Predictors of Place of Death for Seniors in Ontario: A Population-Based Cohort Analysis*

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RÉSUMÉ

Nous avons déterminé le lieu du décès de la totalité des 58 689 personnes âgées (âge $\geq$ 66 ans) en Ontario qui étaient décédées pendant l'exercice 2001-2002. La relation entre le lieu du décès et les caractéristiques médicales et sociodémographiques a été examinée à l'aide d'un modèle logit multinomial. La moitié (49,2 %) de ces personnes étaient mortes à l'hôpital, 30,5 % dans un établissement de soins de longue durée, 9,6 % à la maison tout en recevant des soins à domicile et 10,7 % à la maison alors qu'ils ne recevaient pas de soins à domicile. La comorbidité était le plus fort prédicteur du lieu de décès ($p < 0,0001$). Les personnes atteintes de cancer mourraient probablement à la maison tout en recevant des soins à domicile ; les personnes âgées souffrant de démence allaient probablement mourir dans un établissement de soins prolongés ; celles se trouvant en phase aiguë allaient probablement mourir à l'hôpital. Les personnes dont le statut socio-économique était plus élevé avaient plus de chances de mourir à la maison, mais cet élément a peu contribué au modèle. Une planification et une attribution des ressources appropriées peuvent aider à déplacer le lieu de décès des hôpitaux vers les maisons de soins infirmiers ou vers les services communautaires, selon les préférences de chacun.

ABSTRACT

Place of death was determined for all 58,689 seniors (age $\geq$ 66 years) in Ontario who died during fiscal year 2001/2002. The relationship of place of death to medical and socio-demographic characteristics was examined using a multinomial logit model. Half (49.2 %) of these individuals died in hospital, 30.5 per cent died in a long-term care facility, 9.6 per cent died at home while receiving home care, and 10.7 per cent died at home without home care. Co-morbidities were the strongest predictors of place of death ($p < 0.0001$). A cancer diagnosis increased the chances of death at home while receiving home care; seniors with dementia were most likely to die in LTC facilities; and those with major acute conditions were most likely to die in hospitals. Higher socio-economic status was associated with greater probability of dying at home but contributed little to the model. Appropriate planning and resource allocation may help move place of death from hospitals to nursing homes or the community, in accordance with individual preferences.

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Introduction

Increasingly, research evidence from Canada and other countries indicates that people wish to die at home.[1–5] Many individuals and their families prefer to avoid the technologically focused end-of-life care that is common in hospitals[2] and feel that palliative care at home better allows privacy and family closeness in familiar surroundings at the time of death.[6] Yet, despite this evidence, a large proportion of people in industrialized countries spend their last days in hospitals and other institutional settings.[2,7,8]

The inconsistency between preference and actual place of death has heightened research interest in the determinants of place of death. Several studies have reported that factors predictive of hospital and long-term care (LTC) facility death include increased age[7–14]; female gender[7,10,15,16]; being single as opposed to married or in a common-law relationship[5,8–10,17]; and having a lower income, less education, or lower socio-economic status.[5,7,8,10,18] Among Canadian residents, those born outside the country are significantly more likely to die in hospital than those born in Canada.[16] Decreased physical functioning and increased severity of illness are associated with increased rates of hospital death.[5,6] Higher availability of hospital beds and nursing homes in one's neighbourhood is associated with increased chances of death in institutions (i.e., hospitals and LTC facilities).[10,19] Conversely, availability of hospice services increases the likelihood of death at home,[8,17,20,21] as does the availability of home care insurance.[10,20,21] People with younger, female, or unemployed caregivers and those with multiple primary caregivers are more likely to die at home.[8,15] Death at home is also more likely when the primary caregiver is the care recipient's partner or offspring.

Recent studies conducted in the Canadian provinces of Nova Scotia and Manitoba examined the predictors of place of death in province-wide cohorts. In Nova Scotia, females and younger cancer patients were more likely to die in hospital.[22] In Manitoba, for seniors with cancer, dying at home while receiving home care was the most likely, followed by dying in hospital and dying in an LTC facility. In contrast, seniors with cardiovascular diseases were most likely to die at home without home care and least likely to die in hospital. Regional variations also influenced place of death in Manitoba, with northern and southern residents less and more likely respectively to die in institutional settings than residents of Winnipeg—the largest urban centre of the province.[23]

Our study is the first to examine the role of socio-economic and regional differences (in addition to medical characteristics) in determining place of death in a province-wide cohort of Ontarians, and it is also the first in Ontario to differentiate among four places of death. In common with the other Canadian provinces, Ontario provides universal insurance that covers medically necessary physician and hospital services. Long-term care facility costs and the costs of home care are also covered by public insurance, subject to means-tested co-payment fees for particular services. Comparisons between Ontario's experiences and those of other jurisdictions may provide valuable information about the forces that affect place of death and about the health care services needed in order to shift the emphasis away from hospital death. In support of these aims, this study (a) determined the place of death of all Ontario residents 66 years of age and older who died in fiscal year (FY) 2001/2002 and (b) identified the socio-demographic predictors of place of death for these seniors.

Methods

Study Design and Data Sources

This study was a retrospective statistical analysis of administrative data on the cohort of Ontario seniors who died in FY 2001/2002 (April 1, 2001–March 31, 2002). Ontario provides comprehensive health care coverage for all medically necessary services to all eligible residents, through the Ontario Health Insurance Plan (OHIP). Supplementary private insurance for publicly insured services is prohibited in Ontario.[24] Thus, the administrative databases associated with OHIP provide a reasonably comprehensive picture of the health care obtained by Ontario residents. Data were derived from six administrative databases obtained from the Ontario Ministry of Health and Long-Term Care. The Registered Persons Database (RPDB) contains demographic information: age, sex, postal code, and date of death (where applicable) for all Ontario residents with OHIP coverage. The hospital discharge abstracts provide diagnostic information associated with all in-province hospitalizations and indicate whether the patient died while in the hospital; hospitals are required to report all same day and in-patient procedures to this registry. The OHIP physician claims database contains a record of most physician services, including a diagnostic code indicating the reason for the visit. Information about LTC was obtained from two databases. The Ontario Chronic Care Patient System database contains records of admissions and discharges from chronic care institutions and chronic care beds within acute care hospitals. All Ontarians aged 65 and older receive prescription drug coverage under the Ontario Drug Benefit

Plan (ODB). The ODB database, which records all out-patient prescription drug claims, contains a field that indicates whether the person was living in a LTC facility at the time the prescription was filled. Finally, the Ontario Home Care Administration System database records all publicly funded home care visits. The databases were linked using encrypted identifiers unique to each individual. These identifiers allowed us to extract longitudinal health care information from different sources while maintaining patient anonymity. Neighbourhood characteristics were obtained from the 2001 Canadian census and from the 2002 *Guide to Canadian Healthcare Facilities*.[25]

Study Population

Individuals were included in the sample if they were alive and at least 66 years of age at the start of FY 2001/2002. This ensured that everyone in the sample was eligible for prescription drug coverage (used to identify deaths in LTC) during the period prior to her/his death. A total of 61,237 deaths were identified from the RPDB. Individuals with out-of-province postal codes ($n = 1{,}325$; 2.2 %) were dropped. As well, individuals who had not used any provincially insured services in the 1-year period prior to the date recorded for their death were assumed to have moved out of the province and were excluded ($n = 233$; 0.4 %). Individuals having health care claims that post-dated their recorded date of death by more than 30 days were excluded ($n = 990$; 1.7 %) because the presence of ongoing health care claims suggests that they were incorrectly classified as being dead (claims may legitimately be submitted for a short period after death). The final cohort included 58,689 deaths.

Predictors of Place of Death

Age, sex, and date of death were obtained from the RPDB. Co-morbidities in the final year of life were determined by obtaining the diagnostic codes from all physician claims and hospital discharge records dated within the year prior to the date of death. Two co-morbidities (dementia and cancer) were singled out for specific examination, as they have previously been found to be important predictors of place of death.[23] Diagnosis of cancer was established using specific *international classification of disease–9* (ICD-9) codes for primary and metastatic cancer, and presence of dementia was determined using a validated algorithm for Ontario administrative data.[26][a] The remaining diagnoses were collapsed, using two complementary systems of disease classification. Dummy variables were created to reflect the presence or absence of each of the diseases in the Deyo adaptation of the Charlson index, a validated measure developed to predict the risk of mortality from co-morbid illness,[27] and then summed in order to capture the burden of illness. The sum of the dummy variables can be expected to be as strong a predictor as more complex schemes using weights.[28] The second algorithm used commercial software to place individuals in *adjusted clinical groups*, which group people according to their expected health care use.[29] Although developed in the United States, this system has been applied to Canadian data by a number of researchers.[30] For this analysis, the groups were collapsed into 11 binary *collapsed adjusted diagnostic group*s (CADGs), which focus on the nature (chronic / likely to recur vs. acute) and severity of each co-morbidity and on whether the co-morbidity requires specialist care. (The twelfth CADG is *pregnancy*, which is not applicable to this study.)

Socio-economic status (SES) was measured using an adaptation of Carstair’s deprivation index,[31] calculated for each forward sortation area (FSA). The 503 FSAs in Ontario (identified by the first three characters of the postal code) contain, on average, approximately 7,000 dwellings. Our deprivation index was the average of three standardized (normalized around zero) measures obtained from the 2001 census: proportion of people living in a low income household; male unemployment rate; and proportion of males employed in *blue collar* occupations.[32] FSAs were also characterized by the proportion of recent (within 5 years) immigrants in the population and by the proportion of the population identified as belonging to a visible minority or as Aboriginal, variables that have been found to be barriers to access to health care.[33,34]

Hospital bed availability was calculated per 1,000 population in the county of residence, and LTC bed availability was calculated per 1,000 population aged ≥ 75 in the county of residence. Lastly, each county was classified as either urban or rural, on the basis of population density.

The outcome variable, place of death, was categorized as (a) hospital, (b) LTC facility, (c) home with home care, or (d) home without care. Almost all hospital deaths (99.6 %) were in acute care hospitals, with the remainder in psychiatric or rehabilitation hospitals. Place of death was categorized as *hospital* if the patient died in a hospital, irrespective of the length of hospital stay. The LTC facility category included publicly funded nursing homes, municipal homes for the aged, charitable homes, and complex continuing care beds in hospitals. The home with home care category captured individuals who did not die in a hospital or LTC facility and who received publicly funded home care during the 30 days preceding their death. The remaining individuals in the cohort were classified as having died at home without care. Individuals in this category may have died in their own homes or in private retirement homes but were not receiving publicly financed home care at the time of death.

Statistical Analyses

Because the outcome variable, place of death, had four categories, with no inherent ordering among the categories, multinomial logit analysis was used to identify characteristics that distinguished among the possible places of death. The multinomial analysis was supplemented with pair-wise logistic regressions in order to obtain the adjusted R^2, a measure of the predictive ability of the model. (The adjusted R^2 is a generalization of the conventional coefficient of determination, adjusted for the upper bound.[35])

All tests of significance were two-tailed. Due to the large number of observations, a 0.01 level of significance was used. Analyses were performed using SAS, version 8.0. This study received University of Toronto ethics approval.

Results

Just over half (52.7 %) of the cohort was female. The average age at the time of death was 80 years. More than 85 per cent had at least one Charlson index co-morbidity in the year preceding death; 34 per cent of the cohort had a diagnosis of cancer, and 28 per cent had a diagnosis of dementia. Both minor and major acute medical conditions as well as chronic conditions were the rule, with more than 80 per cent of the cohort falling into the CADG categories capturing these conditions (Table 1).

Availability of hospital and LTC beds varied considerably, with one county having no hospitals and one having no LTC facilities. Neighbourhood demographics likewise showed considerable variation, ranging from neighbourhoods with no recent immigrants to those in which almost one third of the population were recent immigrants (Table 1).

Table 1: Socio-demographic characteristics of seniors in Ontario who died in FY 2001/2002

Characteristic	Number (%) of people
Age (years)	
66–74	15,618 (26.6)
75–84	23,812 (40.6)
≥85	19,248 (32.8)
Sex	
Female	30,940 (52.7)
Male	27,749 (47.3)
Comorbidities	
Number of Charlson Index Diagnoses	
0	7,771 (13.2)
1–3	37,508 (63.9)
≥4	13,410 (22.9)
Cancer	19,966 (34.0)
Dementia	16,267 (27.7)
Selected Collapsed Adjusted Diagnostic Groups	
Minor acute conditions	49,324 (84.04)
Major acute conditions	51,653 (88.01)
Chronic medical unstable conditions	51,259 (87.34)
Chronic medical stable conditions	43,096 (73.43)
Psychosocial conditions	24,797 (42.25)
Regional Characteristics	Median (range)
Social Deprivation Index	0.2 (-2.2–2.5)
Percent Visible Minorities	6.4 (0–88.2)
Percent Recent Immigrants	1.6 (0–30.4)
Percent Aboriginals	1.0 (0–60.3)
LTC Facility Beds per 1,000 Population Aged ≥75	40.4 (0–104.2)
Hospital Beds per 1,000 Population	2.5 (0–9.7)

Of the 58,689 seniors who died in FY 2001/2002, almost half (49.2 %) died in hospitals, 30.5 per cent died in LTC facilities, 9.6 per cent died at home while receiving home care, and the remaining 10.7 per cent died at home without care (Table 2). The regression model showed good ability to predict place of death, and in particular, it discriminated between death at home with no home care and the other three alternatives. The adjusted R^2 value was 0.42 for death at home versus death in a hospital, 0.45 for death at home versus death in LTC, and 0.33 for death at home versus death at home with home care (Table 3).

The probability of dying away from home increased with increasing age. In particular, the probability of dying in LTC increased with increasing age. While seniors from ages 66 to 84 were most likely to die in hospital, the probability of dying in hospital decreased with increasing age. After the age of 85, seniors were more likely to die in LTC than in

Table 2: Place of death by age of seniors in Ontario who died in FY 2001/2002

Age (years)	Number (%) of people				
	Hospital	Long-Term Care Facility	Home with Home Care	Home without Care	Total
66–74	8,800 (56.3)	2,409 (15.4)	1,912 (12.2)	2,508 (16.1)	15,629 (100.0)
75–84	12,458 (52.3)	6,574 (27.6)	2,291 (9.6)	2,489 (10.5)	23,812 (100.0)
≥85	7,639 (39.7)	8,894 (46.2)	1,454 (7.6)	1,261 (6.6)	19,248 (100.0)
Total	28,897 (49.2)	17,877 (30.5)	5,657 (9.6)	6,258 (10.7)	58,689 (100.0)

Table 3: Adjusted R^2 value for pair-wise comparisons of place of death for selected individual predictors and for the full model

Predictor	Comparison					
	Hospital vs. LTC Facility	Hospital vs. Home without Care	Hospital vs. Home with Home Care	LTC Facility vs. Home without Care	LTC Facility vs. Home with Home Care	Home with Home Care vs. Home Without Care
Cancer	0.037	0.066	0.020	0.011	0.107	0.208
Dementia	0.120	0.027	0.007	0.218	0.155	0.009
Number of Charlson Co-morbidities	0.100	0.214	0.055	0.040	0.003	0.076
CADG: Major Acute Conditions	0.106	0.194	0.038	0.023	0.011	0.075
Social Deprivation	0.000	0.000	0.004	0.000	0.003	0.004
Hospital and LTC Facility Beds	0.002	0.000	0.000	0.002	0.004	0.000
Full model	0.311	0.423	0.132	0.445	0.262	0.334

hospital. For those who did die at home, increased age was associated with an increased probability of receiving home care at the time of death (Table 2). Although the likelihood of dying at home decreased with age for both men and women, women were less likely to die at home than were men (adjusting for all other predictors, including age). For those who died away from home, women were more likely than men to die in an LTC facility rather than in a hospital.

The *best* individual predictors of place of death (defined as having the highest adjusted R^2 values) were cancer, dementia, total number of Charlson index co-morbidities, and an *acute major condition* (all $p < 0.0001$ in the multinomial analysis) (Table 3). More specifically, a diagnosis of cancer was related to increased odds of dying at home with home care and differentiated particularly well between death at home with home care versus death in either LTC or at home with no care (adjusted odds ratio for death in LTC versus death at home with home care for a senior with cancer = 0.48 [95% confidence interval 0.44 to 0.51]; adjusted odds ratio for death at home with home care versus death at home without home care = 5.9 [5.4 to 6.5]). Dementia discriminated well between those who died in LTC and those who died elsewhere (adjusted odds ratio for death in a hospital versus death in LTC for seniors with dementia = 0.35 [95% confidence interval 0.33 to 0.36]; odds ratio of death in LTC versus death at home without home care = 9.3 [8.4 to 10.3]; odds ratio of death in LTC versus death at home with home care = 4.4 [4.0, 4.8]). Increasing numbers of diagnoses were associated with increased likelihood of dying in the hospital. Similarly, one or more diagnoses in the acute major condition group was linked to an increased probability of a hospital death (odds ratio for death in a hospital versus death in LTC for someone with an acute major condition = 4.4

[95% confidence interval 4.0 to 4.8]; odds ratio for death in a hospital versus death at home with home care = 3.5 [3.1, 3.9]; odds ratio for death in a hospital versus death at home with no care = 6.2 [5.6, 6.9]) (Table 4).

Measures of resource availability and county of residence were not important predictors of place of death. Adjusted for the other variables, number of LTC beds was not significant ($p = 0.20$). Hospital bed availability was statistically significant ($p < 0.0001$) but did not add much predictive power to the regression model.

After adjusting for the other variables in the model, the percentage of visible minorities in the area of residence was not significant at the 0.01 level ($p = 0.016$). The remaining SES variables (deprivation, proportion of recent immigrants, and proportion of people with Aboriginal status) were all significant ($p < 0.0001$ in each case). Greater neighbourhood deprivation was related to an increased probability of dying in a hospital or LTC facility, when compared with dying at home (whether with or without home care) (Table 4). Adjusting for the other predictors, an increased proportion of recent immigrants was related to greater odds of dying at home (with or without home care) compared with dying in a hospital or in LTC and with an increased probability of dying in a hospital compared with dying in LTC (Table 4). However, these variables were not strong predictors, and their removal from the model did not have a large effect on its predictive ability.

Discussion

In FY 2001/2002, almost half the deaths of Ontario seniors occurred in hospital. This is consistent with other Canadian studies, in which majority of deaths occurred in hospitals.[2,16,22] Heyland et al. reported that, in 1997, 73 per cent of all deaths in Canada (excluding Manitoba and Newfoundland) and two thirds of all deaths in Ontario occurred in hospital.[2]

Seniors who died of cancer had a higher probability of dying at home while receiving publicly funded home care than did seniors without cancer who died. Similar findings have been reported in Manitoba: Seniors who died of cancer were more likely to have been at home receiving home care than in any other location. In Nova Scotia, although a large proportion of cancer deaths occurred in hospital (74% over a 5-year period in the mid-1990s), a strong upward trend in the proportion of out-of-hospital deaths was noted. Our findings in Ontario are reassuring, given recent concerns over slow investment in home and community care in the province. Increasing odds of home death for seniors with cancer may be an indication of the success of palliative home care programs in enabling cancer patients to spend their last days at home.

Seniors with major acute conditions who die are more likely to die in hospital, which is to be expected, since major acute conditions usually warrant hospital admission and are associated with high short-term mortality. Similarly, among those who die, greater

Table 4: Adjusted* odds ratios (and 95% confidence intervals) for selected predictors of place of death

Predictor	Comparison					
	Hospital vs. LTC Facility	Hospital vs. Home without Care	Hospital vs. Home with Home Care	LTC Facility vs. Home without Care	LTC Facility vs. Home with Home Care	Home with Home Care vs. Home without Care
Cancer	1.11 (1.06–1.17)	3.28 (3.01–3.57)	0.52 (0.49–0.56)	2.69 (2.44–2.95)	0.48 (0.44–0.51)	5.94 (5.39–6.54)
Dementia	0.35 (0.33–0.36)	2.14 (1.92–2.39)	1.36 (1.25–1.49)	9.26 (8.40–10.3)	4.35 (4.00–4.76)	1.51 (1.32–1.73)
Number of Charlson Co-morbidities	1.22 (1.20–1.24)	1.72 (1.67–1.77)	1.22 (1.20–1.25)	1.27 (1.23–1.31)	1.01 (0.99–1.04)	1.25 (1.21–1.30)
CADG: Major Acute Conditions	4.40 (4.02–4.81)	6.22 (5.59–6.91)	3.46 (3.08–3.89)	1.15 (1.05–1.26)	0.71 (0.64–0.79)	1.69 (1.51–1.90)
Social Deprivation	Not significant	1.17 (1.10–1.25)	1.28 (1.21–1.36)	1.18 (1.10–1.27)	1.30 (1.22–1.39)	Not significant
% Recent Immigrants	1.02 (1.02–1.03)	Not significant	Not significant	0.96 (0.95–0.97)	0.97 (0.96–0.98)	Not significant
Hospital Bed Availability	0.95 (0.92–0.98)	1.15 (1.10–1.21)	Not significant	1.19 (1.13–1.26)	Not significant	1.14 (1.07–1.22)

* Odds ratios are adjusted for all of the variables in the model (age, sex, co-morbidities, socio-economic and neighbourhood descriptors, and regional descriptors).

burden of illness, measured by the number of Charlson index co-morbidities, is associated with greater likelihood of institutional death – in hospitals, followed by LTC facilities.

Seniors with dementia in their last year of life were most likely to die in nursing homes and other LTC facilities. This is, in large part, due to the fact that dementia is a key factor in facility admission. There is some evidence to suggest that depression and perceived burden of care among caregivers increase with decline in functional status of care recipients.[36,37] It is possible that the caregiving burden of dementia and other psychosocial conditions is greater than the burden of physiologically deteriorative conditions.[38] An examination of Ontario's current respite programs for informal caregivers may help identify areas for improvement with respect to care of frail elderly prior to facility admission.

The social deprivation index used to capture the effect of SES was statistically significant but not a strong predictor of place of death after adjusting for co-morbidities. Seniors in areas with higher social deprivation were more likely to die in hospital than at home and more likely to die in LTC facilities than at home or in hospital. This is consistent with findings in other studies, in which likelihood of home death increased with higher SES.[5,8,9,12,15] Seniors with lower SES who die at home are more likely to be receiving home care than not. This suggests that for seniors dying at home in Ontario, SES is not a deterrent to receiving home care.

The increased likelihood of home death as opposed to LTC facility death for individuals in areas with high proportions of recent immigrants is of interest, in the context of high rates of immigration into Ontario. The trend towards increased home death in immigrant communities may be due to an opposition to institutional death, to the unfamiliarity of and stigma associated with care in nursing homes, or to a lack of LTC that caters to diverse ethnic backgrounds.[39] Alternatively, there may be barriers to accessing health care for immigrant communities, resulting in greatest likelihood of death at home.

For seniors who died at home, receipt of home care at the time of death differentiated well between seniors with and without co-morbidities such as cancer and dementia. Socio-economic variables, notably social deprivation and percentage of recent immigrants in one's neighbourhood, were not significant predictors in pair-wise comparisons of death at home with home care and without home care. Our findings do not reveal any socio-economic disparities between those individuals in the study population who died at home with home care and those who died at home without home care.

Limitations

Three main limitations of our study should be noted. First, since we relied on administrative data, we were unable to capture the effects of several predictors shown to be significant in other studies, namely preference for place of death, cause of death, marital status, education, caregiver availability and characteristics, and receipt of hospice care.[5–9,40] Second, important variables such as ethnicity and immigrant status could not be determined at the individual level and therefore were captured through ecological variables. County of residence may have been a weak predictor because, in many instances, only a short trip was required to utilize services in a different county. However, the use of neighbourhood-level data to assign SES has been validated elsewhere.[41] Third, since we limited our analysis to deaths that occurred in FY 2001/2002, we did not explore the possibility of temporal shifts in place of death and its determinants.[22] Despite these limitations, the administrative data allowed for analysis of a province-wide cohort, examining predictive factors not only for one or two places of death but for the four most common groupings of place of death. An analysis of this magnitude would have been exceedingly difficult and expensive using prospective trial studies.

Conclusion

Four out of every five Ontario seniors die in institutional settings—hospitals or LTC facilities. Common co-morbidities—dementia, cancer, and major acute conditions—are key predictors of place of death for seniors. Lower socio-economic status is associated with fewer home deaths, but for those dying at home, SES is not a barrier to receipt of home care. With the changing population demographics in Canada, end-of-life care will claim an increasing share of health care resources under the universal health care system. There is some evidence that care provided in the home and community is preferred and more cost-effective than care provided in institutional settings.[3,42] Our findings suggest the need for further examination of factors that influence place of death, particularly for chronically ill individuals whose care may be managed effectively in the community to prevent inappropriate acute care admissions. Further, the findings of this study regarding patterns and predictors of place of death may be used to motivate studies that assess the costs of providing end-of-life care in different settings and to inform policy and planning decisions regarding allocation of health care resources to end-of-life care in different settings.

Note

a Dementia was identified by the presence of an ICD-9 diagnostic code of 2900, 2904, 2941, or 3310 in a hospital discharge record or a diagnostic code of 290+ or 331+ in a physician billing record. (The diagnostic codes used in physician records are ICD-8 based.) Cancer was identified by the presence of an ICD-9 diagnostic code of 140+ through 172+, 174+ through 195+, 200+ through 208+, or 196+ through 199+ in a hospital discharge record or physician billing record. The "+" symbol denotes any diagnosis code which starts with the numbers indicated (e.g., 140+ denotes 140, 1400, 1401, . . ., 1409).

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