ORIGINAL RESEARCH

The Influence of Dermatologist and Primary Care Physician Visits on Melanoma Outcomes Among Medicare Beneficiaries

Richard G. Roetzheim, MD, MSPH, Ji-Hyun Lee, RPH, Jeanne M. Ferrante, MD, MPH, Eduardo C. Gonzalez, MD, Ren Chen, MD, MPH, Kate J. Fisher, MA, Kymia Love-Jackson, MBA, and Ellen P. McCarthy, PhD, MPH

Background: **Ambulatory visits to dermatologists and primary care physicians (PCPs) may improve melanoma outcomes through early detection. We sought to measure the effect of dermatologist and PCP visits on melanoma stage at diagnosis and mortality.**

Methods: **We used data from the database linking Surveillance Epidemiology and End Results (SEER) and Medicare data (1994 to 2005) to examine patterns of dermatologist and PCP ambulatory visits before diagnosis for 18,884 Medicare beneficiaries with invasive melanoma or unknown stage at diagnosis. Visits were assessed during the 2-year time interval before the month of diagnosis. We examined whether dermatologist and PCP visits were associated with diagnosis of thinner melanomas (defined as local stage tumors having Breslow thickness <1 mm) and lower melanoma mortality.**

Results: **Medicare beneficiaries visiting both a dermatologist and PCP before diagnosis had greater odds of diagnosis of a thin melanoma (adjusted odds ratio, 1.26; 95% confidence interval, 1.12–1.41) and lower melanoma mortality (adjusted hazard ratio 0.66, 95% confidence interval, 0.57–0.76) compared with those without such visits. The mortality findings were attenuated once stage at diagnosis was adjusted for in the multivariable model.**

Conclusion: **Improved melanoma outcomes among Medicare beneficiaries may depend on adequate access and use of dermatologist and PCP services. (J Am Board Fam Med 2013;26:637–647.)**

Keywords: **Dermatology, Medicare, Melanoma, Primary Care Physicians, SEER Program**

There were more than 70,000 new cases of melanoma diagnosed in 2011, with almost 9,000 deaths.[1] Both the incidence and mortality of melanoma have continually increased for the past 30 years.[1] The prognosis of melanoma is highly dependent on the stage at which it is diagnosed. Thin lesions (Breslow thickness <1 mm) have 10-year survival rates approaching 90%, whereas 10-year survival for people with metastatic disease is <20%.[2]

Physicians may affect stage at diagnosis by providing skin screenings and by promptly evaluating lesions discovered by patients.[3–5] Studies have found that melanomas detected by dermatologists are thinner than those identified by patients.[6,7] Other studies have shown that geographic areas having greater numbers of dermatologists and primary care physicians have detection of melanoma at an earlier stage.[8–10] Despite this, no studies to date have dem-

See Related Commentary on Page 623.

This article was externally peer reviewed.
Submitted 21 January 2013; revised 25 April 2013; accepted 24 May 2013.
From the Department of Family Medicine, University of South Florida, Tampa, FL (RGR, ECG, RC, KL-J); the H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL (RGR, J-HL, KJF); the Department of Family Medicine and Community Health, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School, New Brunswick, NJ (JMF); the Cancer Institute of New Jersey, Trenton, NJ (JMF); and the Division of General Medicine and Primary Care, Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA (EPM).
Funding: This study was supported in part by the American Cancer Society (RSGHP-08-141-01-CPHPS).
Conflict of interest: none declared.
Corresponding author: Richard Roetzheim, MD, MSPH, University of South Florida, Department of Family Medicine, 12901 Bruce B. Downs Blvd., MDC 13, Tampa, FL 33612 (E-mail: rroetzhe@health.usf.edu).

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

onstrated reduced mortality from skin screenings, and the US Preventive Services Task Force concluded that there is currently insufficient evidence to recommend routine skin screening.[11]

Previous studies examining the effects of physician services have had important limitations. Studies linking increasing physician supply to improved melanoma outcomes are subject to ecological fallacy: it is not possible to determine whether individuals with better outcomes in these studies are the same individuals who received more care from physicians. Studies linking physician supply to specific health outcomes may be confounded by socioeconomic status, which often is correlated with physician supply. In addition, studies examining physician services often fail to be population based.[3,6,7]

Understanding the affect of physician services on melanoma outcomes is important as our health care system evolves. The supply of primary care physicians as a percentage of the US physician workforce is in steep decline.[12] Some have questioned whether the supply of dermatologists is adequate to meet demand.[13,14] Some studies suggest that patients may face delays obtaining dermatologic care,[15] which could result in poor melanoma outcomes.[16]

We used data from the Surveillance, Epidemiology and End Results program (SEER)–Medicare linked database to examine patterns of physician ambulatory care before diagnosis and its effect on melanoma outcomes. We hypothesized that patients receiving dermatologic care before diagnosis would have an earlier stage at diagnosis and improved melanoma survival. We also hypothesized that primary care visits before diagnosis would similarly be associated with improved melanoma outcomes.

Methods

Study Sample

This study used a retrospective cohort design to assess physician services and melanoma outcomes using the 2008 SEER-Medicare linked dataset. Patients diagnosed with their first cancer as melanoma within the SEER program between April 1994 and December 2005 represented the cohort of interest (n = 81,505). Those previously diagnosed with cancers (other than nonmelanoma skin cancers) were excluded. We also excluded patients who were diagnosed with other cancers within a year after their diagnosis of primary melanoma (n = 8267). Most people qualify for Medicare at age 65, and to help ensure that subjects had at least 24 months of Medicare claims before their cancer diagnosis we excluded subjects diagnosed with melanoma before age 67 (n = 24,809). Because of clinical complexity, we excluded people who were eligible for Medicare because of end-stage renal disease (n = 22). Consistent with other SEER studies,[17] we also excluded melanoma cases in which the diagnosis was based solely on death certificates or made at autopsy (n = 182). Since we examined Medicare claims of patients in the 24-month period before the month of diagnosis, we further excluded subjects enrolled in a Medicare health maintenance organization within the 24 months before their cancer diagnosis (n = 13,956) because these subjects have no claims history during the period of their enrollment in the health maintenance organization. We also excluded subjects who did not have continuous Medicare Part A and Part B coverage during the 24 months before diagnosis (n = 2894). Finally, because the malignant potential of in situ melanomas is uncertain, we excluded people with in situ lesions (n = 12,491), leading to our final analytic sample (n = 18,884). This study was approved by the appropriate institutional review boards.

Ambulatory Care Visits

There is significant empiric evidence that preventive care in general, and cancer screening in particular, is overwhelmingly delivered in the ambulatory setting.[18–26] We therefore examined Medicare claims (National Claims History database) for the following ambulatory-based evaluation and management services representing physician office visits: 99201 to 99205, 99211 to 99215, 99354 to 99359 (patient office visits); 99241 to 99245, 99271 to 99275 (outpatient consultations); 99301 to 99303, 99311 to 99313, 99315 to 99316, 99312 to 99323, 99331 to 99333 (nursing/boarding facility visits); 99341 to 99345, 99347 to 99350 (home visits); 99387, 99397, 99401 to 99402, 99411, 99412, 99420, 99429 (preventive care visits) 99450, 99455, and 99456 (Disability evaluations).

Similar to prior research, we identified the physician specialty associated with each claim using the Health Care Financing Administration Medicare provider specialty field found among claims in the National Claims History database.[27,28] We defined primary care providers as those having the following specialties: general practice, family medicine,

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

primary care internal medicine, geriatric medicine, and obstetrics/gynecology (OB/GYN). We classified OB/GYN as primary care because 64.3% of visits to such physicians by older women are for routine follow-up or preventive care.[29] Because there may be controversy regarding the primary care role of OB/GYN for older women, we repeated our analysis excluding OB/GYN from our definition of primary care.

For each subject, we determined whether there was an ambulatory claim for either a primary care physician (PCP) or dermatologist during a 24-month period before the month of melanoma diagnosis. Our measures of dermatologist and PCP visits were intended to reflect regular ongoing care rather than care specifically associated with diagnosing melanoma. On the basis of the claims history, each subject was placed into 1 of 4 mutually exclusive categories: previous visit to PCP, previous visit to dermatologist, previous visits to both PCP and dermatology, and no previous visits to either PCP or dermatology.

Thin Melanoma Diagnosis and Mortality

We examined the likelihood that subjects were diagnosed with thin melanomas. We classified thin melanomas as localized lesions with Breslow thickness <1 mm. Subjects classified as having non–thin melanomas included those with regional disease (regional lymph nodes or satellite nodules) or distant metastatic disease at diagnosis. The non–thin melanomas classification also included those having localized lesions at a depth that was intermediate (Breslow thickness 1–2 mm) or thick (Breslow thickness >2 mm) because of their less favorable prognosis.[30–32]

The SEER registry also provided data on vital status for all subjects through 2005. Date and underlying cause of death were obtained through linkages with state vital statistics. Survival was measured from date of diagnosis to date of death or last known follow-up (December 31, 2005). For assessment of melanoma mortality, those people who died of causes other than melanoma or who were alive on December 31, 2005, were censored. The median follow-up time (time from diagnosis till death or last follow-up) was 31 months.

Statistical Analysis

We examined the relationship between previous PCP and dermatologist visits and diagnosis of thin melanomas using multivariable logistic regression. Patients with missing stage at diagnosis were excluded from this analysis (n = 982). We examined the odds of thin melanoma diagnosis (and 95% confidence intervals [CIs]) for the 4 categories of previous PCP and dermatologist visits: neither PCP nor dermatologist, PCP only, dermatologist only, and both PCP and dermatologist. The following variables were used as potential confounders in multivariable models: age at diagnosis, sex, race/ethnicity (derived from SEER variables), marital status at diagnosis, census-derived measures of median household income at the zip code level (categorized by quintiles within each registry), educational attainment at the zip code level (percentage of people with less than a high school education, categorized by quintiles within each registry), year of diagnosis, metropolitan statistical area, SEER geographic registry, Charlson comorbidity index[33,34] (determined from both inpatient and outpatient claims), prior influenza vaccination (as a marker of preventive behaviors),[35,36] and histologic category.

The relationship between PCP/dermatologist visits and melanoma mortality was analyzed using Kaplan-Meier survival curves and Cox proportional regression models adjusting for the potential confounding factors described above. The proportional hazards assumption was checked by the graphical and numerical method developed by Lin et al.[37] In our analysis of mortality, we controlled for differences in treatment modalities recorded in SEER, including surgery (surgery with wide excision [>1.0 cm], surgery without wide excision or with unknown margins, none or unknown surgery), receiving lymph node resection (including sentinel lymph node), and receiving radiation therapy. To determine whether observed associations between physician visits and lower melanoma mortality were explained primarily by earlier stage at diagnosis, multivariable Cox models were first performed, excluding stage at diagnosis and then repeated with stage. The degree to which the hazard ratios differ between these 2 models is an indication of how much of the mortality differences are the result of earlier stage at diagnosis. All analyses were performed using SAS software version 9.3 (SAS Institute Inc., Cary, NC) or R software version 2.15.0 (available from http://www.r-project.org/).

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

Results

Diagnosis of Thin Melanoma

The mean age of the sample subjects was 76.9 years (standard deviation, 6.6 years) and 11,283 of 18,884 subjects (59.7%) were men (Table 1). Almost half of the subjects had melanoma diagnosed as invasive but thin lesions. Most subjects diagnosed with melanoma had claims for previous visits with a PCP, either alone or in conjunction with a dermatologist. For 2419 of the 18,884 subjects (12.8%), however, there was no claim for PCP or dermatologist services in the 24-month period before diagnosis. Of those who had a prior visit with a PCP (n = 15,471), 5920 (38.3%) had a dermatology visit. Of those who did not have a prior visit with a PCP (n = 3413), 994 (29.1%) had a dermatology visit ($P = <.0001$, χ^2 test, for differences in dermatology visits by PCP visit).

Subjects having both a PCP and dermatologist visit, or just a PCP visit, in the 24-month period before diagnosis were more likely to have a diagnosis of thin melanoma compared with subjects without any visits (Table 2). When adjusting for potential confounders, those having both PCP and dermatologist visits before diagnosis had 26% greater odds of a thin melanoma diagnosis. Other predictors of thin melanoma diagnosis included younger age, more recent time of diagnosis, lower comorbid illness burden, prior influenza vaccination, white race (black race, Hispanic ethnicity, and Asian/American Indian/Pacific Islander were less likely to have early stage diagnosis), being married, and living in a zip code with higher educational attainment. Excluding OB/GYN from our definition of PCP visits had no effect on our findings. There was no difference in the odds of thin melanoma diagnosis when comparing patients with a dermatologist visit only versus PCP visit only (adjusted odds ratio, 1.07; 95% CI, 0.92–1.25).

Mortality

Vital status for all study patients (n = 18,884) at the end of follow-up was as follows: alive, n = 12,820 (67.9%); died of melanoma, n = 2083 (11.0%); died of other causes, n = 3853 (20.4%); unknown if died, n = 128 (0.7%). The proportions of persons dying of melanoma by category of physician utilization were as follows; PCP, 1,133 deaths per 9,485 persons (11.9%); dermatologist, 100 deaths per 981 persons (10.2%); both PCP and dermatologist, 481

Table 1. Characteristics of Study Subjects Diagnosed with Melanoma (n = 18,884)

Characteristics	Patients No.	Patients %
Prior physician visits		
Neither PCP nor dermatologist	2,419	12.8
PCP only	9,551	50.6
Dermatologist only	994	5.3
Both PCP and dermatologist	5,920	31.3
Age at diagnosis (years)		
67–75	8,676	45.9
76–85	7,847	41.6
≥86	2,361	12.5
Sex		
Male	11,283	59.7
Female	7,601	40.3
Race/ethnicity		
Non-Hispanic white	17,866	94.6
Bon-Hispanic black	115	0.6
Hispanic	308	1.6
Asian/American Indian/Pacific Islander	110	0.6
Other	485	2.6
Marital status		
Single (never married)	1,129	6.0
Married	9,500	50.3
Separated/divorced	671	3.6
Widowed	3,640	19.3
Unknown	3,944	20.9
MSA of residence		
Large metropolitan	10,570	56.0
Metropolitan	5,552	29.4
Urban	1,117	5.9
Less urban	1,294	6.9
Rural	350	1.9
Unknown	1	0.0
Year of diagnosis		
1994–1997	3,359	17.8
1998–2000	3,802	20.1
2001–2005	11,723	62.1
Histologic type		
Melanoma NOS	8,911	47.2
Nodular melanoma	1,764	9.3
Superficial spreading	4,579	24.2
Lentigo maligna	2,220	11.8
Acral melanoma	266	1.4
Other	1,144	6.1
Stage at diagnosis*		
Local, thin	8,981	47.6
Local, intermediate	3,242	17.2
Local, thick	2,006	10.6
Regional	2,766	14.6
Distant	907	4.8
Unknown	982	5.2

Continued

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

Table 1. Continued

Characteristics	Patients No.	Patients %
Charlson Comorbidity Index		
0	11,324	60.0
1	4,317	22.9
≥2	3,243	17.2
Influenza vaccination	8,017	42.5
No	10,867	57.5
Yes		
Surgery		
Surgery with wide margin	10,893	57.7
Surgery without wide margin	6,471	34.3
No surgery	1,454	7.7
Unknown surgery	66	0.3
Lymph nodes removed		
Yes	4,213	22.3
No	14,328	75.9
Unknown	343	1.8
Radiation		
Yes	488	2.6
No	18,135	96.0
Unknown	261	1.4

*Thin lesions are defined as Breslow thickness <1 mm, intermediate are 1 to 2 mm, and thick are >2 mm.
MSA, metropolitan statistical area; NOS, not otherwise specified; PCP, primary care physician.

deaths per 5,888 persons (8.2%); and neither, 369 deaths per 2,402 persons (15.4%). Survival varied by category of physician utilization ($P < .0001$, log rank test) (Figure 1).

In the analysis adjusting for all factors except stage (model 1), prediagnostic visits to PCPs alone or both PCPs and dermatologists were significantly associated with reductions in melanoma mortality (Table 3). Prediagnostic visits to both dermatologists and PCPs were associated with 34% lower melanoma mortality (adjusted hazard ratio, 0.66; 95% CI, 0.57–0.76). These findings were attenuated once stage at diagnosis was included in the model (model 2), but remained significant, reflecting the potential effects of physician visits in reducing mortality beyond those associated with earlier stage diagnosis. Other factors associated with reduced mortality included female sex, younger age, being married, lower comorbid burden, and having favorable histologic subtypes, such as lentigo maligna or superficial spreading melanoma. When repeating our analysis to exclude OB/GYN from our definition of primary care, we found that in model 2 visits to PCPs only were no long statistically significant. There was no substantive difference in results for model 1.

Discussion

Subjects having ambulatory visits to both PCPs and dermatologists before diagnosis were more likely to be diagnosed with thin melanomas. Likewise, those having previous visits to both PCPs and dermatologists had 34% lower melanoma mortality, a finding that was explained in part, but not entirely, by earlier stage diagnosis.

Physicians can theoretically affect melanoma mortality through screening exams of asymptomatic patients, timely evaluation of lesions discovered by patients, and patient education about melanoma. Lesions identified by physicians tend to be thinner than those discovered by patients.[6–8,38,39] Our results support the hypothesis that ambulatory physician visits are associated with thinner melanoma diagnosis and subsequent improved melanoma survival.

Studies have suggested that dermatologists provide greater accuracy during skin examinations[40] and diagnose melanoma at earlier stage than other physicians.[41] Our study did not find any difference in stage at diagnosis for subjects having ambulatory visits to only dermatologists compared with those having visits only to PCPs. The best outcomes, however, were seen among patients who had previous ambulatory visits to both dermatologists and PCPs, suggesting that these services can complement one another. For example, PCPs may facilitate referrals to dermatologists, and we found that dermatologist visits were more common for patients who had seen PCPs before diagnosis.

Although dermatologists may provide more accurate skin examinations relative to PCPs, some have argued that their affect is more limited because of fewer contacts with patients and thus fewer opportunities to diagnose melanoma.[42] Our results are consistent with this argument: more than half of the patients diagnosed with melanoma had contact with only their PCP in the 24-month period before diagnosis. It is uncertain whether educational programs can improve the diagnostic accuracy of skin examinations by PCPs[43] and whether such screenings can ultimately improve outcomes.[44]

The association between PCP and dermatologist visits and lower melanoma mortality seemed to

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

Table 2. Predictors of Thin Melanoma Diagnosis in Patients Using Multivariable Logistic Regression (n = 17,902)*

	Thin Melanomas			
	n/N	%	Adjusted Odds Ratio	95% Wald CL
Prior physician visits				
Neither PCP nor dermatologist	1,025/2,271	45.1	1.00	Referent
PCP only	4,420/9,122	48.5	1.08	0.98–1.21
Dermatologist only	479/929	51.6	1.17	0.98–1.38
Both PCP and dermatologist	3,057/5,580	54.8	1.26	1.12–1.41
Age at diagnosis (years)				
67–75	4,543/8,266	55.0	1.00	Referent
76–85	3,560/7,434	47.9	0.78	0.73–0.84
≥86	878/2,202	39.9	0.58	0.52–0.65
Sex				
Male	5,407/10,717	50.5	1.00	Referent
Female	3,574/7,185	49.7	1.06	0.99–1.14
Race/ethnicity				
Non-Hispanic white	8,500/16,954	50.1	1.00	Referent
Non-Hispanic black	29/108	26.9	0.53	0.33–0.85
Hispanic	99/290	34.1	0.63	0.49–0.83
Asian/American Indian/Pacific Islander	31/98	31.6	0.51	0.32–0.82
Other	322/452	71.2	1.79	1.43–2.26
Marital status at diagnosis				
Married	4,394/9,108	48.2	1.00	Referent
Never married	449/1,060	42.4	0.86	0.74–0.98
Separated/divorced	272/640	42.5	0.81	0.68–0.97
Widowed	1,306/3,415	38.2	0.80	0.72–0.88
Unknown	2,560/3,679	69.6	2.22	2.02–2.43
Education level of residence				
Quintile 1 (lowest)	1,607/3,637	44.2	1.00	Referent
Quintile 2	1,786/3,668	48.7	1.06	0.95–1.18
Quintile 3	1,741/3,476	50.1	1.14	1.01–1.29
Quintile 4	1,871/3,560	52.6	1.18	1.04–1.35
Quintile 5 (highest)	1,909/3,446	55.4	1.25	1.08–1.46
Median income of residence				
Quintile 1 (lowest)	1,734/3,795	45.7	1.00	Referent
Quintile 2	1,817/3,699	49.1	1.04	0.94–1.17
Quintile 3	1,715/3,461	49.6	1.01	0.89–1.14
Quintile 4	1,813/3,530	51.4	1.01	0.89–1.15
Quintile 5 (highest)	1,835/3,302	55.6	1.11	0.94–1.29
MSA residence				
Large metropolitan	5,037/10,002	50.4	1.00	Referent
Metropolitan	2,688/5,299	50.7	0.95	0.86–1.05
Urban	508/1,058	48.0	0.92	0.78–1.09
Less urban	596/1,212	49.2	1.05	0.88–1.24
Rural	152/330	46.1	0.98	0.75–1.29
Year of diagnosis				
1994–1997	1,465/3,155	46.4	1.00	Referent
1998–2000	1,758/3,569	49.3	1.16	1.04–1.29
2001–2005	5,758/11,178	51.5	1.30	1.18–1.44

Continued

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

Table 2. Continued

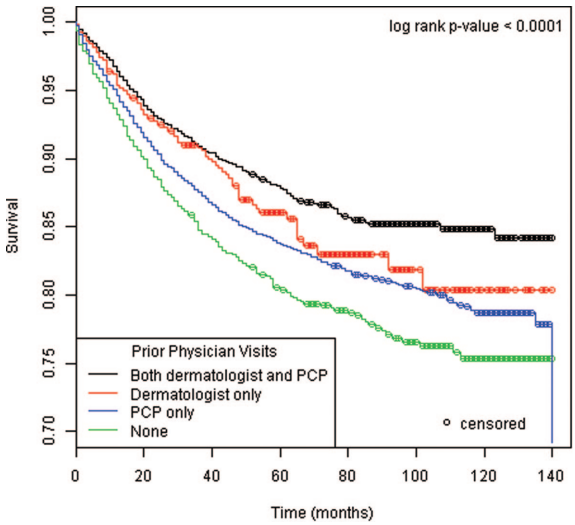
	Thin Melanomas			
	n/N	%	Adjusted Odds Ratio	95% Wald CL
Histologic type				
Melanoma NOS	3,894/8,148	47.8	1.00	Referent
Nodular melanoma	180/1,732	10.4	0.14	0.12–0.17
Superficial spreading	2,932/4,514	65.0	2.09	1.93–2.26
Lentigo maligna	1,588/2,145	74.0	3.25	2.90–3.63
Acral melanoma	78/260	30.0	0.61	0.46–0.80
Other	309/1,103	28.0	0.44	0.38–0.51
Charlson Comorbidity Index				
0	5,633/10,756	52.4	1.00	Referent
1	1,977/4,086	48.4	0.87	0.80–0.94
≥2	1,371/3,060	44.8	0.80	0.73–0.88
Influenza vaccination				
No	3,586/7,577	47.2	1.00	Referent
Yes	5,395/10,325	52.3	1.13	1.05–1.21

Note: The Surveillance Epidemiology and End Results registry was adjusted for, but results are not presented.
*Excluding people with unknown stage at diagnosis. Thin lesions are defined as Breslow thickness <1 mm.
CL, confidence limits; MSA, metropolitan statistical area; NOS, not otherwise specified; PCP, primary care physician.

be mediated in part by earlier stage diagnosis. PCP and dermatologist visits after diagnosis could also theoretically affect adherence to melanoma treatment and subsequent surveillance, but this was not examined in our study. Whether ambulatory visits to dermatologists and PCPs after diagnosis affects treatment or surveillance of melanoma is unknown.

Some have argued that greater physician surveillance is leading to overdiagnosis of melanoma, detecting early stage melanomas with limited malignant potential.[45] Overdiagnosis of cancer is suspected when there is an increased incidence of early stage cancers but no corresponding increase in late-stage disease or cancer mortality.[46] While overdiagnosis is one potential explanation for our findings, the increasing incidence of melanoma in patients 65 years and older has been accompanied by increased incidence of late-stage disease and melanoma mortality.[47]

Figure 1. Melanoma-specific survival. PCP, primary care physician.



A diagnosis of thin melanoma was associated with younger age, lower comorbidity, prior influenza vaccination, being married, living in a zip code with higher educational attainment, and more recent diagnosis. A diagnosis of non–thin melanoma was more common among minorities, including African Americans, Asian/American Indian/Pacific Islanders, and Hispanics. In prior studies, late-stage melanoma diagnosis has been similarly associated with older age,[8] being unmarried,[48,49] lower socioeconomic status,[50–52] and lack of health insurance,[53,54] The trend over time of diagnosis at an earlier stage may be the result of improved detection of melanomas or could be explained in part by improved SEER reporting of early stage lesions.[55]

This study has a number of limitations that should be considered when interpreting the findings. First, this study was limited to patients ages 67 years and older with Medicare fee-for-service insurance and living in SEER registries, and findings may be different for other populations. Associa-

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

Table 3. Factors Associated with Melanoma Mortality in Patients (n = 18,884)*

Characteristics	Unadjusted Model	Multivariable Model 1†	Multivariable Model 2‡
Prior physician visits			
Neither PCP nor dermatologist	1.00 (referent)	1.00 (referent)	1.00 (referent)
PCP only	0.82 (0.73–0.93)	0.84 (0.74–0.95)	0.87 (0.77–0.99)
Dermatologist only	0.69 (0.55–0.86)	0.79 (0.63–1.00)	0.80 (0.64–1.01)
Both PCP and dermatologist	0.59 (0.51–0.67)	0.66 (0.57–0.76)	0.72 (0.62–0.83)
Age at diagnosis (years)			
67–75	1.00 (referent)	1.00 (referent)	1.00 (referent)
76–85	1.29 (1.17–1.42)	1.21 (1.10–1.33)	1.08 (0.98–1.19)
≥86	1.94 (1.71–2.21)	1.76 (1.53–2.02)	1.38 (1.20–1.59)
Sex			
Male	1.00 (referent)	1.00 (referent)	1.00 (referent)
Female	0.79 (0.72–0.87)	0.71 (0.65–0.79)	0.70 (0.63–0.77)
Race/ethnicity			
Non-Hispanic white	1.00 (referent)	1.00 (referent)	1.00 (referent)
Non-Hispanic black	2.33 (1.59–3.41)	1.22 (0.82–1.82)	1.11 (0.75–1.65)
Hispanic	1.67 (1.26–2.20)	1.21 (0.91–1.62)	1.01 (0.76–1.35)
Asian/American Indian/Pacific Islander	1.71 (1.09–2.69)	1.53 (0.95–2.44)	1.37 (0.85–2.20)
Other	0.11 (0.05–0.24)	0.16 (0.07–0.36)	0.22 (0.10–0.49)
Marital status			
Married	1.00 (referent)	1.00 (referent)	1.00 (referent)
Never married	1.51 (1.29–1.77)	1.33 (1.13–1.56)	1.31 (1.11–1.54)
Separated/divorced	1.22 (0.98–1.51)	1.25 (1.00–1.55)	1.21 (0.97–1.51)
Widowed	1.45 (1.31–1.61)	1.30 (1.16–1.46)	1.24 (1.10–1.39)
Unknown	0.36 (0.30–0.42)	0.40 (0.34–0.47)	0.55 (0.46–0.65)
Education level of residence			
Quintile 1 (lowest)	1.00 (referent)	1.00 (referent)	1.00 (referent)
Quintile 2	0.79 (0.70–0.90)	0.93 (0.81–1.07)	0.96 (0.83–1.11)
Quintile 3	0.85 (0.75–0.97)	0.91 (0.78–1.06)	0.97 (0.83–1.13)
Quintile 4	0.79 (0.69–0.90)	0.98 (0.83–1.16)	1.00 (0.85–1.18)
Quintile 5 (highest)	0.69 (0.60–0.79)	0.91 (0.75–1.12)	1.00 (0.82–1.23)
Median income of residence			
Quintile 1 (lowest)	1.00 (referent)	1.00 (referent)	1.00 (referent)
Quintile 2	0.87 (0.76–0.99)	0.91 (0.79–1.04)	0.94 (0.81–1.08)
Quintile 3	0.91 (0.80–1.03)	0.97 (0.83–1.14)	1.03 (0.88–1.21)
Quintile 4	0.91 (0.80–1.04)	1.04 (0.87–1.23)	1.10 (0.93–1.30)
Quintile 5 (highest)	0.69 (0.60–0.79)	0.86 (0.70–1.07)	0.90 (0.73–1.11)
MSA residence			
Large metropolitan	1.00 (referent)	1.00 (referent)	1.00 (referent)
Metropolitan	1.09 (0.99–1.21)	0.99 (0.87–1.13)	1.01 (0.88–1.15)
Urban	1.18 (0.98––1.40)	1.15 (0.93–1.42)	1.14 (0.93–1.41)
Less urban	1.18 (1.00–1.39)	1.13 (0.91–1.40)	1.09 (0.88–1.36)
Rural	0.88 (0.61–1.25)	0.78 (0.53–1.16)	0.83 (0.56–1.23)
Year of diagnosis			
1994–1997	1.00 (referent)	1.00 (referent)	1.00 (referent)
1998–2000	0.90 (0.80–1.02)	0.86 (0.76–0.98)	0.93 (0.81–1.05)
2001–2005	0.94 (0.84–1.05)	0.85 (0.75–0.97)	0.90 (0.79–1.03)

Continued

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

Table 3. Continued

Characteristics	Unadjusted Model	Multivariable Model 1†	Multivariable Model 2‡
Histology type			
Melanoma, NOS	1.00 (referent)	1.00 (referent)	1.00 (referent)
Nodular melanoma	1.74 (1.55–1.95)	1.90 (1.68–2.14)	1.14 (1.00–1.29)
Superficial spreading	0.35 (0.31–0.40)	0.51 (0.44–0.59)	0.72 (0.63–0.83)
Lentigo maligna	0.14 (0.10–0.19)	0.21 (0.16–0.28)	0.39 (0.29–0.53)
Acral melanoma	1.11 (0.82–1.50)	1.05 (0.77–1.44)	0.93 (0.68–1.27)
Other	0.98 (0.83–1.16)	1.05 (0.88–1.25)	0.76 (0.64–0.91)
Stage at diagnosis§			
Local, thin	1.00 (referent)		1.00 (referent)
Local, intermediate	3.00 (2.43–3.70)		2.70 (2.18–3.35)
Local, thick	8.62 (7.11–10.45)		6.65 (5.43–8.14)
Regional/distant	26.82 (22.81–31.55)		16.48 (13.79–19.70)
Unknown	12.68 (10.31–15.60)		6.03 (4.81–7.56)
Charlson Comorbidity Index			
0	1.00 (referent)	1.00 (referent)	1.00 (referent)
1	1.20 (1.08–1.34)	1.15 (1.03–1.28)	1.18 (1.06–1.31)
2+	1.48 (1.32–1.66)	1.42 (1.26–1.61)	1.29 (1.15–1.45)
Influenza vaccination			
No	1.00 (referent)	1.00 (referent)	1.00 (referent)
Yes	0.79 (0.72–0.86)	0.91 (0.83–0.99)	0.97 (0.89–1.07)
Surgery			
Surgery without wide margin	1.00 (referent)	1.00 (referent)	1.00 (referent)
Surgery with wide margin	0.95 (0.85–1.05)	0.75 (0.67–0.83)	0.75 (0.67–0.84)
No/unknown surgery	6.52 (5.79–7.35)	4.50 (3.94–5.13)	2.51 (2.19–2.88)
Lymph node removal			
No/unknown	1.00 (referent)	1.00 (referent)	1.00 (referent)
Yes	1.42 (1.28–1.56)	1.31 (1.18–1.45)	0.78 (0.70–0.87)
Radiation therapy			
No/unknown	1.00 (referent)	1.00 (referent)	1.00 (referent)
Yes	10.12 (8.88–11.54)	3.65 (3.15–4.22)	2.16 (1.87–2.50)

*After excluding people with in situ lesions but including those with unknown stage. Mortality refers to melanoma specific mortality, not all-cause mortality.
†Model 1 adjusted for all factors shown in table plus Surveillance Epidemiology and End Results registry but did not adjust for stage at diagnosis.
‡Model 2 further adjusted model 1 for stage at diagnosis.
§Thin lesions are defined as Breslow thickness <1 mm, intermediate are 1 to 2 mm, and thick are >2 mm.
MSA, metropolitan statistical area; NOS, not otherwise specified; PCP, primary care physician.

tions between physician visits and lower mortality could result if healthier people are more likely to visit PCPs. Our models adjusted for prior influenza vaccination as a proxy for healthy behaviors in effort to minimize this potential bias, but residual confounding is still possible. The SEER-Medicare database lacks potentially important confounders. For example, we lacked data on severity of comorbid illness, which could affect survival, and data on melanoma risk factors (skin type, precursor lesions, etc.) that could affect stage at diagnosis. Nor did we have detailed information on the specific nature of the physician visits assessed or the reasons that patients were seeing dermatologists.

Conclusion

We found that previous ambulatory visits to both dermatologists and PCPs were associated with a greater likelihood of a diagnosis of thin melanoma and reduced melanoma mortality. People with previous visits to both a dermatologist and a PCP had the best melanoma outcomes. Further study is warranted to understand the effect of physician utilization on melanoma outcomes.

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

References

1. Siegel R, Ward E, Brawley O, Jemal A. Cancer statistics, 2011: the impact of eliminating socioeconomic and racial disparities on premature cancer deaths. CA Cancer J Clin 2011;61:212–36.
2. Markovic SN, Erickson LA, Rao RD, et al. Malignant melanoma in the 21st century, part 2: staging, prognosis, and treatment. Mayo Clin Proc 2007;82: 490–513.
3. Epstein D, Lange J, Gruber S, Mofid M, Koch S. Is physician detection associated with thinner melanomas? JAMA 1999;281:640–3.
4. Kantor J, Kantor DE. Routine dermatologist-performed full-body skin examination and early melanoma detection. Arch Dermatol 2009;145:873–6.
5. Kovalyshyn I, Dusza SW, Siamas K, Halpern AC, Argenziano G, Marghoob AA. The impact of physician screening on melanoma detection. Arch Dermatol 2011;147:1269–75.
6. McGuire ST, Secrest AM, Andrulonis R, Ferris LK. Surveillance of patients for early detection of melanoma: patterns in dermatologist vs patient discovery. Arch Dermatol 2011;147:673–8.
7. Fisher NM, Schaffer JV, Berwick M, Bolognia JL. Breslow depth of cutaneous melanoma: impact of factors related to surveillance of the skin, including prior skin biopsies and family history of melanoma. J Am Acad Dermatol 2005;53:393–406.
8. Durbec F, Vitry F, Granel-Brocard F, et al. The role of circumstances of diagnosis and access to dermatological care in early diagnosis of cutaneous melanoma: a population-based study in France. Arch Dermatol 2010;146:240–6.
9. Eide MJ, Weinstock MA, Clark MA. The association of physician-specialty density and melanoma prognosis in the United States, 1988 to 1993. J Am Acad Dermatol 2009;60:51–8.
10. Roetzheim R, Pal N, Van Durme D, et al. Increasing supplies of dermatologists and family physicians are associated with earlier stage of melanoma detection. J Am Acad Derm 2000;43:211–8.
11. U.S. Preventive Services Task Force. Screening for skin cancer. February 2009. Available from: http://www.uspreventiveservicestaskforce.org/uspstf/uspsskca.htm. Accessed September 12, 2013.
12. Whitcomb ME, Cohen JJ. The future of primary care medicine. N Engl J Med 2004;351:710–2.
13. Kimball AB, Resneck JS Jr. The US dermatology workforce: a specialty remains in shortage. J Am Acad Dermatol 2008;59:741–5.
14. Uhlenhake E, Brodell R, Mostow E. The dermatology work force: a focus on urban versus rural wait times. J Am Acad Dermatol 2009;61:17–22.
15. Tsang MW, Resneck JS Jr. Even patients with changing moles face long dermatology appointment wait-times: a study of simulated patient calls to dermatologists. J Am Acad Dermatol 2006;55:54–8.
16. Alam M, Goldberg LH, Silapunt S, et al. Delayed treatment and continued growth of nonmelanoma skin cancer. J Am Acad Dermatol 2011;64:839–48.
17. Ries LAG, Young JL, Keel GE, Eisner MP, Lin YD, Horner M-J, editors. SEER survival monograph: cancer survival among adults: U.S. SEER Program, 1988–2001, patient and tumor characteristics. NIH pub. no. 07–6215. Bethesda, MD: National Cancer Institute; 2007. Available from: http://seer.cancer.gov/publications/survival/. Accessed September 12, 2013.
18. Brull R, Ghali WA, Quan H. Missed opportunities for prevention in general internal medicine. CMAJ 1999;160:1137–40.
19. Freeman HJ. Documentation of rectal examination performance in the clinical teaching unit of a university hospital. Can J Gastroenterol 2000;14:272–6.
20. Harrison RV, Janz NK, Wolfe RA, Tedeschi PJ, Huang X, McMahon LF Jr. 5-Year mammography rates and associated factors for older women. Cancer. 2003;97:1147–55.
21. Huth JF, O'Connor AP. Breast cancer screening practices for hospitalized women. J Cancer Educ 1995;10:22–4.
22. Sharma VK, Komanduri S, Nayyar S, et al. An audit of the utility of in-patient fecal occult blood testing. Am J Gastroenterol 2001;96:1256–60.
23. Trimble CL, Richards LA, Wilgus-Wegweiser B, Plowden K, Rosenthal DL, Klassen A. Effectiveness of screening for cervical cancer in an inpatient hospital setting. Obstet Gynecol 2004;103:310–6.
24. Van Harrison R, Janz NK, Wolfe RA, et al. Characteristics of primary care physicians and their practices associated with mammography rates for older women. Cancer 2003;98:1811–21.
25. White MJ. Consideration of women's health issues by housestaff performing admitting histories and physical examinations. Acad Med 1993;68:698–700.
26. Ziffer A, Song P, Mandelblatt J. Preventive health practices in a teaching hospital: house staff attitudes and performance of gynecological screening. Am J Prev Med 1987;3:142–6.
27. Yu X, McBean AM, Virnig BA. Physician visits, patient comorbidities, and mammography use among elderly colorectal cancer survivors. J Cancer Surviv 2007;1:275–82.
28. Baldwin LM, Adamache W, Klabunde CN, Kenward K, Dahlman C, Warren JL. Linking physician characteristics and medicare claims data: issues in data availability, quality, and measurement. Med Care 2002;40(8 Suppl):82–95.
29. Valderas JM, Starfield B, Forrest CB, Sibbald B, Roland M. Ambulatory care provided by office-based specialists in the United States. Ann Fam Med 2009; 7:104–11.
30. Criscione VD, Weinstock MA. Melanoma thickness trends in the United States, 1988–2006. J Invest Dermatol 2010;130:793–7.

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.

31. Demierre MF, Chung C, Miller DR, Geller AC. Early detection of thick melanomas in the United States: beware of the nodular subtype. Arch Dermatol 2005;141:745–50.
32. Gimotty PA, Botbyl J, Soong SJ, Guerry D. A population-based validation of the American Joint Committee on Cancer melanoma staging system. J Clin Oncol 2005;23:8065–75.
33. Charlson M, Pompei P, Ales K, Mackenzie C. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chron Dis 1987;40:373–83.
34. Klabunde CN, Potosky AL, Legler JM, Warren JL. Development of a comorbidity index using physician claims data. J Clin Epidemiol 2000;53:1258–67.
35. Brookhart MA, Patrick AR, Dormuth C, et al. Adherence to lipid-lowering therapy and the use of preventive health services: an investigation of the healthy user effect. Am J Epidemiol 2007;166:348–54.
36. Ferrante JM, McCarthy EP, Gonzalez EC, et al. Primary care utilization and colorectal cancer outcomes among Medicare beneficiaries. Arch Intern Med 2011;171:1747–57.
37. Lin DY, Wei LJ, Ying Z. Checking the Cox model with cumulative sums of martingale-based residuals. Biometrika 1993; 80:557–72.
38. Geller AC, Johnson TM, Miller DR, Brooks KR, Layton CJ, Swetter SM. Factors associated with physician discovery of early melanoma in middle-aged and older men. Arch Dermatol 2009;145:409–14.
39. Di Quinzio ML, Dewar RA, Burge FI, Veugelers PJ. Family physician visits and early recognition of melanoma. Can J Public Health 2005;96:136–9.
40. Chen SC, Pennie ML, Kolm P, et al. Diagnosing and managing cutaneous pigmented lesions: primary care physicians versus dermatologists. J Gen Intern Med 2006;21:678–82.
41. Pennie ML, Soon SL, Risser JB, Veledar E, Culler SD, Chen SC. Melanoma outcomes for Medicare patients: association of stage and survival with detection by a dermatologist vs a nondermatologist. Arch Dermatol 2007;143:488–94.
42. Bordeaux JS, Lu KQ, Cooper KD. Melanoma: prevention and early detection. Semin Oncol 2007;34: 460–6.
43. Goulart JM, Quigley EA, Dusza S, et al. Skin cancer education for primary care physicians: a systematic review of published evaluated interventions. J Gen Intern Med 2011;26:1027–35.
44. Wolff T, Tai E, Miller T. Screening for skin cancer: an update of the evidence for the U.S. Preventive Services Task Force. Ann Intern Med 2009;150: 194–8.
45. Welch HG, Woloshin S, Schwartz LM. Skin biopsy rates and incidence of melanoma: population based ecological study. BMJ 2005;331:481.
46. Welch HG, Black WC. Overdiagnosis in cancer. J Natl Cancer Inst 2010;102:605–13.
47. Jemal A, Saraiya M, Patel P, et al. Recent trends in cutaneous melanoma incidence and death rates in the United States, 1992–2006. J Am Acad Dermatol 2011;65(5 Suppl 1):S17–25.e1–3.
48. McLaughlin JM, Fisher JL, Paskett ED. Marital status and stage at diagnosis of cutaneous melanoma: results from the Surveillance Epidemiology and End Results (SEER) program, 1973–2006. Cancer 2011; 117:1984–93.
49. Reyes Ortiz CA, Freeman JL, Kuo YF, Goodwin JS. The influence of marital status on stage at diagnosis and survival of older persons with melanoma. J Gerontol A Biol Sci Med Sci 2007;62:892–8.
50. Baumert J, Plewig G, Volkenandt M, Schmid-Wendtner MH. Factors associated with a high tumour thickness in patients with melanoma. Br J Dermatol 2007;156:938–44.
51. Mandala M, Imberti GL, Piazzalunga D, et al. Association of socioeconomic status with Breslow thickness and disease-free and overall survival in stage I-II primary cutaneous melanoma. Mayo Clin Proc 2011;86:113–9.
52. Swetter SM, Johnson TM, Miller DR, Layton CJ, Brooks KR, Geller AC. Melanoma in middle-aged and older men: a multi-institutional survey study of factors related to tumor thickness. Arch Dermatol 2009;145:397–404.
53. Ward EM, Fedewa SA, Cokkinides V, Virgo K. The association of insurance and stage at diagnosis among patients aged 55 to 74 years in the national cancer database. Cancer J 2010;16:614–21.
54. Roetzheim RG, Pal N, Tennant C, et al. Effects of health insurance and race on early detection of cancer. J Natl Cancer Inst 1999;91:1409–15.
55. Watson M, Johnson CJ, Chen VW, et al. Melanoma surveillance in the United States: overview of methods. J Am Acad Dermatol 2011;65:S6–16.

J Am Board Fam Med: first published as 10.3122/jabfm.2013.06.130042 on 7 November 2013. Downloaded from http://www.jabfm.org/ on 24 April 2024 by guest. Protected by copyright.