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Utilization of Surgery, Chemotherapy, Radiation Therapy, and Hospice at the End of Life for Patients Diagnosed with Metastatic Melanoma

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Abstract

Objectives—To examine the patterns of utilization of radiation therapy, chemotherapy, surgery, and hospice at the end of life-care for patients diagnosed with metastatic melanoma.

Methods—We identified 816 Medicare beneficiaries 65 years of age or older with pathologically confirmed metastatic malignant melanoma between January 1, 2000 and December 31, 2007. We evaluated trends and associations between sociodemographic and health services characteristics and the use of hospice care, chemotherapy, surgery, and radiation therapy.

Results—We found increasing use of surgery for patients with metastatic melanoma from 13% in 2000 to 30% in 2007 ($P=0.03$ for trend), no significant fluctuation in use of chemotherapy ($P=0.43$) or radiation therapy ($P=0.46$). Older patients were less likely to receive radiation therapy or chemotherapy. The use of hospice care increased from 61% in 2000 to 79% in 2007 ($P=0.07$ for trend). Enrollment in short-term (1–3 days) hospice care use increased, while long-term hospice care (≥ 4 days) remained stable. Patients living in the SEER Northeast and South regions were less likely to undergo surgery. Patients enrolled in long-term hospice care used significantly less chemotherapy, surgery and radiation therapy.

Conclusion—Surgery and hospice care use increased over the years of this study while the use of chemotherapy and radiation therapy remained consistent for patients diagnosed with metastatic melanoma.

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INTRODUCTION

The incidence rate of malignant melanoma has been increasing since the 1950s.^{1,2} The overall growth rate was 45% from 1992 to 2004, resulting in an annual growth rate of 3.1%, faster than that for any other cancer.³ Melanoma accounts for fewer than 5% of all skin cancer cases but for over 75% of skin cancer deaths.⁴ The intensity of care provided to this rapidly growing group of patients has been studied less than that for other malignant tumors.

Several previous studies have examined the use of care at the end of life among cancer patients using a variety of data sources, and these studies have shown trends of overuse of aggressive care for cancer patients close to death.^{5,6} There have also been increasing trends in hospice enrollment over the years for cancer patients.⁷ We sought to examine the trends in utilization of radiation therapy, surgery, chemotherapy, and hospice among patients with metastatic melanoma. We analyzed the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER)-Medicare data to assess the patterns of care as well as the influence of clinical and demographic factors on trends in utilization of various aspects of the end-of-life care for elderly patients dying of metastatic melanoma. We tested two hypotheses in this study: 1) that patients who enroll in hospice use significantly less surgery, chemotherapy, and radiotherapy than those who do not; and 2) that the percentage of patients who use short-term hospice (3 days or less) is larger than the percentage of patients who use long-term hospice (4 or more days) among patients with metastatic melanoma.

METHODS

We used data from the SEER-Medicare database which links Medicare beneficiaries and their Medicare claims files with patients in the SEER tumor registries.⁸ This National Cancer Institute supported dataset covers 17 geographic areas in the US, an estimated 28% of the US population. Its linked Medicare database includes biennially updated medical claims for 97% of US citizens aged 65 years or older.⁹ To obtain treatment information, we used the encrypted identifier in the Patients Entitlement and Diagnosis Summary File (PEDSF) linked with all available Medicare claims files, including inpatient care, skilled nursing facility care, home health care, hospice care, physician visits, outpatient care, and durable equipment. All data were de-identified such that no protected health information can be linked to individual patients. The institutional review boards from the University of Texas M.D. Anderson Cancer Center and the University of Texas Health Science Center in Houston had exempted this study. We identified 816 Medicare beneficiaries 65 years of age or older who were diagnosed with pathologically confirmed stage IV malignant melanoma between January 1, 2000 and December 31, 2007, used the SEER variable HSTST (historic stage = 'distant'). Inclusion criteria used to identify the cohort included matching dates of death in the SEER dataset and the Medicare dataset, a diagnosis that did not come from an autopsy report or a death certificate, continuous-coverage Part A and Part B enrollment in Medicare from diagnosis date until death, and no managed-care organization enrollment after the diagnosis date.

Dependent variables

We used International Classification of Diseases, 9th edition, procedure codes and Current Procedural Terminology (CPT) codes to identify chemotherapy, surgery, and radiation therapy. Chemotherapy CPT codes used were 9925, 96400–96599, J9000–J9999, J8501–J8999, and Q0081–Q0085. Surgery CPT codes used were 21011–21016, 21555–21558, 21600–21632, 21930–21936, 22110–22116, 22900–22999, 23075–23078, 23100–23195, 23200, 24075–24079, 24100–24152, 24155, 25075–25078, 25085–25240, 26115–26118, 26250–26262, 27047–27059, 27097–27178, 27329–27365, 27615–27634, 27645–27647, 28043–28047, 28050–28160, 28171–28175, 30120–30140, 32503–32507, 32601–32674, 33120–33130, 39220, 44005–44130, 44186–44238, 61300–61530, 61575, 63001–63048, 63050–63051, 63055–63066, 63081–63091, and 63101–63103. Radiation therapy CPT codes analyzed were 61796–61800, 63620–63621, 77400–77416, 77418, G0174, 0197T, 77371–77373, 77435, 77520–77525, G0173, G0251, G0338, G0339 and G0340. We identified utilization of these modalities according to periods at the end of life relative to death. The date of death was used as an index to define four periods of observation: last week before death, last month before death, last 3 months before death, and last 6 months before death. The frequency of end-of-life care was measured in each period.

Independent variables

The initial selection on independent variables were based on the review of available major determinants of medical care utilization from Andersen's health service utilization model.¹⁰ Year of death, age at diagnosis, sex, marital status, median household income for the region of residence, education, geographic region of residence, comorbidity score and days of hospice use (categorized as no hospice, hospice 1–3 days, and hospice 4+ days.) were the selected covariates for multiple logistic regression models. Age was categorized as 65–74 and 75 years. Marital status was categorized as married or other. The Charlson comorbidity score was calculated from an algorithm developed by Klabunde *et al.*^{11,12} using Medicare inpatient and outpatient claims within the 12-month window prior to death. We used neighborhood income and education variables at the level of zip code as provided in the SEER-Medicare database. Use of hospice care was identified based on any hospice admission and/or service date after advanced metastatic melanoma diagnosis date in the SEER-Medicare hospice claims file. The SEER-Medicare database was linked to the Area Resource File¹³ via Health Service Area codes provided in the databases to count the number of Medicare-certified hospice facilities available within each patient's Health Service Area.

Statistical analysis

We conducted a univariate analysis with a chi-square test, comparing the demographic and clinical characteristics between the patients who received various treatments and hospice care and those who did not. We used the Cochran-Armitage test to evaluate the time trends for categorical variables. We used multivariate logistic regression to evaluate the associations between demographic and clinical explanatory variables and the use of hospice care and receipt of chemotherapy, surgery, or radiation therapy. We used forward selection ($P < 0.05$) to eliminate insignificant explanatory variables in regression modeling. We then

investigated possible interaction terms by multivariate logistic regression modeling. Statistical analysis was conducted using SAS version 9.3 (SAS Institute, Inc., Cary, North Carolina, USA).

RESULTS

Utilization of chemotherapy, surgery, and radiation therapy

The characteristics of the study cohort are listed in Table 1, stratified by duration of hospice use. In the total cohort, 256 patients (31.3%) received chemotherapy, 199 (24.4%) received surgery, and 320 (39.2%) received radiation therapy (year-by-year analysis is shown in Figure 1). The proportion of patients receiving chemotherapy fluctuated from 28% in 2000 to 38% in 2004 and back to 27% in 2007 (Cochran-Armitage trend test, $P = 0.43$). Radiation therapy use was 35% in 2000, 46% in 2004 and 2005, and then 38% in 2007 ($P = 0.46$). Figure 1.b demonstrates the increasing use of surgery over the study period, from 13% in 2000 to 30% in 2007 ($P = 0.03$).

A multivariate logistic regression of the factors associated with receiving chemotherapy is shown in Table 2. The factors that were consistently associated with a lower likelihood of receiving chemotherapy were older age and not being married (all $p < .05$). For the multivariate analysis of factors predicting for surgery utilization, two characteristics were independently associated with higher odds of receiving surgery, as shown in Table 2: year of death and SEER region. Patients living in the Northeast region and Southern region had lower odds of receiving surgery than patients who lived in the West/Hawaii region; however, the differences in the odds were not significant for Midwest region. The odds of receiving surgery increased over the years from 2001 to 2007. Older age and not being married were also significantly associated with lower utilization of radiation therapy. In the multivariate analysis of factors associated with receipt of radiation therapy, patients who lived in the SEER Southern region had lower odds of receiving radiation therapy than patients who lived in West/Hawaii region.

Utilization of hospice care

Of the 816 patients in our study, 254 (31.1%) had no hospice care after their metastatic melanoma diagnosis, 471 (57.7%) had short-term (1 to 3 days) hospice care, and 91 (11.1%) had long-term (4 or more days) hospice care. The use of hospice (Figure 2) illustrated an increasing trend, from 61% in 2000 to 79% in 2007 (Cochran-Armitage trend test, $P = 0.07$). However, the increased enrollment was more dramatic and spiked early for those patients using short-term hospice care while long-term hospice care use showed a steadier, more consistent increase in enrollment rate of around 11% over 8 years.

Patients who enrolled in long-term hospice care had their first hospice admission months earlier relative to the time of death than those who used hospice for only 1 to 3 days. Among the patients who used long-term hospice care, 27.5% of users started hospice care 6 months before death, 75.9% started hospice care from one month to six months before death, and only 1.1% first used hospice care in the last month before death. In contrast, 84.4% of the short-term hospice care users contacted a hospice in the last month of life for the first time.

We examined the factors associated with the use of hospice care combining all 8 years covered by the review (Table 3). Only two variables were significantly associated with a higher odds ratio (OR) for duration of hospice care: time of first contact with hospice and SEER geographic region. Patients who enrolled in hospice at an early time after diagnosis were more likely ($P < 0.0001$) to use more days of hospice care than those entering hospice only in the last 3 months. Patients who lived in SEER south region were more likely to receive long-term hospice care (OR: 2.78, $P = 0.02$)

The influence of hospice care on utilization of chemotherapy, surgery and radiation therapy

Overall rates of chemotherapy use were similar for the long-term and short-term hospice care groups, at 35.2% and 30.9%, respectively. The rate of chemotherapy use dropped precipitously to 5.5% in the last 3 months of life for patients in long-term hospice care, compared to 18.1% in the short-term hospice care group. For the short term hospice group the use of chemotherapy was 6.9% in the last month of life and 1.1% in the last week of life which compares to the finding of no use of chemotherapy in the last month of life in the long-term hospice care group.

Patients who did not enroll in long-term hospice care showed the highest overall use rate for surgery, 25%, compared to 19.8% of those who enrolled in long-term hospice care. The difference in surgery use between these two groups increased when the patients entered into the last six months of life, with the respective rates at 19.6% and 4.4%. Just as with chemotherapy use, patients in the long-term hospice care group had no surgery use in the last month of life, while those who did not elect 4 days of hospice care experienced a 3.9% rate of surgery use in the last month of life and a 0.1% rate of use in the last week of life.

Patients electing short-term hospice care had a 40.4% overall rate of radiation therapy, compared to 29.7% for those enrolled in long-term hospice care ($P=0.05$). No long-term hospice patients received radiation therapy in the last month of life, while those not electing 4 days of hospice care showed a 10.8% rate of radiation therapy use in the last month of life, and a 1.4% rate of use in the last week of life.

DISCUSSION

We observed that the use of surgery increased significantly over the study period among patients with metastatic melanoma at diagnosis, while the use of chemotherapy and radiation therapy fluctuated within a stable range. When we examined the influence of hospice enrollment on utilization of cancer treatments, we found that use of chemotherapy, surgery, and radiation therapy among those patients who enrolled in 4 days of hospice care after their diagnosis was significantly lower compared to those who did not use hospice care or who used short-term hospice care. The duration of hospice enrollment was significantly associated with how soon after diagnosis a patient elected the Medicare hospice benefit as well as residence in the Southern SEER region. These findings suggest that early initiation of hospice care and thus longer duration of hospice care has a mitigating effect on the use of other cancer treatment modalities for patients with metastatic melanoma.

A study by Emanuel, *et al.* found that 33% of cancer patients had chemotherapy in the last 6 months of life, 23% in the last 3 months, and 9% in the last month of life in Massachusetts, and that the respective rates were similarly 26%, 20% and 9% for cancer patients in California.⁵ They also found that the proportion of patients receiving chemotherapy was not influenced by the effectiveness of chemotherapy.⁵ A study by Earle and associates found that 15.7% of patients received chemotherapy within 2 weeks of death, with a range of 13.8% in 1993 to 18.5% in 1996.⁶ Miesfeldt, *et al* reported that 6% of Medicare cancer patients received chemotherapy within the last 2 weeks before death.¹⁴ In our cohort of patients with metastatic melanoma, chemotherapy use rates were similar to those found in these previous studies. However, we observed that these utilization rates were significantly reduced if the patients enrolled in long-term hospice care.

Kwok *et al.*, studied the pattern of surgical care in the last year of life for Medicare patients.¹⁵ In reviewing records for more than 1.8 million elderly patients, they found that 31.9% of patients had surgery in the last year of life, 18.3% of patients had surgery in the last month of life, and 8.0% of patients had surgery in the last week of life.¹⁵ Our study of patients with metastatic melanoma showed an overall lower rate of surgery use than their study regardless of hospice use in all observation periods.

There are no current estimates of hospice use among metastatic melanoma patients. According to a National Hospice and Palliative Care Organization report, in 2010, 41.9% of all patients who died in the United States were cared for by hospice programs.⁷ After the 1989 Congressional mandate (PL 101–239, §6005) was passed to increase reimbursement rates by 20% for hospice participation, the number of hospices expanded from 31 in 1984 to 3,257 in 2007.¹⁶ Virnig, *et al.*'s study estimated that 15.5 out of 100 elderly Medicare enrollees used hospice care in the US in 1996.¹⁷ A study by Garber *et al.* estimated the use of hospice care at 30% for patients dying of lung cancer.¹⁸ For patients with the seven most common cancers (bladder or kidney, breast, colon or rectal, esophageal or stomach, lung, pancreas, and prostate), Virnig, *et al.* found that hospice use ranged from 42% for breast cancer to 48% for pancreatic cancer.¹⁹ Our study found higher hospice use rates, 61% in 2000 and 79% in 2007. While national data shows that among Medicare beneficiaries, the rate of patients using 3 or more days' worth of hospice care increased from 18.8% in 2001 to 30.1% in 2007 for all diseases. For cancer patients, this number increased from 36.6% to 43.3% for the same time period⁷. Hospice care duration is still mostly short-term hospice care, 1–3 days, even though hospice care has been found to improve quality of life.^{20,21} The demand for hospice will continue to grow along with the aging population and the escalating health care costs associated with cancer treatment.¹⁶

Patient anxiety about surrendering access to potentially curative treatments when they elect hospice care may have contributed to the preponderance of hospice care being short-term in nature, but the emerging concept of concurrent care, as defined in the Affordable Care Act²², might change this pattern of hospice care election. Concurrent care gives terminally ill patients an opportunity to have potentially curative treatment and hospice care simultaneously.²³ Traditionally, however, in order to have hospice care, patients have had to give up aggressive care, as reflected in our study by the lower utilization rates of the three kinds of anti-cancer treatments among patients who enrolled in long-term hospice care.

Provision of concurrent care might overcome this reason why patients may resist enrolling in hospice. Even though our study showed an increase in the use of hospice over the last decade, most of the rise could be attributed to enrollment in short-term hospice care. The high proportion of short-term hospice care users confirmed findings by Earle *et al.*, who suggested that most patients and physicians may use hospice care as an opportunity to process impending death.⁶ This short-term use likely restricts the palliative benefits of hospice care,^{24,25} thus compromising quality of care, and reducing patient satisfaction with care.^{26,27}

Previous studies have found that the use of hospice is based on many non-patient-related factors, such as the availability of hospice rather than patients' preferences.^{28,29} Fewer hospital beds, more physicians per capita, and higher managed health care organization enrollment are also factors associated with high use of hospice.¹⁷ Bergman *et al.* compared hospice use and more aggressive anti-cancer care use by patients dying with prostate cancer from 1992 to 2005; they found that African American race and a higher Charlson comorbidity index score were correlated with lower hospice use and that having a partner in a recent year were associated with high odds of having hospice care.³⁰ Miesfeldt *et al.* found that patients with older age or female were less likely to receive aggressive care and late hospice enrollment.¹⁴ Lackan *et al.* studied Medicare beneficiaries and found that hospice use was significantly associated with many factors, such as type of insurance, age, marital status, race, sex, residence status, type of cancer, income level, and education level.³¹ Variations in use decreased over time for these subgroups, due to the increased availability of hospice and changes in attitudes about death.³¹ Our study found the time of first encounter with hospice was an important factor for influencing the length of hospice use.

Our study has limitations associated with retrospective analyses of claims data. The foremost limitation of our study was impossibility to obtain the data from registry and medical claim datasets on describing the preference of patients and providers regarding cancer treatments and hospice selection. Another limitation is the population in the database is restricted to patients aged 65 years or older, so it should be noted that these data may not reflect the patterns of care for younger patients. Also, inability to analyze claims data for those enrolled in managed care organizations limited the sample size and the generalizability of the study findings. Moreover, the recently available molecular agents such as vemurafenib and ipilimumab, have shown improved outcomes in patients with metastatic melanoma and might alter the trends observed in this analysis.³² One caveat to our study also arises in that SEER designates a patient's cancer to be metastatic if there is evidence of metastases within 6 months of diagnosis or at the end of the first course of treatment. Therefore, it is possible that some surgeries were performed for patients who were not thought to have metastatic disease. Finally, the representativeness of SEER-Medicare datasets for estimating national trends has been challenged in a recent study.³³

In conclusion, publications have focused on many other types of cancer patients, but have not previously examined care for patients with metastatic melanoma. For patients with metastatic melanoma whose potential for long-term survival is limited by the advanced nature of their disease, quality of life for a patient's remaining time should be considered when weighing the possible benefits of surgery, chemotherapy, or radiation therapies.

Continuing trends toward enrollment in hospice may further improve patient reported outcomes such as satisfaction and improved quality of life and contribute to appropriate cost containment for patients with metastatic melanoma.

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Figure 1. Percent of Patients Receiving Chemotherapy, Surgery, Radiation Therapy after Metastatic Melanoma Cancer Diagnosis from 2000–2007

(Cochrane Armitage test of trend for chemotherapy, surgery and radiation therapy after diagnosis are: $p=0.4347$, $p=0.0310$, $p=0.4566$. The rest trend lines for different periods of life are all not significant.)

Figure 2. Percent of Patients Receiving 1–3 Days Hospice Care or 4+ Days after A Metastatic Cancer Diagnosis from 2000–2007

(Cochrane Armitage test of trend for Hospice in total, Hospice 1–3 days and Hospice 4+ days are: $p=0.0704$, $p=0.5431$, $p=0.0878$)

Figure 3.
Percent of Patients Receiving Chemotherapy, Surgery, Radiation Therapy after A Metastatic Cancer Diagnosis, in The Last Six Months, in The Last Three Months, The Last Month and The Last Week of Life From 2000–2007.

Table 1

Univariate Analysis for the Entire Cohort Classified by Hospice Utilization

	Total N	Original cohort (N=816)			P-Value
		No Hospice N(%) (N=254)	Hospice care 1–3 days N (%) (N=471)	Hospice care 4+ days N (%) (N=91)	
Year of Death					0.06
2000–2001	141	52(36.9)	74(52.5)	15(10.6)	
2002–2003	195	58(29.7)	121(62.1)	16(8.2)	
2004–2005	241	80(33.2)	139(57.7)	22(9.1)	
2006–2007	239	64(26.8)	137(57.3)	38(15.9)	
Age					0.62
Mean(Range)		77(65–97)	77(65–97)	78(66–92)	
65–74	313	94(30.0)	187(59.7)	32(10.2)	
≥75	503	160(31.8)	284(56.5)	59(11.7)	
Gender					0.07
Male	568	183(32.2)	331(58.3)	54(9.5)	
Female	248	71(28.6)	140(56.5)	37(14.9)	
Marital status					0.39
Married	480	141(29.4)	286(59.6)	53(11.0)	
Other	336	113(33.6)	185(55.1)	38(11.3)	
Median household Income					0.11
Lowest quartile	190	65(34.2)	102(53.7)	23(12.1)	
2nd quartile	189	56(29.6)	108(57.1)	25(13.2)	
3rd quartile	190	67(35.3)	97(51.1)	26(13.7)	
Highest quartile	189	52(27.5)	123(65.1)	14(7.4)	
Education < 12 yrs					0.04
Lowest quartile	192	57(29.7)	119(62.0)	16(8.3)	
2nd quartile	191	52(27.2)	118(61.8)	21(11.0)	
3rd quartile	193	52(26.9)	119(61.7)	22(11.4)	
Highest quartile	190	74(39.0)	90(47.4)	26(13.7)	
Comorbidity scores					0.03
0	386	113(29.3)	217(56.2)	56(14.5)	

Original cohort (N=816)					
	Total N	No Hospice N(%) (N=254)	Hospice care 1–3 days N(%) (N=471)	Hospice care 4+ days N(%) (N=91)	P-Value
1	217	66(30.4)	129(59.5)	22(10.1)	0.06
2	213	75(35.2)	125(58.7)	13(6.1)	
Geographic region					
West	405	133(32.8)	228(56.3)	44(10.9)	
Northeast	198	68(34.3)	116(58.6)	14(7.1)	0.02
Midwest	95	23(24.2)	60(63.2)	12(12.6)	
South	118	30(25.4)	67(56.8)	21(17.8)	
Hospice density					
0	189	58(30.7)	100(52.9)	31(16.4)	0.02
1–3	379	111(29.3)	228(60.2)	40(10.6)	
4–43	248	85(34.3)	143(57.7)	20(8.1)	

Table 2
Predictors of Use for Surgery, Chemotherapy and RT after Advanced Melanoma Diagnosis

	Use Surgery				Use Chemotherapy				Use RT			
	OR	95% CI	P		OR	95% CI	P		OR	95% CI	P	
Year of Death												
2000	1.00	Reference	-									
2001	1.91	0.74–4.92	0.18									
2002	1.17	0.43–3.15	0.76									
2003	2.98	1.21–7.36	0.02									
2004	3.32	1.35–8.16	0.01									
2005	1.99	0.81–4.91	0.13									
2006	2.25	0.92–5.53	0.08									
2007	3.04	1.23–7.49	0.02									
Age												
65–74					1.00	Reference	-		1.00	Reference	-	
>=75					0.61	0.45–0.82	<0.0001		0.43	0.32–0.58	<0.0001	
Marital status												
Other					1.00	Reference	-		1.00	Reference	-	
Married					1.99	1.45–2.74	<0.01		1.55	1.15–2.09	<0.01	
Geographic region												
West	1.00	Reference	-						1.00	Reference	-	
Northeast	0.60	0.39–0.91	0.02						0.88	0.61–1.25	0.47	
Midwest	0.85	0.50–1.45	0.55						0.78	0.49–1.26	0.31	
South	0.52	0.31–0.88	0.02						0.55	0.35–0.86	<0.01	

Note: The patients in surgery, chemotherapy and radiation therapy are not mutually exclusive.

Table 3**Predictors of Use of 4 or More Days Hospice Care**

Total:756	OR	95% CI	P
First Contact with Hospice			
Last 3 months	1.00	Reference	-
Last 3 – 6 months	579.04	129.46->999.99	<.0001
Last 6 – 12 months	264.61	55.96->999.99	<.0001
Early than last 12 months	178.44	20.62->999.99	<.0001
Geographic region			
West	1.00	Reference	-
Northeast	0.66	0.24–1.81	0.42
Midwest	0.70	0.19–2.56	0.59
South	2.78	1.19–6.49	0.02

Note: No hospice and hospice 1–3 days are grouped together to versus hospice 4+ days.