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RESEARCH ARTICLE

Cancer Care

Organizational Characteristics and Cancer Care for Nursing Home Residents

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Objective. We evaluate whether organization, market, policy, and resident characteristics are related to cancer care processes and outcomes for dually eligible residents of Michigan nursing homes who entered facilities without a cancer diagnosis but subsequently developed the disease.

Data Sources/Study Design/Data Collection. Using data from the Michigan Tumor Registry (1997–2000), Medicare claims, Medicaid cost reports, and the Area Resource File, we estimate logistic regression models of diagnosis at or during the month of death and receipt of pain medication during the month of or month after diagnosis.

Principal Findings. Approximately 25 percent of the residents were diagnosed at or near death. Only 61 percent of residents diagnosed with late or unstaged cancer received pain medication during the diagnosis month or the following month. Residents in nursing homes with lower staffing and in counties with fewer hospital beds were more likely to be diagnosed at death. After the Balanced Budget Act (BBA), residents were more likely to be diagnosed at death.

Conclusions. Nursing home characteristics and community resources are significantly related to the cancer care residents receive. The BBA was associated with an increased likelihood of later diagnosis of cancer.

Key Words. Nursing homes, cancer care, Balanced Budget Act

Over 60 percent of cancers diagnosed in the United States occur among adults over the age of 65 (Yancik and Ries 2000; Bourbonniere and Van Cleave 2006), and cancer is the second leading cause of death for this group (Sahyoun et al. 2001). An important but largely unexplored provider for cancer care for the elderly is the nursing home, where the prevalence is estimated to be 9 percent (Johnson et al. 2005).

Cancer and its treatment may prompt some patients to enter a nursing home, while other patients are nursing home residents at the time of diagnosis. The care of this latter group is of particular interest because these patients have

a newly diagnosed condition that is exogenous to nursing home care. How a nursing home responds to a new condition that is unrelated to the quality of care patients receive during their residency (unlike pressure sores, for example) lends insight into the determinants of nursing home quality without the interference of selection that emerges from nonrandom pairing of facilities and patients.

We integrate organization, market, policy, and resident characteristics in a model to explain timeliness of cancer diagnosis and pain management. The study group consists of Medicaid and Medicare-insured (dually eligible) elderly residents of Michigan nursing homes who entered facilities for long-term custodial care without a cancer diagnosis but were subsequently diagnosed with cancer from 1997 to 2000. All had been residents for at least 31 days.

Our study informs two lines of inquiry. First, we address how nursing home and market variables are related to the care provided to residents. The rising number of elderly in the United States, combined with the absence of quality-of-care information on serious, painful, and costly diseases such as cancer, makes this investigation particularly relevant. This study uniquely examines the ability of nursing homes to recognize a condition that is not caused by facility care processes.

The second line of inquiry concerns the 1997 Balanced Budget Act (BBA), which included some of the most substantial payment policy changes for nursing homes in the past two decades. It cut funding for Medicare skilled and rehabilitation care for short-stay residents significantly—by U.S.\$2 billion in 1999 (Medicare Payment Advisory Commission 2003)—and replaced cost-based payment with a prospective pricing system (PPS) phased in for fiscal years (FYs) starting on or after July 1, 1998. Such a large reduction in resources likely affected many internal nursing home care processes. Konetzka et al. (2006a) and Konetzka, Norton, and Stearns (2006b) found that the BBA payment changes for short-stay residents also negatively affected the quality of care for long-stay residents through more deficiencies and higher rates of pressure sores and urinary tract infections.

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Another BBA provision may have affected access of dually eligible residents to outpatient care necessary for cancer diagnosis by allowing states more flexibility in the amount they pay to cover Medicare cost-sharing for the dually Medicare and Medicaid insured. After a deductible is met, Medicare pays 80 percent of an allowable amount. States cover some or all of the deductible and remaining 20 percent for the dually insured. Although they did not specifically examine the dually eligible in nursing homes, Mitchell and Haber (2004/2005) report that after Michigan cut the cost-sharing amounts by nearly 76 percent, as allowed by the BBA, the dually insured in the state had significantly less access to outpatient services relative to the pre-BBA period.

PREVIOUS LITERATURE

Research regarding cancer care in nursing homes is limited but suggests that there is room for improvement. Few nursing home residents with cancer receive chemotherapy or radiation (Buchanan et al. 2005; Johnson et al. 2005; Bradley, Clement, and Lin 2008). This may reflect family, resident, and physician decisions that the benefits of treatment do not outweigh the burden on the resident. However, most residents with cancer also do not receive hospice care (Buchanan et al. 2005; Johnson et al. 2005; Bradley, Clement, and Lin 2008) and pain among nursing home residents with cancer is inadequately treated (Bernabei et al. 1998; Johnson et al. 2005). Other studies show that pain, despite the source, is inadequately controlled among nursing home residents (Won et al. 1999; Tarzian and Hoffman 2004) and that palliative care is underutilized (Hodgson et al. 2006).

Other studies have examined newly admitted nursing home residents already diagnosed (Bernabei et al. 1998; Buchanan et al. 2005) or a cross-section of those with cancer (Johnson et al. 2005). Very little is known about residents who enter a facility without a cancer diagnosis. Bradley, Clement, and Lin (2008) found that cancer is likely to be diagnosed as late stage or unstaged among this group.

With the exception of Bernabei et al. (1998) and Bradley, Clement, and Lin (2008), research regarding cancer care in nursing homes has not controlled for resident characteristics. Nor has it shown how nursing home characteristics are related to resident care. However, researchers are increasingly finding important differences in quality of care across health care organizations after controlling for patient characteristics (Carter and Porell 2003; Troyer 2004).

CONCEPTUAL FRAMEWORK

The conceptual framework for the study, outlined in Figure 1, characterizes care processes and outcomes as a function of resident and organizational characteristics, funding policies, and the market in which the nursing home operates. Care processes include pain management as well as assessing the patient for symptoms and arranging referrals to outside providers.

Since the primary goal of for-profit nursing homes is to maximize profits, they have strong incentives to reduce resources devoted to care, which may result in poorer quality. In contrast, not-for-profit and government-owned nursing homes are assumed to have utility functions that include the quantity and quality of services (Newhouse 1970) and a break-even or target profit constraint (Hoerger 1991). Most evidence shows for-profits provide lower quality care than nursing homes with other types of ownership (Zinn 1994; Spector, Selden, and Cohen 1998; Castle 2000; Harrington et al. 2000; Hillmer et al. 2005; Castle, Engberg, and Men 2008).

Figure 1: Conceptual Framework

Nurse staffing is a key nursing home organizational characteristic that is often related to better performance on process and outcome indicators (Institute of Medicine [IOM] 2001; GAO 2002; Carter and Porell 2003; Harrington 2005; Wan, Zhang, and Unruh 2006). If staff spend more time with residents, they are more likely to distinguish cancer symptoms from those of other chronic conditions and recognize untreated pain.

Nursing home decisions about how they produce services are also influenced by other organizational factors such as payer mix (Bazzoli et al. 2008; Castle, Engberg, and Men 2008). Since Medicaid reimbursement rates are lower than private pay charges and Medicare payments, nursing homes with a higher Medicaid patient load may be less able to provide good quality care (Harrington et al. 2000; Troyer 2004).

Competition for resources and residents is a key feature of the nursing home's market. In more competitive markets, it will be harder to attract, train, and retain nursing staff, and nursing homes may have to pay more for staff. It will also be harder to attract residents, especially higher-paying self-pay residents. Thus, a nursing home will face resource constraints that may lead to poorer care processes and outcomes. In contrast, markets that are richer in other health care resources may augment nursing home services (e.g., with diagnostic services). However, policy changes, such as the BBA reductions, may affect nursing home resources and the ability to refer to outpatient diagnostic services. The post-BBA time period is likely to be associated with less timely diagnosis and poorer pain management.

Finally, resident characteristics influence the process and outcomes of care they receive. Residents who are older or have a diagnosis of dementia may be less able to communicate their symptoms to caregivers and, as a result, may be more likely to be diagnosed later or less likely to receive pain medication than other residents.

METHODS

Data Sources and Sample Selection

The study uses a unique combination of data from the Michigan Tumor Registry, statewide Medicaid and Medicare files, and Medicaid cost reports to extract a study sample of dually eligible nursing home residents with a first primary cancer diagnosis from January 1, 1997, through December 31, 2000. The dually eligible, who have very low incomes and have spent down their resources to be eligible for Medicaid, also tend to be the frailest of the frail elderly.

The Michigan Tumor Registry supplied information on cancer diagnosis and date.¹ Other research regarding cancer among nursing home residents has relied on the Minimum Data Set completed by nursing home staff at admission, upon significant changes in status and routinely on a quarterly basis (Buchanan et al. 2005; Johnson et al. 2005), but it does not show the specific type and stage of cancer or diagnosis date.

Patients in the Tumor Registry were matched to the Michigan state segment of the Medicare Denominator file for the years 1997–2000 using beneficiary Social Security numbers and Health Identification Codes. From the statewide Medicare files, we extracted all claims for inpatient, outpatient, physician, and hospice services during the study period for all patients that correctly matched to the Michigan state segment of the Medicare Denominator file (approximately 89 percent of patients) and enrolled in Medicare Parts A and B and a fee-for-service plan.²

Medicaid-insured patients were identified by matching the Medicaid eligibility files against the Tumor Registry using deterministic and probabilistic methods. The process for linking the Tumor Registry, Medicare, and Medicaid datasets is described more fully elsewhere (Bradley et al. 2007). We limited the sample to patients diagnosed with cancer between 1997 and 2000, those aged 66 or older at the time of diagnosis, and long-term care residents diagnosed with cancer after entering a nursing home. The study subjects were not receiving Medicare-covered skilled or rehabilitation services in the nursing home. To increase the likelihood that staff had time to recognize cancer symptoms and uncontrolled pain, all residents were in the same nursing home for at least 31 days before diagnosis.³

Using the resident's month and year of diagnosis, we matched each patient with nursing home organizational data for the same year from Medicaid nursing home cost reports obtained from the Michigan Department of Community Health, Medical Service Administration with the Medicaid provider identification number. For most residents, the diagnosis month fell within the nursing home's FY; only 16 residents were matched to an FY ending 6 months before diagnosis. We were only unable to match 77 residents (5 percent of the initial 1,408 in the sample) with cost reports. We removed 15 residents who were diagnosed during an FY for which the cost report covered fewer than 180 days. Finally, we matched the sample with data on market characteristics from the Area Resource File for the diagnosis year.⁴ The final sample includes 1,316 residents in 399 nursing homes located in 82 counties in Michigan.

Variables

Two dependent variables serve as indicators of the cancer care nursing home residents received. Timeliness of diagnosis, defined as diagnosis at death or in the same month as death, is a care outcome. Following Bernabei et al. (1998), the second dependent variable is a care process indicator, whether the resident received pain medication during the month of diagnosis or the month following diagnosis. Since pain medication may not be indicated for early stages of cancer, we estimate models for pain using only residents diagnosed with late (i.e., metastatic) or unstaged cancer ($n = 973$). Patients with unstaged cancer have survival probabilities consistent with distant stage disease. Unstaged cancer generally indicates that a treatment plan will not be implemented.

The organizational, market, and policy predictor variables are shown in Table 1 along with descriptive statistics and the expected sign for their coefficients in the models. Nurse staffing is expected to be negatively related to diagnosis at death but positively associated with pain medication. Ownership is indicated by binary variables with not-for-profit as the referent category.

A payer mix that includes a higher percentage of lower-paying Medicaid residents is expected to stress care processes and result in poor outcomes. The sign for the Medicare variable is uncertain. Although there were payment cutbacks for Medicare patients in nursing homes and their higher acuity would require more intense care, Medicare remains a higher payer than Medicaid. In addition, experience with the more acutely ill Medicare patients could improve care for other residents.

Higher occupancy rates may stretch nursing home resources and overburden staff. However, if higher occupancy results from attracting more private pay patients because of perceived better care, higher occupancy may be associated with more care resources.

Market competition from other nursing homes is measured with a county Herfindahl index using nursing home beds. County is a reasonable definition because of funding patterns and many residents are in facilities in the same county in which they had previously resided (Banaszak-Holl, Zinn, and Mor 1996). The number of short-term hospital beds per 1,000 population is included in the models. Since other county health care resources, such as the number of physicians, had a high degree of collinearity with hospital beds, they are excluded.

Three variables examine the effect of the BBA. First, a binary variable for diagnosis in an FY starting on or after July 1, 1998 reflects the immediate

Table 1: Organizational and Market Characteristics Variables, Descriptive Statistics, and Expected Signs for Coefficients

<i>Organizational Characteristics</i>	<i>Definition</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Expected Sign for Diagnosis at Death</i>	<i>Expected Sign for Pain Medication</i>
Nursing hours/pt. day	Total RN, LPN, and aide hours/total nursing home patient days	3.47	0.72	—	+
Ownership					
Not-for-profit (referent)	1 if not-for-profit owned; 0, otherwise	0.26	—	NA	NA
For-profit	1 if for-profit owned; 0, otherwise	0.62	—	+	—
Government	1 if government owned; 0, otherwise	0.13	—	+	—
% Medicaid	Medicaid patient days/total patient days $\times$ 100	72.9	14.2	+	—
% Medicare	Medicare patient days/total patient days $\times$ 100	10.2	7.2	?	?
Occupancy	Total patient days/Total available bed days $\times$ 100	90.4	7.5	+	—
Market characteristics					
County Herfindahl index	$\sum$ (Nursing home beds/total nursing home beds in county) ²	0.199	0.227	—	+
Sht. term general hosp. beds/1,000 pop. in county	Short-term general hospital beds/(total population/1,000)	2.69	1.22	—	+
Post Balanced Budget Act Diagnosis	1 if diagnosed in fiscal year starting on or after July 1, 1998; 0, otherwise	0.51	—	+	—
BBA phase-in	Before BBA (= 0)	0.22	0.26	+	—
Diagnosed after BBRA	1 if diagnosed on or after April 1, 2000; 0, otherwise	0.16	—	—	+

NA, not applicable; BBA, Balanced Budget Act; BBRA, Balanced Budget Refinement Act; ?, unknown.

changes in the cost-sharing payment for outpatient care. While it is possible that the cost-sharing provision also affected nursing homes through their Medicare-skilled care, beneficiaries owe no payment for the first 20 days. The Medicare payer mix variable would also control for the cost-sharing for days 21–100. Second, drawing on Konetzka et al. (2004), to reflect the phase-in of the Medicare PPS, we coded the BBA phase-in as 0 for FYs ending before July 1, 1998; 0.25 for FYs beginning July 1, 1998 through June 30, 1999; 0.50 for July 1, 1999 to June 30, 2000; and 0.75 for FYs beginning on or after July 1,

2000. Nursing homes new to Medicare after 1995 had no phase-in and were coded as 1. Finally, we also include a dichotomous variable indicating if the resident was diagnosed on or after April 1, 2000, when the Balanced Budget Refinement Act (BBRA) was implemented. In response to concerns about industry viability, the BBRA increased payment rates in all payment groups and more in some thought to have especially low reimbursement.

We also controlled for patient characteristics. Residents who are older or have a diagnosis of dementia may be less able to communicate their symptoms to caregivers and, as a result, may be more likely to be diagnosed later or less likely to receive pain medication than other residents. In addition, staff, family members, or physicians may feel that the harm outweighs the benefit of diagnosis of their condition.⁵ Similarly, if a resident is already enrolled in hospice care, cancer symptoms may receive less attention but pain management should receive more. Finally, we controlled for diagnosis at death in the pain model.

The longer a resident has been in a nursing home, the more staff will recognize atypical behavior that may indicate an illness or unmanaged pain. Since length of stay in a nursing home before diagnosis ranged from 31 days to over 10 years, we created a binary variable to reflect a short length of stay, 31–90 days. Finally, we included cancer site in the diagnosis model, but not in the pain medication model, because we restrict that sample to patients with late or unstaged cancer. Patients with later-stage disease (meaning metastases to proximal and distant sites), regardless of the site, are likely to experience considerable cancer-related pain.

Analysis

We estimated the relationship between the independent and dependent variables with logistic regression using Huber–White robust standard errors clustering for county using *STATA* version 10.⁶ The number of residents per county ranged from 1 to 221. The statistical significance of the association of the independent variables with the dependent variable was assessed with the χ^2 likelihood ratio test. The threshold for statistical significance was set at an α level of 0.05.

RESULTS

Descriptive statistics are shown in Tables 1 and 2. Similar to nursing homes nationally, the majority of study residents were in for-profit nursing homes,

Table 2: Patient Characteristics Variables and Descriptive Statistics

<i>Variable</i>	<i>Count (%) n = 1,316</i>
Dependent	
Diagnosis at death or same month as death	334 (25.4)
Received any pain medication in month of or month after cancer diagnosis	794 (60.3)
Explanatory/control	
Age (years)	
66–70 (referent)	78 (5.9)
71–75	160 (12.2)
76–80	226 (17.2)
81–85	333 (25.3)
≥ 86	519 (39.4)
Race	
White (referent)	1,022 (77.7)
African American/other	294 (22.3)
Sex	
Male (referent)	438 (33.3)
Female	878 (66.7)
Alzheimer's disease	376 (28.6)
Stayed 31–90 days before diagnosis	105 (8.0)
Cancer sites	
Breast	209 (15.9)
Colorectal	219 (16.6)
Lung	188 (14.3)
Prostate	128 (9.7)
Other gastrointestinal	59 (4.5)
Pancreas	48 (3.7)
Urinary bladder	51 (3.9)
Leukemias	41 (3.1)
Other (referent)	373 (28.3)
Hospice	20 (1.52)
Late stage or unstaged at diagnosis	973 (73.9)

Medicaid was the dominant payer, and most of the residents were in nursing homes with high occupancy (Kaiser Family Foundation [KFF] 2008). Most study residents were in nursing homes located in competitive markets, with an average Herfindahl index of 0.199. The average number of short-term hospital beds per 1,000 population was 2.69, which was somewhat under the national average during the study time period (National Center for Health Statistics 2009). Approximately one-half of the residents were diagnosed with cancer during an FY starting after BBA provisions began to be implemented.⁷

About 25 percent ($n = 334$) of the residents in the study were diagnosed at death or during the month they died and most (60 percent) received pain medication (Table 2). The majority of residents diagnosed at any time had late

or unstaged cancer (74 percent); about 61 percent ($n = 592$) of these residents received pain medication during the month of or month after diagnosis. The majority of the residents in the study sample were 86 or older, white, and female.⁸ Eight percent of the study residents had stays between 31 and 90 days before diagnosis. Only 20 residents were enrolled in hospice in the month of cancer diagnosis.

The marginal effects of each variable from the diagnosis logistic regression models are reported in Table 3. All p values correspond to two-sided tests. As expected, residents in nursing homes with a higher number of nursing hours per day had less likelihood of having their cancer diagnosed at or near death. None of the other organization variables was statistically significantly related to timeliness of diagnosis. However, location in a county with more hospital beds decreased the likelihood of being diagnosed at death.

The BBA policy variables show that residents diagnosed during an FY starting after July 1, 1998 were more likely to be diagnosed at death, but neither the BBA phase-in nor the BBRA variable was statistically significant when all the three variables are included in the model. Because there is likely collinearity among the BBA variables, we also estimated models with either FY starting after July 1, 1998, or the BBA phase-in.⁹ Each variable was statistically significant and positive when the other two BBA variables were omitted.

As expected, the oldest residents were likely to be diagnosed at or near death as were those diagnosed with Alzheimer's disease.

The models predicting the use of pain medication in the diagnosis month or the following month for residents diagnosed with late-stage disease reveal a slightly different pattern. Most organizational and market characteristics were not significant. However, residents in nursing homes with a high Medicaid patient load were less likely to have pain medication as were residents in homes with a higher Medicare percentage of days.¹⁰ When we estimated the models using all three BBA variables, none were statistically significant. However, when we separately examined other variables, diagnosis after July 1, 1998 was significant ($p < .01$) as was the BBA phase-in ($p = .05$). However, in contrast to our expectation, residents diagnosed following implementation of the BBA were more, not less, likely to receive pain medication.

Older residents were less likely and female residents were more likely to receive pain medication in the month of or month after cancer diagnosis. As expected, residents with stays of 31–90 days or less before diagnosis or death were less likely to receive pain medication. The hospice variable was not significant but those diagnosed at death were less likely to have received pain medication.

Table 3: Logistic Regression Results, Michigan Dually Eligible Nursing Home Residents, 1997–2000, Marginal Effects[‡] and Robust Standard Errors

<i>Variables</i>	<i>Diagnosis at Death or Same Month as Death (n = 1,316)</i>			<i>Pain Medication in Month of or after Cancer Diagnosis (n = 973)</i>		
	<i>All BBA Variables dy/dx (Robust SE)</i>	<i>Post-BBA only dy/dx (Robust SE)</i>	<i>BBA Phase-In Only dy/dx (Robust SE)</i>	<i>All BBA Variables dy/dx (Robust SE)</i>	<i>Post-BBA Only dy/dx (Robust SE)</i>	<i>BBA Phase-In Only dy/dx (Robust SE)</i>
Organizational characteristics						
Nursing hours/patient day	– 0.029* (0.014)	– 0.028* (0.013)	– 0.027* (0.014)	0.004 (0.018)	0.004 (0.019)	0.007 (0.018)
Ownership						
NFP (referent)	—	—	—	—	—	—
For-profit ownership	0.017 (0.030)	0.015 (0.031)	0.014 (0.030)	0.052 (0.038)	0.050 (0.039)	0.049 (0.038)
Government ownership	0.087 (0.062)	0.092 (0.062)	0.106 [†] (0.064)	0.040 (0.077)	0.040 (0.077)	0.049 (0.076)
% Medicaid	– 0.001 (0.001)	– 0.001 (0.001)	– 0.001 (0.001)	– 0.004*** (0.001)	– 0.004*** (0.001)	– 0.004*** (0.001)
% Medicare	– 0.001 (0.002)	– 0.001 (0.002)	– 0.001 (0.002)	– 0.006*** (0.002)	– 0.006*** (0.002)	– 0.007*** (0.002)
Occupancy	0.003 [†] (0.002)	0.003 (0.002)	0.002 (0.002)	– 0.003 (0.003)	– 0.003 (0.002)	– 0.003 (0.002)
Market characteristics						
County Herfindahl index	– 0.060 (0.065)	– 0.064 (0.065)	– 0.073 (0.065)	0.143 (0.106)	0.144 (0.106)	0.133 (0.106)

Short-term general hospital beds/1,000 population in county	-0.025* (0.012)	-0.025* (0.012)	-0.028* (0.012)	-0.005 (0.015)	-0.005 (0.015)	-0.007 (0.015)
Post-Balanced Budget Act diagnosis	0.110*** (0.030)	0.088*** (0.018)	—	0.077 (0.054)	0.085** (0.033)	—
BBA phase-in	-0.076 (0.069)	—	0.090** (0.032)	-0.014 (0.099)	—	0.133* (0.067)
Diagnosed after BBRA	0.025 (0.035)	—	—	0.042 (0.043)	—	—
Patient characteristics						
Age (years)						
66-70 (referent)	—	—	—	—	—	—
71-75	-0.035 (0.043)	-0.039 (0.042)	-0.047 (0.041)	-0.081 (0.071)	-0.080 (0.071)	-0.086 (0.073)
76-80	0.007 (0.056)	0.004 (0.055)	-0.002 (0.057)	-0.097 (0.072)	-0.098 (0.072)	-0.102 (0.073)
81-85	0.069 (0.048)	0.066 (0.047)	-0.062 (0.048)	-0.096 [†] (0.055)	-0.096 [†] (0.056)	-0.100 [†] (0.057)
≥ 86	0.124* (0.051)	0.120* (0.050)	0.116* (0.051)	-0.157** (0.057)	-0.157** (0.057)	-0.159** (0.058)
Race						
White (referent)	—	—	—	—	—	—
African American/other	-0.058 [†] (0.032)	-0.056 [†] (0.032)	-0.053 [†] (0.032)	-0.063 (0.052)	-0.061 (0.051)	-0.058 (0.053)
Sex						
Male (referent)	—	—	—	—	—	—
Female	-0.004 (0.031)	-0.005 (0.031)	-0.007 (0.032)	0.073* (0.031)	0.073* (0.031)	0.070* (0.031)

continued

Table 3. *Continued*

<i>Variables</i>	<i>Diagnosis at Death or Same Month as Death (n = 1,316)</i>			<i>Pain Medication in Month of or after Cancer Diagnosis (n = 973)</i>		
	<i>All BBA Variables dy/dx (Robust SE)</i>	<i>Post-BBA only dy/dx (Robust SE)</i>	<i>BBA Phase-In Only dy/dx (Robust SE)</i>	<i>All BBA Variables dy/dx (Robust SE)</i>	<i>Post-BBA Only dy/dx (Robust SE)</i>	<i>BBA Phase-In Only dy/dx (Robust SE)</i>
Alzheimer's disease	0.042* (0.021)	0.042* (0.022)	0.049* (0.022)	0.009 (0.029)	0.009 (0.029)	0.011 (0.030)
Stayed 31–90 days before diagnosis	–0.058 (0.055)	–0.057 (0.055)	–0.053 (0.055)	–0.281*** (0.047)	–0.280*** (0.046)	–0.279*** (0.048)
Hospice	–0.144* (0.058)	–0.143* (0.059)	–0.143* (0.063)	–0.104 (0.091)	–0.106 (0.090)	–0.097 (0.088)
Diagnosed at death	– (0.051)	– (0.050)	– (0.049)	–0.094*** (0.026)	–0.094*** (0.026)	–0.088*** (0.026)
Cancer sites						
Other (referent)	–	–	–	–	–	–
Breast	0.002 (0.042)	0.003 (0.043)	0.001 (0.044)	–	–	–
Colorectal	0.001 (0.041)	0.003 (0.041)	0.007 (0.044)	–	–	–
Lung	0.085 (0.062)	0.086 (0.062)	0.094 (0.063)	–	–	–
Prostate	0.167* (0.070)	0.166* (0.070)	0.163* (0.071)	–	–	–
Other gastrointestinal	0.019 (0.051)	0.017 (0.050)	0.018 (0.049)	–	–	–

Pancreas	0.076 (0.073)	0.078 (0.073)	0.085 (0.073)	—	—	—
Urinary bladder	− 0.203*** (0.030)	− 0.203*** (0.030)	− 0.204*** (0.030)	—	—	—
Leukemias	0.088 (0.065)	0.091 (0.065)	0.086 (0.063)	—	—	—
Wald's χ^2	309.39	244.05	238.49	184.06	167.63	159.20
Prob. χ^2	0.000	0.000	0.000	0.000	0.000	0.000

†Marginal effects at mean for continuous variables, for discrete change from 0 to 1 for binary variables.

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

BBA, Balanced Budget Act; BBRA, Balanced Budget Refinement Act.

DISCUSSION

The quality of care provided to residents of nursing homes has long been of concern to policy makers and consumers (IOM 1986, 2001). Although there has been a good deal of research regarding general care processes and quality indicators, there has been little study of care for serious chronic diseases among nursing home residents. Cancer is common among the elderly and has evolved from a uniformly fatal illness to a chronic, progressive condition for many. Diagnosing cancer among elderly nursing home residents can lead to better treatment as well as pain management decisions. However, in our study of dually eligible custodial care residents in Michigan nursing homes from 1997 through 2000 who developed cancer after entering a facility, just over 25 percent were not diagnosed with cancer until death or during the month of death. Of residents diagnosed with cancer after entering a nursing home, approximately 40 percent received no pain medication in the month of or following their diagnosis, even those diagnosed with late or unstaged cancer. It is unlikely that the low rates of diagnosis and prescription of pain medication are in the best interests of the residents.

Our study shows that diagnosis and treatment of cancer was highly dependent on nursing home, market, and policy variables. In nursing homes with more hours of nursing care per day, residents were less likely to be diagnosed with cancer at death. Similarly, when nursing homes had a higher percentage of residents funded by lower-paying payers—that is, Medicaid—residents were less likely to receive any pain medication in the month of or month following diagnosis. These results are consistent with research using other indicators of nursing home quality, including inspection deficiencies and pressure sores (Harrington et al. 2000). However, studying cancer treatment is somewhat different because developing cancer is not likely to be caused by nursing home care processes.

The results also suggest that the BBA's provisions were associated with later diagnosis of cancer. With Michigan's payment cuts for deductibles and coinsurance for the dually eligible, other community health care providers may have been reluctant to provide outpatient and diagnostic services needed to diagnose cancer. Nursing homes in counties with more health care resources may counteract this effect and find alternative providers. The results also support the notion that phased-in funding cuts for Medicare services may have reduced nursing homes resources, hampering their ability to identify residents with symptoms and limiting staff time available to arrange referrals.

In contrast, after the BBA, residents were somewhat more likely to receive pain medication. This may be the result of improvements in knowledge and attitudes concerning pain management among health care professionals over

time. However, as the percentage of residents covered by Medicare increased, pain medication was less likely, which may reflect the resource constraints from the BBA. The increase in resources from the BBRA, implemented near the end of our study period, seems not to have affected diagnosis or pain management.

Our study has several limitations. First, we lacked information concerning resident or family preferences for determining a specific diagnosis or prescription of pain medication. Similarly, we did not have information about advance directives that may be related to not pursuing a diagnosis of cancer, although it should not be related to pain management. Second, our findings regarding staffing are limited to total nursing hours because we were unable to identify the nursing skill mix from our data.¹¹ Third, we were not able to separate BBA effects from other secular trends such as enhancements in palliative care. Fourth, we could not examine a nursing home's experience with cancer care since we only have data for dually eligible residents with cancer. Finally, the generalizability of the results is limited because the data are from one state and are specific to dually eligible residents. However, long-term custodial care in nursing homes is financed largely by Medicaid, which paid for 65 percent of nursing home residents in 2006 (KFF 2008).

The nursing home is an important site for cancer care. This and an aging U.S. population make investigations regarding the care of nursing home cancer patients particularly relevant. Our study suggests that resource decisions of nursing homes and policy makers are important in equipping nursing homes to respond to the need for cancer care. The study results may also have implications for studying diagnosis and treatment of other undertreated chronic conditions (Lapane et al. 1999; Rojas-Fernandez et al. 2002; Christian, Lapane, and Toppa 2003). Diagnosis and treatment of many chronic conditions in the nursing home population are likely to be influenced by the variables we studied. Future research would include private pay patients to identify disparities in care by payer and further explore how major changes in payment policies affect quality of care for cancer and other chronic conditions.

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Disclaimers: None.

NOTES

1. External audit findings have found that the Michigan Cancer Surveillance Program, which maintains the Michigan Tumor Registry, successfully abstracts > 95 percent of all cancer cases diagnosed in the state. Fewer than 1 percent of cases are identified only from the death certificate. Three percent is the gold standard according to the North American Association of Central Cancer Registries Inc. (G. Copeland, Michigan Cancer Surveillance Program, personal communication, April 20, 2009).
2. Less than 3 percent of Michigan Medicare beneficiaries were enrolled in managed care. Thus, claims data are available for the majority of Medicare beneficiaries.
3. A resident is discharged from a nursing home when admitted to a hospital and may be admitted again to the same or a different nursing home following the hospital stay. We examined admission and discharge dates to nursing homes and transfers to other nursing homes to ensure a minimum 31-day stay at the same nursing home.
4. We used Wayne county data for the city of Detroit.
5. We identified patients diagnosed with Alzheimer's disease or dementia using the following International Classification of Diseases, version 9 (ICD-9) codes: 331.0 (Alzheimer's disease) (26, 27); 331.x (frontotemporal dementia, senile degeneration of the brain, hydrocephalus [communicating and obstructive], and cerebral degeneration); 290.0 (dementias and senile psychotic conditions); and 797 (senility without mention of psychosis).
6. Some research shows payer mix is endogenous in models of nursing home quality using measures that result from nursing home care such as pressure sores (Harrington and Swan 2003). In contrast, since cancer is exogenous to this care, we estimated single equation models without instrumental variables. We tested this idea empirically as well by estimating instrumental (IV) models using *STATA* version 10.1 ivprobit. Using the percent of population in the county with < 12th-grade education or county unemployment rate as instrumental variables for Medicaid percent in the diagnosis model, we failed to reject exogeneity of percent Medicaid ($p = .12$ and $.42$, respectively). Using percent education < 12 years or percent poverty in the county as IVs in the pain model, we failed to reject exogeneity ($p = .12$ and $.50$, respectively).
7. In 1997, 322 (24.5 percent) of the study residents were diagnosed; 335 (25.5 percent) in 1998; 348 (26.4 percent) in 1999; and 311 (23.6 percent) in 2000.

8. In elderly cancer patients, the Charlson comorbidity score does not adequately reflect functional ability or predict tolerance to treatment (Extermann, 2000). In models including a series of comorbidity binary variables, none was statistically significant. After omitting the comorbidity variables, the coefficients on the more parsimonious models did not change.
9. Models with the BBRA or an interaction term of percent Medicare and BBA phase-in showed no significance. Excluding them did not change the coefficients or significance of the remaining variables.
10. We tested the sensitivity of the estimates for both models to participation in the Medicare skilled nursing program. Omitting nursing homes not participating in Medicare did not change the results.
11. When we matched our sample to the Online Survey Certification and Reporting data, RN hours per day was not significant. Since we lost 106 observations where the nursing homes had lower nurse staffing, higher Medicaid percent, and lower occupancy and our other results were largely the same, we do not present these results.

REFERENCES

- Banaszak-Holl, J., J. S. Zinn, and V. Mor. 1996. "The Impact of Market and Organizational Characteristics on Nursing Care Facility Service Innovation: A Resource Dependency Perspective." *Health Services Research* 31 (1): 97-117.
- Bazzoli, G. J., H. F. Chen, M. Zhao, and R. C. Lindrooth. 2008. "Hospital Financial Condition and the Quality of Patient Care." *Health Economics* 17: 977-95.
- Bernabei, R., G. Gambassi, K. Lapane, F. Landi, C. Gatsonis, R. Dunlop, L. Lipsitz, K. Steel, and V. Mor. 1998. "Management of Pain in Elderly Patients with Cancer. SAGE Study Group. Systematic Assessment of Geriatric Drug Use via Epidemiology." *Journal of the American Medical Association* 279: 1877-82.
- Bourbonniere, M., and J. H. Van Cleave. 2006. "Cancer Care in Nursing Homes." *Seminars in Oncology Nursing* 22 (1): 51-7.
- Bradley, C., C. Given, Z. Luo, C. Roberts, G. Copeland, and B. A. Virnig. 2007. "Medicaid, Medicare, and State Tumor Registries: A Linkage Strategy." *Medical Decision Making* 27 (4): 352-63.
- Bradley, C. J., J. P. Clement, and C. Lin. 2008. "Absence of Cancer Diagnosis and Treatment in Elderly Medicaid-Insured Nursing Home Residents." *Journal of the National Cancer Institute* 100 (1): 21-31.
- Buchanan, R. J., J. Barkley, S. Wang, and M. S. Kim. 2005. "Analyses of Nursing Home Residents with Cancer at Admission." *Cancer Nursing* 28 (5): 406-14.
- Carter, M. W., and F. W. Porell. 2003. "Variations in Hospitalization Rates among Nursing Home Residents: The Role of Facility and Market Attributes." *Gerontologist* 43: 175-91.
- Castle, N. G. 2000. "Deficiency Citations for Physical Restraint Use in Nursing Homes." *Journals of Gerontology B—Psychological and Social Sciences* 55: S33-40.
- Castle, N. G., J. Engberg, and A. Men. 2008. "Nurse Aide Agency Staffing and Quality of Care in Nursing Homes." *Medical Care Research and Review* 65: 232-52.

- Christian, J. B., K. L. Lapane, and R. S. Toppa. 2003. "Racial Disparities in Receipt of Secondary Stroke Prevention Agents among US Nursing Home Residents." *Stroke* 34 (11): 2693–7.
- Extermann, M. 2000. "Measuring Comorbidity in Older Cancer Patients." *European Journal of Cancer* 36: 453–71.
- GAO. 2002. *Nursing Home Expenditures and Quality*. GAO-02-431R. Washington, DC: GAO.
- Harrington, C. 2005. "Quality of Care in Nursing Home Organizations: Establishing a Health Services Research Agenda." *Nursing Outlook* 53: 300–4.
- Harrington, C., and J. H. Swan. 2003. "Nursing Home Staffing, Turnover, and Case Mix." *Medical Care Research and Review* 60: 366–92.
- Harrington, C., D. Zimmerman, S. L. Karon, J. Robinson, and P. Beutel. 2000. "Nursing Home Staffing and Its Relationship to Deficiencies." *Journal of Gerontology: Social Sciences* 55B: S278–87.
- Hillmer, M. P., W. P. Wodchis, S. G. Gill, G. M. Anderson, and P. A. Rochon. 2005. "Nursing Home Profit Status and Quality of Care: Is There Any Evidence of an Association?" *Medical Care Research and Review* 62 (2): 139–66.
- Hodgson, N., L. Landsberg, A. Lehning, and M. Kleban. 2006. "Palliative Care Services in Pennsylvania Nursing Homes." *Journal of Palliative Medicine* 9 (5): 1054–8.
- Hoerger, T. J. 1991. "'Profit' Variability in For-Profit and Not-For-Profit Hospitals." *Journal of Health Economics* 10: 259–89.
- Institute of Medicine (IOM). 1986. *Improving the Quality of Care in Nursing Homes*. Washington, DC: National Academy Press.
- Institute of Medicine (IOM). 2001. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academy Press.
- Johnson, V. M. P., J. M. Teno, M. Bourbonniere, and V. Mor. 2005. "Palliative Care Needs of Cancer Patients in U.S. Nursing Homes." *Journal of Palliative Medicine* 8 (2): 273–9.
- Kaiser Family Foundation (KFF). 2008. "State Health Facts" [accessed on May 27, 2008]. Available at <http://www.statehealthfacts.org>
- Konetzka, R. T., E. C. Norton, P. D. Sloane, K. E. Kilpatrick, and S. C. Stearns. 2006a. "Medicare Prospective Payment and Quality of Care for Long-Stay Nursing Facility Residents." *Medical Care* 44 (3): 270–6.
- Konetzka, R. T., E. C. Norton, and S. C. Stearns. 2006b. "Medicare Payment Changes and Nursing Home Quality: Effects on Long-Stay Residents." *International Journal of Health Care Finance and Economics* 6: 173–89.
- Konetzka, R. T., D. Yi, E. C. Norton, and K. E. Kilpatrick. 2004. "Effects of Medicare Payment Changes on Nursing Home Staffing and Deficiencies." *Health Services Research* 39: 463–87.
- Lapane, K. L., H. H. Fernandez, J. H. Friedman, and SAGE Study Group. 1999. "Prevalence, Clinical Characteristics, and Pharmacologic Treatment of Parkinson's Disease in Residents in Long-Term Care Facilities." *Pharmacoepidemiology* 19: 1321–7.
- Medicare Payment Advisory Commission. 2003. *A Data Book: Healthcare Spending and the Medicare Program*. Washington, DC: MedPAC.
- Mitchell, J. B., and S. G. Haber. 2004/2005. "State Payment Limitations on Medicare Cost-Sharing: Impact on Dually Eligible Beneficiaries." *Inquiry* 41: 391–400.

- National Center for Health Statistics. 2009. *Health, United States, 2008, with Chartbook*. Hyattsville, MD. [Accessed August 19, 2009]. Available at [http://www.cdc.gov/nchs/data/08.pdf#118](http://www.cdc.gov/nchs/data/hus/08.pdf#118)
- Newhouse, J. 1970. "Toward a Theory of Non-Profit Institutions: An Economic Model of a Hospital." *American Economic Review* 60: 64-74.
- Rojas-Fernandez, C. H., K. L. Lapane, C. MacKnight, and K. A. Howard. 2002. "Undertreatment of Osteoporosis in Residents of Nursing Homes: Population-Based Study with Use of the Systematic Assessment of Geriatric Drug Use via Epidemiology (SAGE)." *American Association of Clinical Endocrinologists* 8: 335-42.
- Sahyoun, N. R., H. Lentzner, D. Hoyert, and K. N. Robinson. 2001. *Trends in Causes of Death among the Elderly. Aging Trends; No. 1*. Hyattsville, MD: National Center for Health Statistics. Available at http://www.cdc.gov/nchs/data/ahcd/aging_trends/01death.pdf [accessed on May 27, 2008].
- Spector, W. D., T. M. Selden, and J. W. Cohen. 1998. "The Impact of Ownership Type on Nursing Home Outcomes." *Health Economics* 7: 639-53.
- Tarzian, A. J., and D. E. Hoffman. 2004. "Barriers to Managing Pain in the Nursing Home: Findings from a Statewide Survey." *Journal of the American Medical Directors Association* 6 (3): S13-9.
- Troyer, J. L. 2004. "Examining Differences in Death Rates for Medicaid and Non-Medicaid Nursing Home Residents." *Medical Care* 42 (10): 985-91.
- Wan, T. T. H., N. J. Zhang, and L. Unruh. 2006. "Predictors of Resident Outcome Improvement in Nursing Homes." *Western Journal of Nursing Research* 28 (8): 974-93.
- Won, A., K. Lapane, G. Gambassi, R. Bernabei, V. Mor, and L. A. Lipsitz. 1999. "Correlates and Management of Nonmalignant Pain in the Nursing Home. SAGE Study Group. Systematic Assessment of Geriatric Drug Use via Epidemiology." *Journal of the American Geriatric Society* 47 (8): 936-42.
- Yancik, R., and L. A. Ries. 2000. "Aging and Cancer in America." *Hematology/Oncology Clinics of North America* 14: 17-23.
- Zinn, J. S. 1994. "Market Competition and the Quality of Nursing Home Care." *Journal of Health Politics, Policy and Law* 19 (3): 555-82.

SUPPORTING INFORMATION

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Appendix SA1: Author Matrix.

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