNF] placement). Increased spending related to chronic diseases directly correlates with an increase in overall health care spending (Anderson, 2010).

National health care expenditures in the United States exceed $2.2 trillion or 16% of the gross domestic product, a 14% increase from 2000 (National Center for Health Statistics, 2010). An important issue is the amount of dollars spent on health care

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delivered in costly care settings such as hospitals, EDs, and SNFs. Preventable hospital admissions cost Medicare in excess of $17 billion (Health Research & Educational Trust, 2010) with annual cost estimates for ED visits more than $9 billion for older adults alone (Agency for Healthcare Research and Quality, 2010). Skilled nursing facility stays for older adults are estimated to cost more than $150 billion annually (Gaugler, Duval, Anderson, & Kane, 2007). Eliminating just 5% of the care provided in these costly settings could save billions of dollars.

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Prediction models have been developed as a way to identify, calculate, or predict outcomes such as the use of costly health care services. Predictive modeling based on analysis of administrative data is an approach frequently used to identify high-risk subgroups for targeted interventions. For example, computer algorithms have been developed to categorize patients into complexity tiers as a basis for focusing primary care interventions (Reid, Roos, MacWilliam, Frohlich, & Black, 2002). Higher tiers reflect the presence of multiple medical conditions and therefore greater complexity of case management, thus increasing the likelihood that patients will incur higher costs (Reid, MacWilliam, Verhulst, Roos, & Atkinson, 2001). The Johns Hopkins ACG System Predictive Model is one such model that includes the number of medical diagnoses and *prior* use of health services to identify patients at high risk of extensive health service use in the *future* and to estimate potential expenses (Weiner, Abrams, & Bodycombe, 2003). Similarly, the Elder Risk Assessment (ERA) is a risk screen developed for use with older adults receiving primary care services to predict hospitalizations and ED visits within the next 2 years (Crane et al., 2010). The ERA includes marital status and age categories in addition to prior hospital stays and specific diagnoses. A recent review, however, indicates that the overall predictive ability of models based on data found in traditional administrative databases is poor, alternatively recognizing that including relatively simple, real-time, clinically actionable data such as sociobehavioral factors may be more accurate in identifying patients at high risk of extensive and expensive health care service use (Kansagara et al., 2011).

Predisposing characteristics (e.g., education, occupation, ethnicity), social aspects that may influence an individual's ability to access care (e.g., income, insurance), and a person's perspective of their need for care are recognized as important indicators of use of costly health services (Andersen, 1995). However, these variables are often underutilized because they are less readily available in administrative databases. Functional status data are complex, and gathering it is considered problematic because the data are mostly dependent on patient-provided history, it fluctuates, and it is difficult or impossible to pull from databases with any consistency (Crane et al., 2010).

Although experts recognize that adding functional and social variables could improve risk model discrimination because many of these variables have been associated with increased risk of costly care (Gaugler et al., 2007; Gill, Allore, & Han, 2006; Kansagara et al., 2011; Kim, Newman, & Lipsitz, 2013; Meldon et al., 2003), these variables are not widely used in health care use prediction models. Including functional and social variables to enhance the performance of existing risk models would require a new level of sophistication in obtaining, storing, coding, and evaluating functional and social data. The decision to invest resources to develop this sophistication will depend on the presence of an evidence base that indicates that these variables add a

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significantly improved balance of sensitivity and specificity to existing administrative screening mechanisms.

We conducted a secondary analysis of data from a study of nurse care coordination in a health care home (HCH), which included a sample of 57 community-dwelling older adults with multiple chronic medical conditions. The patients were identified from administrative databases at the study site as at risk of use of costly health care services (Vanderboom, Holland, Lohse, Targonski, & Madigan, 2014). The purpose of the study was to explore the differences in predisposing characteristics, enabling resources, patient-perceived need for care, and professionally evaluated need for care between those patients who did and those patients who did not use costly care services (hospitalizations, ED visits, or SNF stays) in a 3-month period of time. Data from the parent study were grouped and analyzed in terms of predisposing characteristics, enabling resources and patient-perceived need for care variables. Statistically or clinically significant differences between groups for functional and social variables would encourage further study of the predictive capability of those variables.

CONCEPTUAL FRAMEWORK

The study was guided by the Behavioral Model of Health Service Use, which can be used to identify factors that predict the use of costly health care transitions (hospitalizations, ED visits, and SNF stays). The Behavioral Health Model of Health Service Use (Andersen, 1995; Andersen & Aday, 1978) is a widely used model that identifies individual predictors of service use in the categories of predisposing characteristics, enabling resources, and need for care (see Figure 1). *Predisposing characteristics* are those present in an individual that affect their propensity to use services. These include demographics and social structure (e.g., education, occupation, and ethnicity), health beliefs (attitudes, values, and knowledge) and psychological characteristics (mental dysfunction, cognitive impairment, and autonomy). *Enabling resources* are the social aspects/determinants that influence an individual's ability to access care, such as income, health insurance, transportation, and family resources. Need for care refers to health or functional factors that are often the most immediate cause for health service use. Need factors are considered from two perspectives—the patient's perceived need and the professionally evaluated need for care. *Patient-perceived need for care*, or illness level, is defined as a patient's judgment on severity of his or her illness or self-rated health status; *clinician-evaluated need for care* is defined as professional judgment about a patient's health status. Perceived need helps understand care-seeking and adherence, whereas evaluated need is related to the kind and amount of treatment provided.

METHODS

Design

We conducted a secondary analysis of existing data from a study of community-dwelling older adults with chronic, complex illnesses receiving primary care in an HCH (Vanderboom et al., 2014). The study was approved by the institutional review board.

Sample and Setting

The sample included 57 community-dwelling older adult primary care patients. All participants met the inclusion criteria of 55 years and older, multiple chronic health conditions, and the ability to speak and read English. Exclusion criteria included cognitive impairment documented in the medical record, untreated mental health condition, or terminal illness. The setting was a large primary care practice within an academic medical center located in the upper Midwest. The region's population is predominantly white, although slightly higher minority population rates are observed in the county's urban center where the HCH is located (He, Sengupta, Velkoff, & DeBarros, 2005). The remainder of the county is rural. The county residents are socioeconomically similar to the U.S. white population as a whole (U.S. Census Bureau, 2013).

Variables and Measures

Variables available were grouped according to concepts within the conceptual framework—predisposing characteristics, enabling resources, and need for care (patient-perceived need and professionally evaluated; see Table 1). The outcome variable, costly care, was defined as any hospitalization, any ED visit, and any SNF days during the 3 months of follow-up in the parent study. Description of how the variables were measured and the data source for the variables is also included in Table 1.

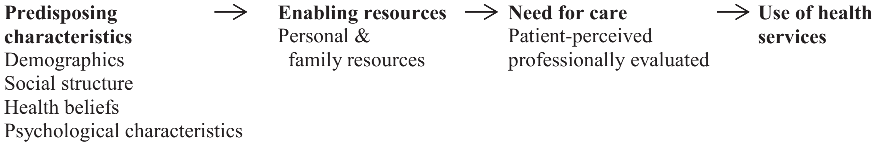

FIGURE 1
Behavioral model of health service use.

TABLE 1
Study Variables, How Measured, and Data Sources From Parent Study Grouped by Framework Concepts

Variables	How Measured	Data Source
Predisposing characteristics		
Age	>80 years; <80 years	Medical record
Increased age	45–64 years; 65–79 years; 80+ years	Medical record
Race/ethnicity	Non-Caucasian race/ethnicity	Medical record
History of depression	Down, depressed, hopeless	Interview
	–Yes/no; little interest in doing things	Interview
	–Yes/no	
Enabling resources		
Income[b]	More than enough, enough or not enough	Interview
Inadequate support system	Help is never, infrequently, occasionally, often available or whenever needed	Interview
Living situation	Alone/with others	Interview
Live alone	Yes/no	Interview
Available caregiver	Yes/no	Interview
Patient perceived need for care		
Self-rated health status	Excellent, good, fair, poor	Interview
Moderate to severe functional impairment	No significant, slight, moderate or severe impairment	Interview
Persistent bathing disability	Yes/no	Interview
ADL difficulty	Yes (1+ADL difficulty)/no ADL difficulty	Interview
IADL difficulty	Yes/no	Interview
Any restricted activity days	Yes/no	Interview
Any bed disability days	Yes/no	Interview
Fall with injury (past 3 months)	Yes/no	Interview
Memory concerns	Yes/no	Interview
Considering a move	Yes/no	Interview
Evaluated need for care		
ACG-PM score[a]	Mean (*SD*), range	Administrative database
Health care home tier	Tier 3 or 4	Administrative database
ERA score[b]	<15/>15	Administrative database
Cognition[c]	Cognitively intact/impaired	Interview
2 or more hospitalizations in prior 3 months	Yes/no	Medical record
Any hospitalization in prior 30 days	Yes/no	Medical record
Prior nursing home use	Yes/no	
Live well risk category (Risk for nursing home use)[d]	No, low, moderate, or high risk	Interview
6 or more prescribed medications	Yes/no	Medical record

Note. ACG-PM, adjusted clinical groups-predictive modeling; ADL, activities of daily living; ERA, Elder Risk Assessment; IADL, instrumental activities of daily living.

[a] From "The Johns Hopkins ACG Case-Mix System Version 6 Release Notes. Section 2. The ACG Predictive Model: Helping to Manage Persons at Risk for High Future Costs," by J. P. Weiner, C. Abrams, and D. Bodycombe, 2003, retrieved September 21, 2012, from www.acg.jhsph.edu

[b] From "Use of an Electronic Administrative Database to Identify Older Community Dwelling Adults at High-Risk for Hospitalization or Emergency Department Visits: The Elders Risk Assessment Index," S. J. Crane, E. E. Tung, G. J. Hanson, S. Cha, R. Chaudhry, and P. Takahashi, 2010, *BMC Health Service Research, 10*, p. 338.

[c] From "Detection of Cognitive Impairment and Dementia Using the Animal Fluency Test: The DECIDE Study," By R. Sebaldt, W. Dalziel, F. Massoud, et al., 2009, *Canadian Journal of Neurological Sciences, 36*(5), pp. 599–604.

[d] From "Live Well At Home Project," by Minnesota Board on Aging, retrieved February 21, 2014, from http://www.mnlivewellathome.org/

Analysis

Continuous variables were summarized with means, standard deviations, medians, and ranges; categorical variables were summarized with counts and percentages. Group differences between those participants who used costly care and those who did not were compared using two-sample *t* test, Wilcoxon rank sum test, chi-square test, or Fisher's exact test. All tests were two-sided. Because of the exploratory nature of this study, data were analyzed using a *p* value threshold of .10 so as not to exclude potentially valuable indicators as suggested by Schoenfeld (1980). No a priori adjustments were made for multiple comparisons. All statistical analyses were performed using SAS 9.2 statistical software (SAS Inc., Cary, NC).

RESULTS

Data from the total sample of 57 patients were available. Seventeen of the participants (29.8%) experienced a hospitalization, ED visit, or SNF stay. Group differences in the indicators can be found in Table 2. In the category of *predisposing characteristics*, there were no statistically or clinically significant differences in participants' ages; all patients were Caucasian, non-Hispanics. Although not found to be statistically significant at the 0.10 level, a greater percentage of males (52.9%) used costly care than females (47.1%; p = .15) and a greater percentage of patients who used costly care felt down, depressed, or hopeless (41.2%) than patients who did not (22.5%; p = .20).

TABLE 2
Group Differences

Variables	Use of Costly Health Services No, *N* (%)	Yes, *N* (%)	*p*
Predisposing characteristics			
Age (years)			.92
45–64	7 (17.5)	3 (17.7)	
65–79	16 (40.0)	6 (35.3)	
80+	17 (42.5)	8 (47.0)	
Age, mean (*SD*)	76.1 (10.0)	78.4 (11.6)	.42
Range	56–94	56–94	
Male gender	13 (32.5)	9 (52.9)	.15
Non-Hispanic Caucasian	40 (100)	17 (100)	
Education			.77
Grade 5–8	2 (5.0)	0 (0.0)	
Some high school	3 (7.5)	1 (5.9)	
HS diploma	5 (12.5)	4 (23.5)	
Some college	30 (75.0)	12 (70.6)	
History of depression			
Down, depressed, hopeless?—yes	9 (22.5)	7 (41.2)	.20
Little interest in doing things?—yes	8 (20.0)	5 (29.4)	.50
Enabling resources			
Health coverage			.63
Medicare (but not Medicaid)	37 (92.5)	15 (88.2)	
Other	3 (7.5)	2 (11.8)	
Income			.74
More than enough/enough	34 (85)	15 (88.2)	
Not enough	6 (15)	2 (11.8)	
Availability of support: help is available…			.84
Never/infrequently	4 (10.0)	2 (11.8)	
Occasionally/often/whenever needed	36 (90.0)	15 (88.2)	
Does not live alone	20 (50.0)	9 (52.9)	.84
Married			.50
Yes	22 (55.0)	11 (64.7)	
No	0	1 (5.9)	
Patient-perceived need for care			
Self-rated health status			.24
Excellent/very good/good	24 (60.0)	7 (41.2)	
Fair/poor	16 (40.0)	10 (58.8)	

(*continues*)

TABLE 2
Group Differences (*Continued*)

Variables	Use of Costly Health Services		
	No, *N* (%)	**Yes, *N* (%)**	***p***
Moderate to severe functional impairment			.04
No significant/Slight impairment	34 (85.0)	10 (58.8)	
Moderate to severe impairment	6 (15.0)	7 (41.2)	
Persistent bathing disability	2 (5.0)	4 (23.5)	.06
ADL difficulty (1+ difficulty)	3 (7.5)	6 (35.3)	.015
IADL difficulty (1+ difficulty)	24 (60)	15 (88.2)	.059
Any restricted activity days	12 (30.8)	8 (47.1)	.24
Any bed disability days	8 (20.5)	4 (23.5)	.80
Fall with injury (prior 3 months)	6 (15.0)	3 (17.6)	.80
Memory concerns	8 (20.0)	4 (23.5)	.73
Considering a move	16 (40.0)	3 (17.6)	.13
Professionally evaluated need for care			
Number of comorbidities, mean (*SD*)	13.1 (5.8)	14.0 (6.7)	.86
Range	4-29	6–29	
Cognitively impaired	8 (20.0)	7 (41.2)	.11
2 or more hospitalizations in prior 3 months	5 (12.5)	4 (23.5)	.42
Any hospitalization in prior 30 days	0 (0.0)	2 (11.8)	.08
Prior nursing home use	14 (35.0)	7 (41.2)	.66
Live well at home rapid screen risk			.02
No risk	9 (22.5)	3 (17.7)	
Low risk	15 (37.5)	1 (5.9)	
Moderate risk	4 (10.0)	6 (35.3)	
High risk	12 (30.0)	7 (41.2)	
Number of medications, mean (*SD*)	16.9 (4.9)	18.1 (7.2)	.94
Range	5–28	10–35	

Note. Variables in bold indicate statistical significance (<.10). ADL, activities of daily living; IADL, instrumental activities of daily living.

There were no statistically or clinically significant differences between patients who used and those who did not use costly care in *enabling resources* variables, including living situation, insurance, or income. The majority of patients who used costly care were married (64.7%), lived with others (52.9%), had health insurance/Medicare (88.2%), and reported an adequate income (88.2%). Nearly two-thirds (70.6%) had attended some college.

There were significant group differences in the *patient-perceived need for care* variables. More patients who used costly care reported limitations in one or more activities of daily living (ADL) ($p = .015$) (and specifically in bathing, $p = .06$), and in one or more instrumental activities of daily living (IADL) (p = .059) than those who did not use costly care. Similarly, more patients who used costly care rated the extent of limitations to their functioning as moderate to severe ($p = .04$) compared with those who did not use costly care.

In the category of *professionally evaluated need for care*, patients who used costly care had on average 14 comorbid conditions whereas those who did not use costly care had on average 13 comorbid conditions ($p = .86$). Eleven percent of patients who used costly care had been hospitalized in the 30 days prior to the study, whereas none of the patients who did not use costly care had been hospitalized in the prior 30 days ($p = .08$). Patients who used costly care scored at greater risk for SNF placement on the Live Well at Home Rapid Screen (MN Board of Aging, 2008) than those who did not use costly care ($p = .02$). Although not a statistically significant difference for this analysis ($p = .11$), a greater percentage of patients who used costly care were found to be cognitively impaired (41.2%) than those who did not use costly care (20.0%).

DISCUSSION

The purpose of this study was to explore the differences in factors that indicate service use between patients who did and patients who did not use costly care (hospitalizations, ED visits, or SNF stays) in a sample of community-dwelling older adults with multiple chronic conditions. Our findings of differences in patients' perceived need for care (i.e., difficulty with ADL and IADL) are consistent with the use of costly health services as suggested by the Behavioral Health Model of Health Service Use. Andersen (1995) asserts that need variables, both patient-identified need and professionally evaluated need, should ideally drive health service use. Our findings regarding the importance of functional status are consistent with a recent review that compared the predictive value of four instruments identifying older adults at risk of ED visits (Buurman et al., 2011). The best performing of the four instruments comprised seven items measuring functional status including measures of both ADL and IADL (Buurman et al., 2011). Similarly, a recent study by Sylvia et al. (2008) also found that impaired functional ability (ADL and IADL limitations) was present in high-risk patients.

Our findings share similarities with those of a meta-analysis of the predictors of SNF admission among community-dwelling older adults (Gaugler et al., 2007). Skilled nursing facility admission was predicted most strongly by dependency in ADL and cognitive impairment. Another large study of community-dwelling older adults (70 years and older) found that the occurrence of persistent disability in bathing was independently associated with the risk of long-term SNF placement (Gill et al., 2006). The Live Well at Home Rapid Screen was developed and is used by the Minnesota Department of Health to identify community-dwelling older adults at risk for SNF admission (MN Board of Aging, 2008). The Live Well at Home Rapid Screen score was included as one of our study variables (professionally evaluated need for care). Consistent with the screen's intent, we found that patients who scored higher on the screen were more likely to use costly care. Although this is technically a professionally evaluated screen, it differs from other screens in that it requires patients' perceived need for care information regarding their health and functional status. Findings from this study add to the strength of the evidence for use of the Live Well at Home Rapid Screen in clinical practice.

In contrast to the predictor variables for SNF use identified previously, patient-perceived need for care variables are rarely included in risk identification methods for hospital readmissions or ED visits (e.g., Johns Hopkins ACG System Predictive Model; ERA) that primarily include professionally evaluated variables such as medical diagnoses or prior service use. Reasons posited for not using patient-perceived need for care variables include the limitations of patient self-report (e.g., low response rates, recall bias, literacy requirements, time and cost; Crane et al., 2010).

SNF admission was predicted most strongly by dependency in activities of daily living and cognitive impairment.

Although very preliminary, our findings suggest that patient-perceived need for care variables can be collected and are potentially as informative as professionally evaluated need for care. Both patient-perceived and professionally evaluated needs for care variables should be explored further to fully describe the contextual needs that underpin the use of costly health care. The current national focus on patient-centered measures and patient-reported outcomes supports this contention, particularly for community-dwelling older people whose individual appraisal of ability and status is likely to influence care seeking and the use of health care services.

LIMITATIONS

The study was a secondary analysis of an existing database with a small sample. As the intent was exploratory, the *p* value threshold was increased from .05 to .10 to make sure that candidate variables were not excluded from consideration because of lack of study power. No adjustment for multiple comparisons was done. The study was conducted in one setting with a homogeneous and well-educated sample. These limitations restrict generalizability of study findings, but the results provide important preliminary findings for subsequent studies.

Implications for Case Management

Case managers are well positioned to provide care coordination in HCHs (Treadwell & Giardino, 2014). A principal component of case management, regardless of practice setting, is to get a person clinically necessary care in a timely manner to optimize wellness and functional capability (Case Management Society of America, 2012). Findings from this study reinforce the importance of considering patient-reported needs when planning care as part of the collaborative practice inherent in case management. The use of the Live Well At Home Rapid Screen by case managers may be especially valuable for identifying patients' functional status and perceived needs for care that may assist them in maintaining their independence and maximizing wellness. Targeting case management services using evidence-based decision support tools such as prediction models enhances the opportunity to maximize outcomes and minimize waste of

> *Findings from this study reinforce the importance of considering patient-reported needs when planning care as part of the collaborative practice inherent in case management…. The rising expectation of viewing health in terms of "physical, mental, and social well-being, and not merely the absence of disease and infirmity" (World Health Organization, 2003) is compatible with the patient-centered care provided by case managers and suggests including patient-perceived need for care as an important indicator for use of health services and inclusion in case management prediction models.*

resources. Most health service use prediction models use variables that are discrete events such as readmissions or the number of diagnoses and that are readily available in administrative databases. As the national health policy focus shifts to measuring quality (especially from the viewpoint of the patient) in addition to cost, new health indicators must be explored to reflect evolving health-related concerns (Bowling, 1997). The rising expectation of viewing health in terms of "physical, mental, and social well-being, and not merely the absence of disease and infirmity" (World Health Organization, 2003) is compatible with the patient-centered care provided by case managers and suggests including patient-perceived need for care as an important indicator for use of health services and inclusion in case management prediction models.

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