

Complexity in Geriatric Home Healthcare

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Abstract: The aging population and the associated rise in the prevalence of chronic conditions suggest that the home health population is increasingly complex and challenging to manage. The purpose of this study was to use national administrative data (Outcome and Assessment Information Set assessments of persons discharged in 2004 and 2005) to examine the clinical complexity of older adults admitted to home healthcare. Our descriptive analyses confirm that multiple chronic conditions and cognitive impairment are common and result in longer lengths of stay. The findings support the need for geriatric home healthcare practices that effectively address multiple morbidities and cognitive function.

Keywords

chronic conditions
cognitive impairment
complexity
home healthcare
length of stay
multimorbidity

Knowledge about patients is a necessary precursor to effective quality improvement. Published data currently available on the U.S. home health population are limited and dated.¹ The authors use a unique national data set—the Outcome and Assessment Information Set (OASIS)—to examine two major contributors to complexity in older home healthcare patients. The first is multimorbidity (i.e., multiple chronic conditions), a common problem among persons age 65 or older (Wolff, Starfield, & Anderson, 2002). The second is cognitive impairment, a condition with significant implications for home health patient clinical outcomes and self-management. This article uses OASIS data on all persons age 65 or older in the United States discharged from home healthcare in 2004 and 2005 to describe the prevalence of chronic conditions and cognitive impairment. It then examines the association of each with home health length of stay, an indicator of resource use and, potentially, of the challenge of developing and implementing care plans for clinically complex patients.

Background

The aging of the U.S. population and the increase in remaining life expectancy at age 65 have major implications for all sectors of healthcare, including home healthcare. The share of the U.S. population over age 65 is expected to nearly double from 12% in 2006

to 20% in 2030, while the number of persons over age 85 will almost quadruple from 5.3 to 21 million between 2006 and 2050 according to current projections (Federal Interagency Forum on Aging-Related Statistics, 2008). Increases in longevity are a double-edged sword. Survival to late ages is associated with an increase in the risk of chronic conditions (Vogeli et al., 2007) including heart failure (Bleumink et al., 2004), Type 2 diabetes (Wild, Roglic, Green, Sicree, & King, 2004), and Alzheimer's disease (Gao, Hendrie, Hall, & Hui, 1998; von Strauss, Viitanen, De Ronchi, Winblad, & Fratiglioni, 1999).

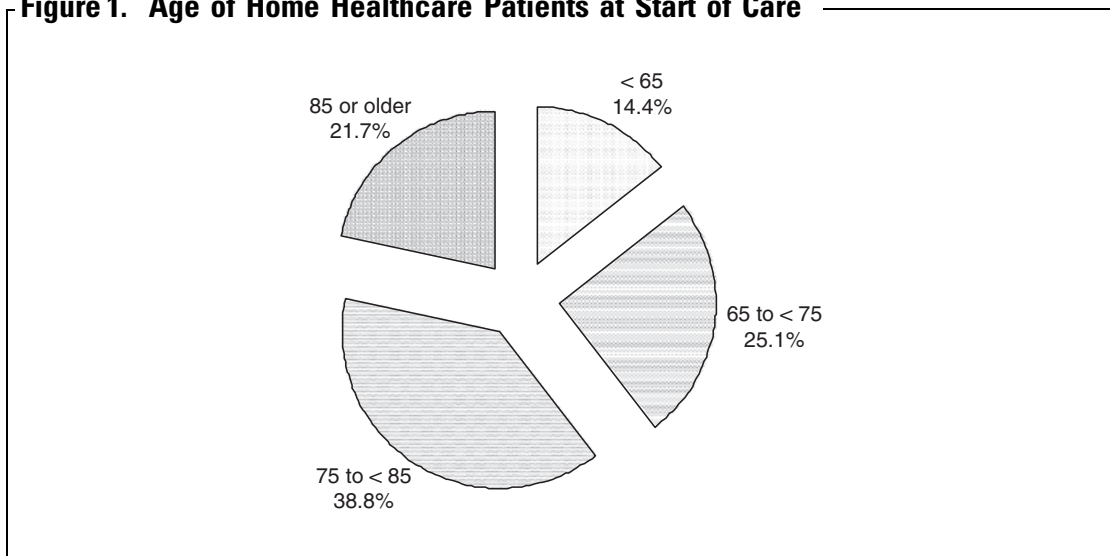
The impact of multiple chronic conditions on health status, service use, and outcomes was summarized in a review of the literature (Gijssen et al., 2001). With relatively few exceptions, comorbidity measured as an index or a count of chronic somatic diseases had a significant effect on mortality, functional status, quality of life, and different aspects of healthcare, often after adjustment for a large variety of clinical and other covariates. Gijssen and colleagues concluded that comorbidity, in general, affects health outcomes in studies conducted in a range of settings with different designs and outcome measures, and after adjustment for other factors. We are aware of no published data, however, on the impact in home healthcare.

Deficits in cognitive function are also associated with longevity and may be captured in counts of chronic conditions when Alzheimer's or related dementias are reported as medical diagnoses. The median survival for adults after a diagnosis of dementia is over 4 years, and the range is wide depending on age at diagnosis (10.7 years for people between 65 and 69, and 3.8 years for people over 90) (Xie, Brayne, & Matthews, 2008). Surviving for an extended period of time with dementia creates a situation where treatment for other conditions is likely to be required and, at the same time, complicated by the impact of cognitive deficits on adherence to treatment, participation in healthcare planning, and self-management.

Study Purpose and Significance

The purpose of this study is to describe the frequency of two indicators of clinical com-

¹The most recent data available from the National Home and Hospice Care Survey are from 2000. Another round of the survey was completed in 2007 and data are forthcoming.

Figure 1. Age of Home Healthcare Patients at Start of Care

plexity (i.e., multimorbidity and cognitive impairment) and their relationship with home health length of stay (LOS). There is little empirical research on home health LOS other than analyses conducted to develop the Medicare home health prospective payment system. In contrast, LOS in inpatient settings is widely analyzed as a proxy measure for resource use. We also assume that LOS is a proxy measure of resource use in home healthcare and that longer stays potentially indicate challenges in care planning and management as well as greater difficulty achieving home health goals. Better information about chronic conditions and cognitive impairment in home healthcare, and their impact on LOS, is important to understanding and addressing the challenges faced by agencies, individual clinicians, and paraprofessionals when caring for geriatric patients.

Methods

Data

Study data are from the OASIS National Repository maintained by the Centers for Medicare and Medicaid Services (CMS). OASIS is a standardized home health data collection system developed by CMS to assess and improve the quality of home healthcare provided to Medicare and Medicaid beneficiaries. All agencies certified to participate in the Medicare or Medicaid programs are required to complete and submit OASIS for patients whose care is funded by either program. OASIS

assessments are conducted at several points in time over a patient's stay including home health admission and discharge. There is some variation in the items collected depending on the reason for the assessment. OASIS is described in detail at <http://www.cms.hhs.gov/OASIS>.

OASIS discharge assessments submitted by all certified home health agencies in the United States in calendar years 2004 and 2005 were identified. They were linked to corresponding OASIS admission assessments to create home health episodes. The data were obtained from the University of Colorado, the CMS OASIS contractor, and analyzed as part of a larger research project funded by the U.S. Office of the Assistant Secretary for Planning and Evaluation (ASPE). The data file included 6,493,623 home health episodes. Our analyses were restricted to the 5,585,931 episodes where patients were age 65 or older at admission. The one exception is the distribution of home health episodes by age category reported in Figure 1, which is based on all 6,493,623 episodes.

There are some limitations inherent in using OASIS data. Collection and submission of OASIS is not required for patients: (1) receiving only personal care, chore, or housekeeping services; (2) paying privately; or (3) receiving services from organizations or individuals who are not certified home health agencies. The great majority of older persons receiving relatively short-term skilled care from agencies certified by Medicare or Medicaid, however, is likely to be included in OASIS because almost all older adults are Medicare beneficiaries and

few are thought to pay privately for skilled home healthcare. National data are not available, however, to document the proportion of home health episodes excluded from our OASIS file.

Definition of Study Variables

The study variables include patient age, home health LOS, chronic conditions, and cognitive function. Patient age was determined from the date of birth recorded on the OASIS tracking sheet. LOS is the number of days between admission and discharge from the home health agency. It includes the time spent in inpatient facilities when patients were transferred to an inpatient provider, but not discharged, and subsequently returned to the same home health agency.

Eighteen chronic condition groups were created based on a review of the literature and input from two clinical experts who served on a Technical Advisory Group for the ASPE research project. (See Table A1 for a list of ICD-9-CM codes defining each of the 18 chronic condition groups.) We classified patients as having one or more of the 18 chronic conditions using information recorded in the medical diagnosis fields on the admission OASIS. The primary and a maximum of five other diagnoses can be recorded (OASIS items M0230 and M0240) and, under certain circumstances, an additional Medicare payment-related diagnosis can be recorded in a separate field (M0245). The instructions for these items are to list each diagnosis and the ICD-9-CM code for which the patient is receiving home healthcare.

Cognitive impairment was defined as “none,” “mild,” and “moderate to severe” based on the OASIS cognitive functioning item (M0560). No impairment was defined as “alert/oriented, able to focus and shift attention, comprehends and recalls task directions independently.” Mild impairment was defined as “requires prompting (cuing, repetition, reminders) only under stressful or unfamiliar conditions.” Moderate to severe impairment was defined as “requires assistance and some direction in specific situations (e.g., on all tasks involving shifting of attention), or consistently requires low stimulus environment due to distractibility,” or “requires considerable assistance in routine situations; is not alert and oriented or is unable to shift attention and recall directions more than half of the time,” or “totally dependent due to distur-

bances such as constant disorientation, coma, persistent vegetative state, or delirium.”

A limitation of the study is that both chronic conditions and cognitive impairment are likely to be underreported on OASIS. As noted above, the OASIS instrument limits the number and type of medical diagnoses that can be recorded to a primary and up to five secondaries *for which the patient is receiving home healthcare*. Medicare prospective payment system financial incentives encourage reporting of diagnoses that support the need for therapy services, and agencies increasingly record ICD-9-CM V-codes that indicate, for example, “aftercare following surgery or other procedures” (V58) and “rehabilitation procedures” (V57) rather than the underlying medical condition. For these reasons, some chronic conditions are likely to be omitted (or “crowded out”) on OASIS. Assessment of cognitive functioning is based on provider observation. Anecdotal comments suggest that agency staff may be reluctant to report cognitive impairment due to limited resources to address the problem, risk of denial of home health services, and possible nursing home placement of the patient.

It is difficult to know whether underreporting is random or more likely to occur when chronic conditions and cognitive impairment appear to be well controlled. In the former case, the LOS findings do not require qualification; in the latter case, the results reported here describe the impact on LOS of chronic conditions and cognitive impairment of greater concern to admitting clinicians. The reliability of the OASIS cognitive function item (M0560) is acceptable (Kinatukara, Rosati, & Huang, 2005) but no data are available on medical diagnoses. Despite these limitations, OASIS is an important—and currently the best—source of national data on the clinical status of older Medicare and Medicaid beneficiaries admitted to home healthcare.

Analyses

Secondary data analysis of home health episodes constructed from OASIS assessments was conducted to examine the distribution of key study variables and their relationship with home health LOS. Because all episodes for persons age 65 or older at the time of home health admission were analyzed, not a sample of episodes, the statistical significance of differ-

ences was not tested. We focus instead on the magnitude of the observed differences (e.g., the difference in mean LOS among groups defined by chronic conditions) when describing the results. All analyses were conducted using SAS version 9.13 (SAS Institute, Cary, NC). Approval was obtained from the VNSNY institutional review board (IRB) to conduct the analyses.

Results

Figure 1, based on all 6.5 million OASIS episodes ending in 2004 and 2005, confirms that most home healthcare funded by the Medicare or Medicaid programs is *geriatric care*. The age of patients on admission was 65 or older for 85.6% of the home health episodes. The largest share (38.8%) was provided to persons age 75–85, with 21.7% of all episodes provided to persons 85 years or older. The remainder of our analyses concerns the 5.6 million home health episodes of individuals 65 or older on admission.

The prevalence of reported chronic conditions on admission is reported in Table 1 in descending order of frequency. Hypertension is the most frequent chronic condition (29.8%), with diabetes (20.7%) and arthritis and musculoskeletal diseases (15.6%) second and third. Other conditions prevalent in over 5% of the episodes include heart failure (12.5%), chronic pulmonary disease (11.8%), acute myocardial infarction or chronic ischemic heart disease (11.2%), cardiac dysrhythmia (8.6%) and stroke, or late effects of a cerebrovascular accident (8.3%). These frequencies are lower than the numbers that have been reported for the general population over 65 years for some conditions; for example, 53.3% of community residents age 65 or older reported having hypertension according to the National Health Interview Survey (Adams, Lucas, & Barnes, 2008). The potential reasons for the lower estimates of chronic conditions on OASIS were discussed above.

The distribution of the number of chronic conditions reported on admission follows the prevalence estimates for the individual conditions (Table 1). Most home healthcare for older adults involves managing one or more chronic conditions. Three-quarters of all episodes (75.1%) were provided to patients with medical diagnoses classified into one or more of the 18 chronic condition groups. One third of the episodes (33.0%) were provided to

Table 1. Distribution of Chronic Conditions and Cognitive Functioning on Admission

Percent distribution of chronic conditions ^a	
Hypertension	29.8
Diabetes	20.7
Arthritis and musculoskeletal diseases	15.6
Heart failure	12.5
Chronic pulmonary disease	11.8
Acute myocardial infarction; chronic ischemic heart disease	11.2
Cardiac dysrhythmia	8.6
Stroke or late effects of CVA	8.3
Dementia	4.4
Neurological diseases other than Alzheimer's and other cerebral degeneration	3.8
Alzheimer's or other cerebral degeneration	2.8
Cancer: metastatic or primary with poor prognosis	2.6
Depression	2.5
Peripheral vascular disease	2.4
Chronic hepatic renal disease	1.7
Skin ulcer	1.1
AIDS/HIV	<0.1
Genitourinary diseases	<0.1
Percent distribution of number of chronic conditions	
None	24.9
One or more conditions	75.1
One only	33.0
Two only	25.0
Three only	12.6
Four only	3.8
Five or more	0.7
Cognitive functioning	
No impairment	63.9
Mild impairment	23.7
Moderate to severe impairment	12.5

Notes. The total number of home health episodes on which the percentages are based is 5,585,931.

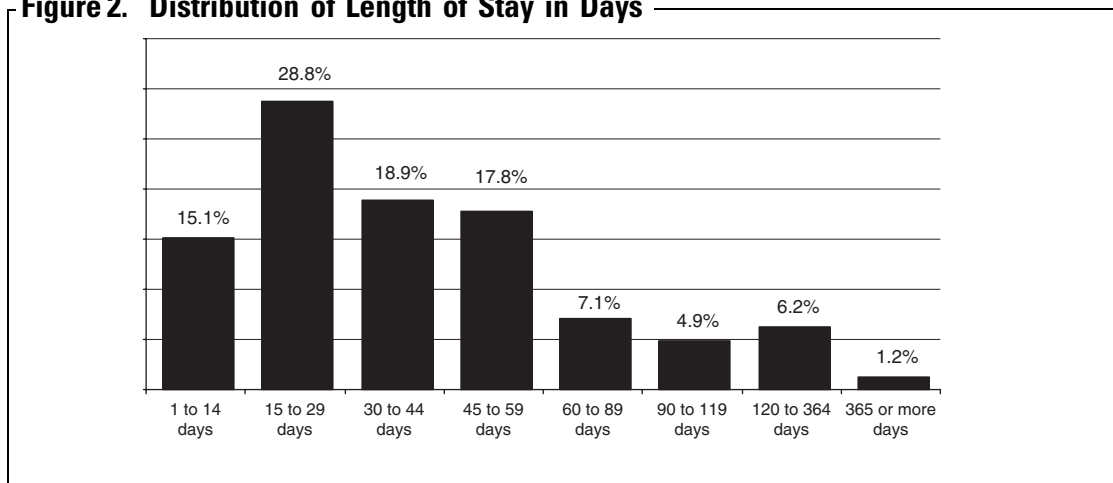
See Appendix Table A1 for listing of ICD-9-CM codes defining each chronic condition group.

See Methods section for definition of cognitive functioning.

^aPercents do not sum down the column to 100% because all home health diagnosis fields were examined on the Start-of-Care OASIS and patients can have diagnoses in more than one chronic condition group.

patients with only one of the 18 chronic conditions, one quarter (25.0%) to patients with two chronic conditions, and the balance of episodes (17.1%) to patients with three or more chronic conditions. These chronic conditions were not necessarily listed as the primary reason for home care. Regardless, they are likely to have affected the plan of care as well as outcomes such as function, rehospitalization, and discharge disposition.

Table 1 also describes cognitive function, according to OASIS data, on admission. Home health patients were assessed as being cognitively impaired in 36.2% of episodes (cal-

Figure 2. Distribution of Length of Stay in Days

culated from numbers in Table 1). Patients were assessed as mildly cognitively impaired in 23.7% of episodes and moderately to severely impaired in 12.5% of episodes.

The distribution of home health LOS is reported in Figure 2. The mean and median LOS for all episodes was 53.4 and 34.0 days, respectively (not shown). The relatively large difference between the mean and median in-

dicates that LOS is skewed. The great majority (80.6%) of home health episodes ended within 60 days of admission (calculated from numbers reported in Figure 2) while only 1.2% lasted a year or more.

The relationship between LOS and the number of chronic conditions patients had on admission is examined in Table 2. Table 3 examines the impact of the combination of a

Table 2. Impact of Multiple Chronic Conditions on Length of Stay in Days

Index Condition	Index Condition Only	One Additional Condition	Two Additional Conditions	Three or more Additional Conditions
Hypertension				
Mean LOS	56.1	62.5	69.4	77.8
Median LOS	35	38	43	48
Diabetes				
Mean LOS	59.4	64.9	70.7	78.5
Median LOS	37	40	43	48
MI or chronic ischemia; cardiac dysrhythmias				
Mean LOS	43.7	52.7	61.8	73.3
Median LOS	29	34	38	45
Arthritis – musculoskeletal disease				
Mean LOS	43.1	60.5	74.0	86.8
Median LOS	29	37	46	54
Heart failure				
Mean LOS	53.3	59.3	66.8	75.8
Median LOS	35	38	42	47
Chronic pulmonary disease				
Mean LOS	49.1	56.1	63.9	74.0
Median LOS	33	36	40	46
Stroke or late effects CVA				
Mean LOS	53.0	62.5	71.6	81.4
Median LOS	36	40	44	49

Note. Episodes where patients had more than one index condition are included more than once in the table (i.e., they are included in the analyses reported on each row for their index conditions).

chronic condition and cognitive impairment on LOS. In both of these analyses the seven chronic conditions that were most prevalent (i.e., those where >5% of admissions had the condition; see Table 1) were used as index conditions.² The LOS for the home care episode, in the case of Table 2, was calculated for patients who had the index condition alone, the index condition and one additional chronic condition from among the seven, the index condition and two additional chronic conditions, and the index condition and three or more chronic conditions from among the seven. An analogous process was followed to calculate LOS in Table 3.

The relationship between the number of chronic conditions and LOS is clearly demonstrated in Table 2. With each additional condition, the mean and median LOS increased across all seven of the index conditions. However, there is some variation in the magnitude of the effect of an increasing number of comorbidities on LOS across index conditions. For example, among episodes with arthritis-musculoskeletal disease as the index condition, the mean LOS more than doubled from 43.1 days when *only* the index condition was present to 86.8 days for episodes with the index condition and three comorbidities. In contrast, the increase was far more modest with diabetes (the corresponding means are 59.4 and 78.5 days, respectively).

Table 3 reports the results of a similar analysis in which the same index chronic conditions are used and the effect on LOS of adding cognitive impairment is examined. Just as LOS increased with additional chronic diseases, LOS increased with cognitive impairment. Among persons with hypertension, for example, there was roughly a 20-day difference in the mean LOS between those with and without cognitive impairment. Generally, the magnitude of the difference in LOS between patients with moderate to severe cognitive impairment compared with those with mild impairment is trivial.

²In the analyses reported here, we combined two groups of cardiac diagnoses (i.e., the acute myocardial infarction and chronic ischemic heart disease, and the cardiac dysrhythmia groups) into a single cardiac diagnosis group to simplify the presentation of the results. Heart failure, however, remained a separate group because of the clinical importance of this condition for home health practice and outcomes.

Table 3. Impact of Chronic Conditions and Cognitive Impairment on Length of Stay in Days

Index Condition	No Cognitive Impairment	Mild Cognitive Impairment	Moderate to Severe Cognitive Impairment
Hypertension			
Mean LOS	55.3	76.0	75.4
Median LOS	35	47	45
Diabetes			
Mean LOS	59.0	77.2	76.9
Median LOS	37	47	46
MI or chronic ischemia; cardiac dysrhythmias			
Mean LOS	48.6	65.8	67.0
Median LOS	31	41	41
Arthritis – musculoskeletal disease			
Mean LOS	48.7	72.8	73.0
Median LOS	31	45	44
Heart failure			
Mean LOS	56.6	71.0	69.4
Median LOS	37	44	42
Chronic pulmonary disease			
Mean LOS	52.8	66.9	66.3
Median LOS	34	42	41
Stroke or late effects CVA			
Mean LOS	54.0	67.2	72.6
Median LOS	36	43	43

Note. Episodes where patients had more than one index condition are included more than once in the table (i.e., they are included in the analyses reported on each row for their index conditions).

Discussion

In 2003 the Institute of Medicine concluded that improving the healthcare provided to people with multiple chronic conditions is a national priority (Adams & Corrigan, 2003). Federal grant programs explicitly single out the management of multiple morbidities and complex patients as focus areas (AHRQ, 2005, 2007), and journal issues and task forces have been devoted to these topics (Vogeli et al., 2007; Yancik et al., 2007). The prevalence of multimorbidity among older home health patients confirmed by the data presented in this article suggests that home care agencies are serving complex patients. The results further document that both multiple chronic conditions and cognitive impairment are associated with longer home health LOS, suggesting that these clinically complex patients present care planning and management challenges. The current attention to multiple morbidities in the overall healthcare system should be mirrored

in quality improvement and quality assurance efforts in home healthcare.

Many policy and practice changes will be required for home health providers to care effectively for these complex patients. Our findings reinforce the importance of addressing two key issues. First, it is vital that chronic conditions and cognitive function be accurately assessed and recorded because OASIS is used for national-, agency-, and patient-level quality assurance. Given the limitations of current reporting of medical conditions on OASIS, consideration should be given to including a chronic disease checklist as part of the admission OASIS assessment. Similarly, new methods for rigorously assessing mental status being tested in a CMS demonstration (RTI International, 2008) should be considered for inclusion in OASIS.

Second, the knowledge and tools needed to provide effective care to persons with multimorbidity and cognitive impairment are largely lacking. A review of clinical practice guidelines for 15 common chronic conditions found that the majority do not address older people with multiple conditions and that their application to individuals with typical combinations of conditions would result in complicated care plans involving multiple, often costly medications and conflicting patient self-care instructions (Boyd et al., 2005). Currently, guidelines and evidence-based practice recommendations do not, with one identified exception (Brown, Mangione, Saliba, & Sarkisian, 2003), address the complexity associated with multiple conditions. Furthermore, they do not routinely incorporate diversity among older people in life expectancy, health risks, and care preferences (Durso, 2006). Efforts to identify effective interventions (Smith, Soubhi, Fontin, Hudon, & O'Dowd, 2007) and test new models of care organization (Boyd et al., 2007) that address the challenges inherent in multimorbidity are in their infancy. The results of early efforts are mixed (Counsell et al., 2007), and none that we know of explicitly address the needs of clinicians in home care. Similarly, cognitive impairment is a condition with significant implications for home healthcare and self-management. Despite its prevalence, other research suggests that dementia is the "elephant in the room" whose presence is known but rarely acknowledged due to a combination of provider beliefs, agency policies, and interpretations of eligibility and payment criteria

(Cabin, 2007). As a result, there is a dearth of rigorously tested care practices for maximizing the functional capacity of individuals with cognitive deficits.

In summary, the data reported in this article and the current state of science suggest that much work remains to be done in accumulating evidence relevant to addressing complexity in home care. This effort is critical to effective quality improvement in home healthcare for older adults. Better assessment and the development and evaluation of care plans appropriate for patients with common combinations of chronic conditions (e.g., diabetes and hypertension) as well as different levels of cognitive function are steps that can be taken now to improve home healthcare.

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Table A1. Medical Diagnoses Used to Identify Persons with Chronic Conditions

Chronic Condition Group		
1.	HIV/AIDS	042–044
2.	Metastatic cancer or primary cancer with poor prognosis	196–199
	Esophagus	150
	Stomach	151
	Pancreas	157
	Trachea, bronchus, and lung	162
	Pleura	163
	Ovary and other uterine adnexa	183
	Brain	191
	Lymphosarcoma and reticulosarcoma	200
	Leukemia of unspecified cell type	208
3.	Diabetes	250
4.	Dementia	
	Senile and presenile organic psychotic conditions	290
	Alcohol amnesic syndrome	291.1
	Other alcoholic dementia	291.2
	Other organic psychotic conditions (chronic)	294
5.	Depression	
	Chronic depressive personality	301.12
	Prolonged depressive reaction	309.1
	Depressive disorder, not elsewhere classified	311
6.	Alzheimer's or other cerebral degeneration	
	Cerebral degenerations usually manifest in childhood	330
	Alzheimer's disease	331.0
	Pick's disease	331.1
	Senile degeneration of brain	331.2
	Other cerebral degenerations	331.3– 331.9
7.	Other neurological diseases	
	Parkinson's disease	332
	Other extrapyramidal diseases and abnormal movement disorders	333.4– 333.5
	Motor neuron disease, including ALS	334–335
	Multiple sclerosis	340
	Other demyelinating diseases of central nervous system	341
	Hemiplegia and hemiparesis	342
	Cerebral palsy	343
	Other paralytic syndromes	344
8.	Hypertension	401–405
9.	Acute myocardial infarct or chronic ischemic heart disease	410
	Angina pectoris	413
	Other forms of chronic ischemic heart disease	414
10.	Cardiac dysrhythmias	427
11.	Heart failure	428
12.	Stroke or late effects of CVA	430–436 438
13.	Peripheral vascular disease	443
14.	Chronic pulmonary disease	
	Bronchitis not specified as acute or chronic, chronic bronchitis, emphysema	490–492
	Asthma	493
	Bronchiectasis with or without acute exacerbation	494
	Extrinsic allergic alveolitis; chronic airway obstruction not elsewhere to classified; coal worker's pneumoconiosis; asbestosis; pneumoconiosis due other silica or silicates; pneumoconiosis due to other inorganic dust; pneumonopathy due to inhalation of other dust; pneumoconiosis unspecified	495–505

(continued)

Table A1. Medical Diagnoses Used to Identify Persons with Chronic Conditions

(Continued)

Chronic respiratory conditions due to fumes and vapors	506.4
Pulmonary fibrosis	515
15. Chronic hepatic or renal diseases	
Severe chronic liver disease	
Chronic hepatitis C with hepatic coma	070.44
Chronic hepatitis C without mention of hepatic coma	070.54
Chronic liver disease and cirrhosis	571
Liver abscess and sequelae of chronic liver disease (portal hypertension)	572.3
Liver abscess and sequelae of chronic liver disease (other sequelae of chronic liver disease)	572.8
Person with a condition influencing their health status, organ or tissue replaced by transplant, liver	V42.7
Nephrotic syndrome	581
Chronic glomerulonephritis	582
Rapidly progressive glomerulonephritis with lesion	583.4
Chronic kidney disease	585
Encounter for dialysis and dialysis catheter care	V56
16. Skin ulcer	
Stage 3 or 4 only	b
17. Genitourinary diseases	
Chronic prostatitis	601.1
18. Arthritis & musculoskeletal diseases	
Diffuse diseases of connective tissue	710
Rheumatoid arthritis and other inflammatory polyarthropathies	714
Osteoarthritis and allied disorders	715
Ankylosing spondylitis and other inflammatory spondylopathies	720
Polymyalgia rheumatica	725
Osteoporosis	733

^aInternational Classification of Diseases, 9th revision, Clinical Modification.

^bA diagnosis of a stage 3 or 4 skin ulcer is based on a Start-Of-Care OASIS item (M0360 = 3 or 4) and not an ICD-9 diagnosis code.