JAMA Dermatology | Original Investigation

Association of Delays in Surgery for Melanoma With Insurance Type

Adewole S. Adamson, MD, MPP; Lei Zhou, MSPH; Christopher D. Baggett, PhD; Nancy E. Thomas, MD, PhD; Anne-Marie Meyer, PhD

Editorial page 1094
Author Audio Interview
Supplemental content

IMPORTANCE Timely receipt of treatment for cancer is an important aspect of health care quality. It is unknown how delays of surgery for melanoma vary by insurance type.

OBJECTIVE To analyze factors associated with delays between diagnosis and surgery for melanoma in patients with Medicare, Medicaid, or private insurance.

DESIGN, SETTING, AND PARTICIPANTS Retrospective cohort study of patients who received a diagnosis of melanoma between 2004 and 2011 in North Carolina using data from the North Carolina Cancer Registry linked to administrative claims from Medicare, Medicaid, and private insurance. Inclusion criteria were incident patients with a diagnosis of melanoma stage 0 to III and with continuous insurance enrollment from at least 1 month prior to the month of diagnosis to 12 months after diagnosis of melanoma.

MAIN OUTCOMES AND MEASURES Surgical delay, defined as definitive surgical excision occurring more than 6 weeks after melanoma diagnosis. Generalized linear models with log link, Poisson distributions, and robust standard errors were used to estimate adjusted risk ratios (RRs) to model risk of delay in definitive surgery.

RESULTS A total of 7629 patients were included (4210 [55%] female; mean [SD] age, 64 [15] years), 48% (n = 3631) Medicare, 48% (n = 3667) privately insured, and 4% (n = 331) Medicaid patients. Privately insured patients were least likely to experience a delay in definitive surgery, followed by Medicare and Medicaid patients (519 [14%], 609 [17%], and 79 [24%], respectively; $P < .001$). After demographic adjustment, the risk of surgical delay was significantly increased in patients with Medicaid compared with private insurance (RR, 1.36; 95% CI, 1.09-1.70). Delays were more likely in nonwhite patients (RR, 1.38; 95% CI, 1.02-1.87). Surgical delays were less likely if the physician performing the surgery (RR, 0.82; 95% CI, 0.72-0.93) or the diagnosing clinician (RR, 0.81; 95% CI, 0.71-0.93) was a dermatologist as compared with a nondermatologist.

CONCLUSION AND RELEVANCE Surgical treatment delays were common but were less prevalent in patients diagnosed or surgically treated by a dermatologist. Medicaid patients experienced the most surgical delays. A reduction in delays in melanoma surgery could be achieved through better access to specialty care and cross-disciplinary coordination.

Author Affiliations: Department of Dermatology, University of North Carolina at Chapel Hill, Chapel Hill (Adamson, Thomas); Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill, Chapel Hill (Adamson); Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill, Chapel Hill (Adamson, Zhou, Baggett, Thomas, Meyer); Department of Epidemiology, University of North Carolina at Chapel Hill, Chapel Hill (Baggett, Meyer).

Corresponding Author: Adewole S. Adamson, MD, MPP, Department of Dermatology, University of North Carolina, Genome Science Bldg, 250 Bell Tower Dr, Campus Box 7287, Chapel Hill, NC 27599 (adewole@med.unc.edu).

JAMA Dermatol. 2017;153(11):1106-1113. doi:10.1001/jamadermatol.2017.3338
Published online October 4, 2017.

Melanoma is a potentially deadly form of skin cancer, and its incidence continues to increase in the United States.[1] It accounts for a minority of skin cancers diagnosed but is responsible for the majority of associated deaths.[2] The primary treatment for melanoma is surgical excision, which is often curative. However, depending on depth of invasion and stage of disease, surgical excision may also include sentinel node biopsy and systemic and/or radiation therapy. Whereas dermatologists are principally involved in diagnosing and treating most melanomas, physicians of numerous specialties including primary care, general or plastic surgery, medical oncology, and radiation oncology are often involved in both diagnosis and treatment. This makes the cancer care continuum unique and potentially treacherous for patients with melanoma given the multiple possible paths that can be taken between diagnosis and treatment.

Given this complex network of independent and potentially unconnected clinicians, timely and appropriate treatment may be delayed or not received at all. Delays in cancer treatment can result in increased morbidity and mortality.[3-6] In melanoma, a recent study found that approximately 1 in 5 Medicare beneficiaries experienced a delay of longer than 1.5 months until time of surgery, the suggested upper limit for standard of care.[7,8] Delays were less frequent when patients received their initial biopsy or surgical treatment from a dermatologist.[7]

Whereas delays in surgical treatment for melanoma have been studied in Medicare beneficiaries, to our knowledge, no studies have focused on younger patients (<65 years), who make up 52% of melanoma diagnoses.[9] Health insurance type has been shown to affect quality of care delivered to patients with many cancer types; however, it is unknown whether insurance type affects treatment delays in patients with a diagnosis of melanoma.[10-12]

Using a unique data set, which links North Carolina cancer registry data with insurance claims, we examined the difference in melanoma surgical delays for patients enrolled in Medicare, Medicaid, and privately insured health plans in North Carolina.[13] Specifically, we sought to determine whether insurance payer, patient-level, clinician-level, or tumor-level factors were associated with delays in surgery. Given the evidence that delays are less frequent for patients either diagnosed or treated by dermatologists, we wanted to examine factors associated with receipt of diagnosis or surgical treatment for melanoma by a dermatologist.

Key Points

Question Are patients with Medicaid more likely than patients with Medicare or private insurance to experience delays in surgery for melanoma?

Findings In this population-based cohort study of 7629 patients who received a diagnosis of melanoma between 2004 and 2011 in North Carolina, Medicaid patients were significantly more likely to experience delays in surgery compared with privately insured patients.

Meaning Medicaid patients are at greater risk of surgical delays for melanoma.

Methods

Data Source and Study Population

The University of North Carolina Institutional Review Board approved the present study. Informed consent was waived due to the retrospective nature of the study. The data used in this study were from the University of North Carolina Integrated Cancer Information and Surveillance System, a data resource that links cancer data from the North Carolina Central Cancer Registry to administrative and claims data from Medicare, Medicaid, and private health insurance plans from across the state. This data source has been well described for cancer-related population-based studies.[14-18] The cancer registry was used to identify all melanoma cases diagnosed from 2004 to 2011 and subsequently linked to claims data. We restricted the sample to patients between the ages of 20 and 100 years. For study inclusion, patients had a first or only diagnosis of stage 0 to 3 melanoma. To ensure that we could observe all relevant initial treatment, patients were required to be continuously enrolled in their insurance plan from at least 1 month before diagnosis to 12 months after diagnosis. Patients whose diagnosis was made by means of death certificate or autopsy were excluded, and identified from the cancer registry. We also excluded patients enrolled simultaneously in all 3 health insurance types (private insurance, Medicare fee for service, and Medicaid). Finally, patients were required to have a skin biopsy, defined as either an excision, skin biopsy, or shave removal code, occurring within 30 days before to 7 days after melanoma diagnosis.

Outcome Variables and Covariates

The primary outcome was surgical delay, defined as definitive surgical excision occurring more than 6 weeks after melanoma diagnosis. To assess the potential impact of dermatologists on the process of care, our secondary outcomes were predictors of receipt of diagnosis or surgical excision by a dermatologist. For 2564 (33.6%) of patients, melanoma was diagnosed by means of an excision (excisional biopsy) or shave removal and not a standard skin biopsy. Similar codes can be used for either an excisional biopsy (diagnosis) or surgical excision (treatment), making differentiating outcomes challenging. Thus, to separate definitive surgical excision treatment from excisional biopsy, we defined definitive surgical treatment as surgical excision (including Mohs excision) within the window of 7 to 365 days after the date of diagnosis (the eTable in the Supplement provides the list of codes). We assessed patient-level and clinician-level characteristics associated with diagnosis and surgical excision by dermatologists and nondermatologists. Age, race/ethnicity, American Joint Committee on Cancer (AJCC) stage of disease, and tumor site as reported from the cancer registry were included. We did not include patients with AJCC stage IV disease because of the high likelihood that delays in this population could have been due to inoperable tumors. Insurance status (Medicare, Medicaid, private) was derived from claims. Specialty information was

derived from the clinician information on the professional and outpatient claims. Nondermatology clinicians included general surgeons, plastic surgeons, and general or family practitioners. Rural vs urban residence was defined from Rural-Urban Commuting Area codes.[19] North Carolina National Cancer Institute center indicator was derived using zip code information on the claims. Charlson Comorbidity Index (CCI) was calculated, and those in the cohort with missing data on this index were reassigned to a value of 0. Given the exclusion criteria, patients in this cohort did not have a diagnosis of cancer listed as one of their comorbid conditions in the CCI.

Statistical Analysis

Generalized linear models with log links, Poisson distributions, and robust standard errors were used to estimate adjusted risk ratios (RRs) and 95% confidence intervals for diagnosis by dermatologist, surgery by dermatologist, and delayed surgical treatment. For the models, the referent groups were as follows: younger than 50 years old at diagnosis, female sex, white race, private insurance, nonrural zip code, diagnosis in 2004, CCI of 0, tumor location on the trunk, and AJCC stage of 0. Analysis was performed using SAS statistical software, version 9.3 (SAS Institute Inc). All statistical tests were 2 tailed with $\alpha = .05$.

Results

Descriptive Analysis of Cohort

A total of 26 220 unique cases of melanoma were identified within the North Carolina Central Cancer Registry from 2004 through 2011. After cohort exclusions were applied, there were 7629 cases of melanoma in the analytic sample (**Table 1**). The mean (SD) age of the cohort was 64 (15) years, with 98% (n = 7484) non-Hispanic white patients. Roughly the same proportions of patients were covered by Medicare (3631 [48%]) or private insurance (3667 [48%]), while the rest were covered by Medicaid (331 [4%]). The most common anatomic tumor location was the head and neck (2191 [29%]), followed by trunk (2167 [28%]), upper extremities (1997 [26%]), and lower extremities (1227 [16%]). The most commonly diagnosed tumor stages were AJCC stage 0 (ie, melanoma in situ) (3375 [44%]) and stage I (2874 [38%]) melanomas.

Unadjusted Predictors of Delay

Of the patients with a melanoma diagnosis, 16% (n = 1207) had a delay in surgery of longer than 6 weeks. Privately insured patients experienced surgical delays the least frequently compared with Medicare and Medicaid patients (519 [14%], 609 [17%], and 79 [24%], respectively). Older age ($P = .03$) and nonwhite race (33 [24%] vs 1174 [16%]; $P = .02$) were associated with a delay of longer than 6 weeks, as was having a rural zip code (471 [17%] vs 736 [15%]; $P = .004$). Anatomic location ($P < .001$) and increased AJCC stage ($P < .001$) were also associated with delays in surgery beyond 6 weeks. Patients diagnosed by a dermatologist experienced a delay 16% of the time (n = 982) vs 15% (n = 225) for nondermatologists. Patients surgically treated by a dermatologist experienced a delay 14% of the time (n = 608) vs 19% (n = 599) for nondermatologists (Table 1).

Adjusted Risk Predictors of Diagnosis by a Dermatologist

Dermatologists diagnosed 80% (n = 6121) of the melanomas in the cohort. Patients older than 60 years were more likely to receive their diagnosis from a dermatologist than nondermatologists. Privately insured patients were more likely to receive their diagnosis from a dermatologist than Medicare (RR, 0.94; 95% CI, 0.91-0.97) or Medicaid patients (RR, 0.72; 95% CI, 0.65-0.79) (**Table 2**). Nonwhite patients were less likely to receive their diagnosis from a dermatologist than white patients (RR, 0.83; 95% CI, 0.74-0.94). Patients located in rural zip codes were less likely to receive their diagnosis from a dermatologist than patients with an urban zip code (RR, 0.91; 95% CI, 0.89-0.93). The proportion of melanomas diagnosed by dermatologist was lower at higher AJCC stages. However, dermatologists, compared with nondermatologists, diagnosed a higher proportion of melanomas at each stage. Patients with a CCI of 1 or more had a decreased likelihood of being diagnosed by a dermatologist as compared with patients without documented comorbidity (RR, 0.92; 95% CI, 0.87-0.97).

Adjusted Risk Predictors of Definitive Surgery by a Dermatologist

Dermatologists performed the surgical excision in 59% (n = 4487) of patients (Table 1). There was no difference between white and nonwhite patients in the frequency of surgical excision performed by a dermatologist vs a nondermatologist. Medicaid patients were less likely than privately insured patients to have their definitive surgery performed by a dermatologist (RR, 0.81; 95% CI, 0.71-0.92) (**Table 3**). Dermatologists were less likely to perform surgical excisions on the upper extremities (RR, 0.95; 95% CI, 0.90-0.99), lower extremities (RR, 0.89; 95% CI, 0.84-0.94), and head and neck (RR, 0.95; 95% CI, 0.90-1.00) compared with lesions on the trunk. With increasing stage, the likelihood of receiving surgical treatment from a dermatologist declined. Charlson comorbidity index was not associated with likelihood of surgical treatment by a dermatologist. Patients diagnosed by a dermatologist were more likely to be treated by a dermatologist (RR, 2.40; 95% CI, 2.19-2.62).

Adjusted Risk Predictors of Surgical Delay

After adjustment for demographic and clinician factors, the risk of surgical treatment delays beyond 6 weeks was significantly increased in patients with Medicaid insurance compared with private insurance (RR, 1.36; 95% CI, 1.09-1.70) (**Table 4**). Other independent predictors of a 6-week or longer surgical delay included nonwhite race (RR, 1.38; 95% CI, 1.02-1.87), lower extremity melanoma (RR, 1.20; 95% CI, 1.01-1.42) or head and neck melanoma (RR, 1.48; 95% CI, 1.29-1.71) compared with melanoma on the trunk, and AJCC stage (RR, 1.41; 95% CI, 1.16-1.70 for stage II vs 0 and RR, 1.36; 95% CI, 1.05-1.75 for stage III vs 0). Diagnosis by a dermatologist (RR, 0.81; 95% CI, 0.71-0.93) and treatment by a dermatologist (RR, 0.82;

Table 1. Characteristics of Cohort and Unadjusted Predictors of Delay

Characteristic	No. (%) of Cases			*P* Value[a]
		Time to Surgery		
	All Patients (N = 7629)	≤6 wk (n = 6422)	>6 wk (n = 1207)	
Patient				
Age at diagnosis, y				
<50	1470 (19)	1268 (20)	202 (17)	.03
50-59	1225 (16)	1049 (16)	176 (15)	
60-69	1840 (24)	1523 (24)	317 (26)	
70-79	1975 (26)	1650 (26)	325 (27)	
≥80	1119 (15)	932 (15)	187 (15)	
Sex				
Male	4210 (55)	3515 (55)	695 (58)	.07
Female	3419 (45)	2907 (45)	512 (42)	
Race				
Non-Hispanic white	7484 (98)	6310 (98)	1174 (97)	.02
Others	145 (2)	112 (2)	33 (3)	
Insurance type				
Private	3667 (48)	3148 (49)	519 (43)	<.001
Medicare	3631 (48)	3022 (47)	609 (50)	
Medicaid	331 (4)	252 (4)	79 (7)	
Rural zip code				
No	4929 (65)	4193 (65)	736 (61)	.004
Yes	2700 (35)	2229 (35)	471 (39)	
Year of diagnosis				
2004	661 (9)	549 (9)	112 (9)	.22
2005	778 (10)	651 (10)	127 (11)	
2006	781 (10)	640 (10)	141 (12)	
2007	930 (12)	787 (12)	143 (12)	
2008	1073 (14)	900 (14)	173 (14)	
2009	1143 (15)	980 (15)	163 (14)	
2010	1127 (15)	969 (15)	158 (13)	
2011	1136 (15)	946 (15)	190 (16)	
Charlson comorbidity index				
0	7072 (93)	5965 (93)	1107 (92)	.15
≥1	557 (7)	457 (7)	100 (8)	
Physician				
Diagnosis by dermatologist				
No	1508 (20)	1283 (20)	225 (19)	.28
Yes	6121 (80)	5139 (80)	982 (81)	
Surgery by dermatologist				
No	3142 (41)	2543 (40)	599 (50)	<.001
Yes	4487 (59)	3879 (60)	608 (50)	
Tumor				
Cancer anatomic location				
Trunk	2167 (28)	1880 (29)	287 (24)	<.001
Head and neck	2191 (29)	1755 (27)	436 (36)	
Upper extremities	1997 (26)	1720 (27)	277 (23)	
Lower extremities	1227 (16)	1031 (16)	196 (16)	
Other skin, not otherwise specified	47 (1)	36 (1)	11 (1)	
American Joint Committee on Cancer Stage				
0	3375 (44)	2893 (45)	482 (40)	<.001
I	2874 (38)	2424 (38)	450 (37)	
II	474 (6)	360 (6)	114 (9)	
III	256 (3)	199 (3)	57 (5)	
Unknown	650 (9)	546 (9)	104 (9)	

[a] *P* value is for the association between the characteristic and time to surgery.

Table 2. Adjusted Risk Predictors of Diagnosis by a Dermatologist

Characteristic	Time to Surgery, wk >6 wk, RR (95% CI)	*P* Value
Patient		
Age at diagnosis, y		
<50	1 [Reference]	
50-59	0.99 (0.95-1.03)	.60
60-69	1.05 (1.01-1.09)	.01
70-79	1.08 (1.03-1.12)	<.001
≥80	1.08 (1.03-1.13)	.003
Sex		
Male	0.98 (0.95-1.00)	.06
Female	1 [Reference]	
Race		
Non-Hispanic white	1 [Reference]	
Others	0.83 (0.74-0.94)	.002
Insurance type		
Private	1 [Reference]	
Medicare	0.94 (0.91-0.97)	<.001
Medicaid	0.72 (0.65-0.79)	<.001
Rural zip code		
No	1 [Reference]	
Yes	0.91 (0.89-0.93)	<.001
Year of diagnosis		
2004	1 [Reference]	
2005	0.97 (0.91-1.03)	.30
2006	1.01 (0.95-1.07)	.76
2007	1.04 (0.98-1.09)	.17
2008	1.06 (1.01-1.11)	.03
2009	1.06 (1.01-1.12)	.02
2010	1.05 (1.00-1.11)	.051
2011	1.00 (0.95-1.06)	.86
Charlson comorbidity index		
0	1 [Reference]	
≥1	0.92 (0.87-0.97)	.001
Tumor		
Cancer anatomic location		
Trunk	1 [Reference]	
Head and neck	1.02 (0.99-1.05)	.28
Upper extremities	1.00 (0.97-1.03)	.93
Lower extremities	0.97 (0.93-1.00)	.06
Other skin, not otherwise specified	0.83 (0.67-1.04)	.11
American Joint Committee on Cancer stage		
0	1 [Reference]	
I	0.92 (0.90-0.94)	<.001
II	0.73 (0.68-0.78)	<.001
III	0.73 (0.67-0.81)	<.001
Unknown	0.85 (0.80-0.89)	<.001

Abbreviation: RR, risk ratio.

95% CI, 0.72-0.93) were associated with a reduced risk of delay. Treatment at a National Cancer Institute center was not associated with a reduced risk of delay at 6 weeks.

Discussion

To our knowledge, this is the first population-based study to examine surgical treatment delays in patients with melanoma stratified by insurance type. We found that patients with Medicaid experienced more delays in treatment compared with privately insured and Medicare patients. Whereas the treatment delay disparity for Medicaid patients is troubling, it is equally concerning that 17% of Medicare patients and 14% of privately insured patients experienced delays in surgical care for melanoma. This highlights a potential practice gap in melanoma care. Although our study was not designed to uncover the causes of treatment delays, it highlights an important health care quality disparity. Surgical delays can result in increased morbidity and mortality, making this an important area of focus for health care quality improvement.[3-6] There is a large body of evidence showing disparities in cancer care based on insurance type, including increased wait times, treatment delays, and increased mortality.[12,20-22] This is of particular concern for Medicaid patients with melanoma, who are more likely to present with advanced disease and are less likely to receive treatment.[12]

A previous study found that 22.3% of Medicare patients had a surgical delay of more than 6 weeks; in our study, the figure was 17% for Medicare patients.[7] A notable difference between our study and that by Lott et al[7] is that we were able to identify the definitive date of melanoma diagnosis. Perhaps more importantly, we found that 33.6% of melanomas were likely diagnosed using shave removal or excisional codes. These codes were not included in the previous study. This could result in misclassification and potential bias due to misattribution of biopsy codes, not associated with the incident melanoma. Although dermatologists also performed shave removals and excisional biopsies, nondermatologists were significantly more likely to use these codes in our cohort. This likely explains the smaller delay effect size observed with delays in treatment in our cohort. By including these codes, we improved attribution between diagnoses and treatment procedures and reduced potential misclassification and potential bias regarding risk of delay by specialty.

As with previous studies, our results show worse melanoma-related care for patients who were poor, older, nonwhite, or had late-stage disease.[23-25] Remarkably, we found that regardless of insurance type, significant surgical delays exist. These delays may represent an important practice gap in melanoma process of care from which 1 of 2 conclusions can be drawn. Either the suggested 6-week period between biopsy and excision is a flawed measure of quality, or the health care system is systematically failing to deliver high-quality care to a substantial proportion of patients with melanoma in general.[8] It must be noted that whereas the diagnosis of melanoma at earlier stages can decrease melanoma-related mortality, it is uncertain whether a delay to surgical excision of 6 weeks has significant biological implications for patients.[26-29] Unfortunately, there is a paucity of population-based studies analyzing the morbidity of delay of surgery for melanoma. As a

Table 3. Adjusted Risk Predictors of Definitive Surgery by a Dermatologist

Characteristic	Time to Surgery, wk >6 wk, RR (95% CI)	*P* Value
Patient		
Age at diagnosis, y		
<50	1 [Reference]	
50-59	1.01 (0.95-1.07)	.84
60-69	1.01 (0.95-1.07)	.76
70-79	0.99 (0.93-1.06)	.80
≥80	1.03 (0.95-1.11)	.48
Sex		
Male	1.02 (0.99-1.06)	.21
Female	1 [Reference]	
Race		
Non-Hispanic white	1 [Reference]	
Others	0.87 (0.74-1.02)	.09
Insurance type		
Private	1 [Reference]	
Medicare	0.97 (0.92-1.01)	.16
Medicaid	0.81 (0.71-0.92)	.001
Rural zip code		
No	1 [Reference]	
Yes	0.94 (0.91-0.98)	.001
Year of diagnosis		
2004	1 [Reference]	
2005	1.02 (0.93-1.12)	.65
2006	1.07 (0.98-1.18)	.13
2007	1.14 (1.05-1.24)	.003
2008	1.13 (1.04-1.23)	.003
2009	1.15 (1.06-1.25)	<.001
2010	1.22 (1.12-1.32)	<.001
2011	1.23 (1.14-1.34)	<.001
Charlson comorbidity index		
0	1 [Reference]	
≥1	0.97 (0.90-1.04)	.38
Physician		
Diagnosis by dermatologist		
No	1 [Reference]	
Yes	2.40 (2.19-2.62)	<.001
Tumor		
Cancer anatomic location		
Trunk	1 [Reference]	
Head and neck	0.95 (0.91-1.00)	.03
Upper extremities	0.95 (0.90-0.99)	.02
Lower extremities	0.89 (0.84-0.94)	<.001
Other skin, not otherwise specified	1.22 (0.96-1.54)	.10
American Joint Committee on Cancer stage		
0	1 [Reference]	
I	0.73 (0.70-0.76)	<.001
II	0.46 (0.40-0.53)	<.001
III	0.40 (0.33-0.50)	<.001
Unknown	0.67 (0.61-0.73)	<.001

Abbreviation: RR, risk ratio.

Table 4. Adjusted Risk Predictors of Surgical Delay

Characteristic	Time to Surgery, wk >6 wk, RR (95% CI)	*P* Value
Patient		
Age at diagnosis, y		
<50	1 [Reference]	
50-59	1.04 (0.86-1.25)	.70
60-69	1.16 (0.96-1.40)	.11
70-79	1.06 (0.86-1.30)	.58
≥80	1.01 (0.81-1.27)	.93
Sex		
Male	1.04 (0.93-1.17)	.45
Female	1 [Reference]	
Race		
Non-Hispanic white	1 [Reference]	
Others	1.38 (1.02-1.87)	.04
Insurance type		
Private	1 [Reference]	
Medicare	1.05 (0.91-1.23)	.49
Medicaid	1.36 (1.09-1.70)	.007
Rural zip code		
No	1 [Reference]	
Yes	1.10 (0.99-1.22)	.09
Year of diagnosis		
2004	1 [Reference]	
2005	0.94 (0.74-1.18)	.58
2006	1.06 (0.85-1.34)	.60
2007	0.93 (0.74-1.17)	.56
2008	0.99 (0.80-1.24)	.96
2009	0.89 (0.71-1.11)	.30
2010	0.87 (0.70-1.10)	.25
2011	1.02 (0.82-1.27)	.86
Charlson comorbidity index		
0	1 [Reference]	
≥1	0.98 (0.81-1.18)	.80
Physician		
Diagnosis by dermatologist		
No	1 [Reference]	
Yes	0.81 (0.71-0.93)	.002
Surgery by dermatologist		
No	1 [Reference]	
Yes	0.82 (0.72-0.93)	.002
Tumor		
Cancer anatomic location		
Trunk	1 [Reference]	
Head and neck	1.48 (1.29-1.71)	<.001
Upper extremities	1.02 (0.88-1.20)	.76
Lower extremities	1.20 (1.01-1.42)	.04
Other skin, not otherwise specified	1.63 (0.97-2.74)	.07
American Joint Committee on Cancer stage		
0	1 [Reference]	
I	1.08 (0.95-1.22)	.24
II	1.41 (1.16-1.70)	<.001
III	1.36 (1.05-1.75)	.02
Unknown	1.01 (0.82-1.23)	.94

Abbreviation: RR, risk ratio.

result, no clear guidelines exist to direct clinicians about a safe interval between biopsy and excision for melanoma.

Limitations

Our study has several important limitations. The population includes patients exclusively from North Carolina, which may not be generalizable to the rest of the United States. Given that we only included patients who were continuously enrolled from 1 month prior to the month of diagnosis through 12 months after diagnosis, we are missing those Medicaid patients who frequently cycle on and off insurance coverage. However, excluding these patients may have biased delays toward the null because Medicaid patients tend to have more access issues in health care than Medicare or privately insured patients.[30,31] Another limitation is that we could not identify whether surgical interventions after melanoma diagnosis were associated with other conditions not related to melanoma (eg, keratinocyte carcinomas). This misattribution would have biased results, leading to underestimation of surgical delays. Some melanomas, particularly melanoma in situ, could have been treated with topical immunotherapy with imiquimod, followed by surgical excision. These patients would have been classified as experiencing treatment delay, but this would have been a planned, clinically appropriate delay in care. We were unable to capture all of the potential causes for delays; therefore, there may be some unmeasured or unknown confounders, which could influence the results. Also, variance resulting from the clustering of patients within clinics is not accounted for in our model and thus our standard errors may be narrower than reality.

Understanding the causes for delay will be important to find ways to correct this practice gap. Dermatologists diagnose a majority of melanomas and are, therefore, the gatekeepers to the melanoma care process. We found that patients diagnosed or surgically treated by a dermatologist had a decreased likelihood of surgical delay. Increasing access to dermatologists could perhaps help eliminate this treatment disparity. However, timely access to dermatologists varies by insurance type and many dermatologists do not accept patients with Medicaid.[32,33] Enhanced communication among specialists involved in melanoma care could help reduce surgical delays. Research should focus on finding the appropriate window between biopsy and excision of melanoma. While timing is one aspect of receiving quality care, so is receiving the correct type of care. Future research should also include examining whether patients with melanoma, regardless of insurance type, are receiving appropriate evidence-based cancer care.

Conclusions

For patients with melanoma, surgical treatment delays were common. Patients with Medicaid had the highest likelihood of delays; however, significant proportions of Medicare and privately insured individuals also experienced delayed care. Patients diagnosed or surgically treated by a dermatologist had a lower likelihood of surgical delays. Delays in melanoma care could be reduced through better access to specialty care and cross-disciplinary partnerships to ensure that patients can safely navigate the treatment episode. Understanding why Medicaid patients receive less timely care for melanoma should be given further scrutiny.

ARTICLE INFORMATION

Accepted for Publication: June 2, 2017.

Published Online: October 4, 2017. doi:10.1001/jamadermatol.2017.3338

Author Contributions: Mr Zhou and Dr Meyer had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Adamson, Baggett, Meyer.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Adamson, Zhou.
Critical revision of the manuscript for important intellectual content: Adamson, Baggett, Thomas, Meyer.
Statistical analysis: Zhou, Baggett, Meyer.
Obtained funding: Adamson.
Administrative, technical, or material support: Adamson, Thomas, Meyer.
Supervision: Meyer.

Conflict of Interest Disclosures: None reported.

Funding/Support: This study was supported in part by the University of North Carolina at Chapel Hill Department of Dermatology and the University of North Carolina Integrated Cancer Information and Surveillance System.

Role of the Funder/Sponsor: The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Previous Presentation: Parts of this work were presented at the North Carolina Dermatologic Association Annual Meeting; January 21, 2017; Charlotte, North Carolina.

REFERENCES

1. Chen ST, Geller AC, Tsao H. Update on the epidemiology of melanoma. *Curr Dermatol Rep*. 2013;2(1):24-34.

2. Siegel R, Naishadham D, Jemal A. Cancer statistics, 2012. *CA Cancer J Clin*. 2012;62(1):10-29.

3. Bilimoria KY, Ko CY, Tomlinson JS, et al. Wait times for cancer surgery in the United States: trends and predictors of delays. *Ann Surg*. 2011;253(4):779-785.

4. Korsgaard M, Pedersen L, Sørensen HT, Laurberg S. Delay of treatment is associated with advanced stage of rectal cancer but not of colon cancer. *Cancer Detect Prev*. 2006;30(4):341-346.

5. Bardell T, Belliveau P, Kong W, Mackillop WJ. Waiting times for cancer surgery in Ontario: 1984-2000. *Clin Oncol (R Coll Radiol)*. 2006;18(5):401-409.

6. Spurgeon P, Barwell F, Kerr D. Waiting times for cancer patients in England after general practitioners' referrals: retrospective national survey. *BMJ*. 2000;320(7238):838-839.

7. Lott JP, Narayan D, Soulos PR, Aminawung J, Gross CP. Delay of surgery for melanoma among Medicare beneficiaries. *JAMA Dermatol*. 2015;151(7):731-741.

8. Huff LS, Chang CA, Thomas JF, et al. Defining an acceptable period of time from melanoma biopsy to excision. *Dermatol Reports*. 2012;4(1):e2.

9. Howlader N, Noone AM, Krapcho M, et al. SEER Cancer Statistics Review, 1975-2013. Bethesda, MD: National Cancer Institute. https://seer.cancer.gov/archive/csr/1975_2013/. Accessed January 17, 2017.

10. Spencer CS, Gaskin DJ, Roberts ET. The quality of care delivered to patients within the same hospital varies by insurance type. *Health Aff (Millwood)*. 2013;32(10):1731-1739.

11. LaPar DJ, Bhamidipati CM, Mery CM, et al. Primary payer status affects mortality for major surgical operations. *Ann Surg*. 2010;252(3):544-550.

12. Amini A, Rusthoven CG, Waxweiler TV, et al. Association of health insurance with outcomes in adults ages 18 to 64 years with melanoma in the United States. *J Am Acad Dermatol*. 2016;74(2):309-316.

13. Meyer AM, Olshan AF, Green L, et al. Big data for population-based cancer research: the integrated cancer information and surveillance system. *N C Med J*. 2014;75(4):265-269.

14. Goyal RK, Wheeler SB, Kohler RE, et al. Health care utilization from chemotherapy-related adverse events among low-income breast cancer patients:

effect of enrollment in a medical home program. *N C Med J*. 2014;75(4):231-238.

15. Wheeler SB, Kuo TM, Durham D, Frizzelle B, Reeder-Hayes K, Meyer AM. Effects of distance to care and rural or urban residence on receipt of radiation therapy among North Carolina Medicare enrollees with breast cancer. *N C Med J*. 2014;75(4):239-246.

16. Doll KM, Meng K, Basch EM, Gehrig PA, Brewster WR, Meyer AM. Gynecologic cancer outcomes in the elderly poor: a population-based study. *Cancer*. 2015;121(20):3591-3599.

17. Doll KM, Meng K, Gehrig PA, Brewster WR, Meyer AM. Referral patterns between high- and low-volume centers and associations with uterine cancer treatment and survival: a population-based study of Medicare, Medicaid, and privately insured women. *Am J Obstet Gynecol*. 2016;215(4):447.e1-447.e13.

18. Doll KM, Basch EM, Meng K, et al. Clinical benefits associated with Medicaid coverage before diagnosis of gynecologic cancers. *J Oncol Pract*. 2016;12(6):e724-e733.

19. Hart LG, Larson EH, Lishner DM. Rural definitions for health policy and research. *Am J Public Health*. 2005;95(7):1149-1155.

20. Fedewa SA, Lerro C, Chase D, Ward EM. Insurance status and racial differences in uterine cancer survival: a study of patients in the National Cancer Database. *Gynecol Oncol*. 2011;122(1):63-68.

21. Simard EP, Fedewa S, Ma J, Siegel R, Jemal A. Widening socioeconomic disparities in cervical cancer mortality among women in 26 states, 1993-2007. *Cancer*. 2012;118(20):5110-5116.

22. Halpern MT, Holden DJ. Disparities in timeliness of care for US Medicare patients diagnosed with cancer. *Curr Oncol*. 2012;19(6):e404-e413.

23. Tsai S, Balch C, Lange J. Epidemiology and treatment of melanoma in elderly patients. *Nat Rev Clin Oncol*. 2010;7(3):148-152.

24. Pollack LA, Li J, Berkowitz Z, et al. Melanoma survival in the United States, 1992 to 2005. *J Am Acad Dermatol*. 2011;65(5)(suppl 1):S78-S86.

25. Zell JA, Cinar P, Mobasher M, Ziogas A, Meyskens FL Jr, Anton-Culver H. Survival for patients with invasive cutaneous melanoma among ethnic groups: the effects of socioeconomic status and treatment. *J Clin Oncol*. 2008;26(1):66-75.

26. 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(4):488-494.

27. McKenna DB, Marioni JC, Lee RJ, Prescott RJ, Doherty VR. A comparison of dermatologists', surgeons' and general practitioners' surgical management of cutaneous melanoma. *Br J Dermatol*. 2004;151(3):636-644.

28. McKenna DB, Lee RJ, Prescott RJ, Doherty VR. The time from diagnostic excision biopsy to wide local excision for primary cutaneous malignant melanoma may not affect patient survival. *Br J Dermatol*. 2002;147(1):48-54.

29. Carpenter S, Pockaj B, Dueck A, et al. Factors influencing time between biopsy and definitive surgery for malignant melanoma: do they impact clinical outcome? *Am J Surg*. 2008;196(6):834-842.

30. Rosenbaum S. Medicaid payments and access to care. *N Engl J Med*. 2014;371(25):2345-2347.

31. Felland LE, Lechner AE, Sommers A. Improving access to specialty care for Medicaid patients: policy issues and options. New York, NY: The Commonwealth Fund; 2013. https://pdfs.semanticscholar.org/cd46/56b7a62779a8afa7b16574f7758bb76c6075.pdf. Accessed December 10, 2016.

32. Resneck J Jr, Pletcher MJ, Lozano N. Medicare, Medicaid, and access to dermatologists: the effect of patient insurance on appointment access and wait times. *J Am Acad Dermatol*. 2004;50(1):85-92.

33. Chaudhry SB, Armbrecht ES, Shin Y, et al. Pediatric access to dermatologists: Medicaid versus private insurance. *J Am Acad Dermatol*. 2013;68(5):738-748.

NOTABLE NOTES

The Black Panther, From Politics to Popular Culture

Chetan Ambastha, BA; Anshum Sood, BS; Stephanie Steinweg, MD

Although the black panther is not a true animal species, the term is used to describe black pigmentation in a number of large feline species, including jaguars and leopards. Studies show that their dark pigmentation patterns are linked to polymorphisms in 2 genes, the melanocortin-1 receptor (*MC1R*) and the agouti-signaling protein (*ASIP*). The melanocortin-1 receptor is activated by binding of α-melanocyte–stimulating hormone, leading to the production of eumelanin, which is responsible for dark pigmentation. Conversely, the melanocortin-1 receptor is inhibited by the antagonist *ASIP*, leading to the production of pheomelanin, which is responsible for light pigmentation. Therefore, activating mutations in *MC1R* and inactivating mutations in *ASIP* are thought to underlie the melanization of the captivating black panther.[1] In 1966, these striking animals became a symbol for one of the most influential civil rights groups, as well as the inspiration for Marvel Comics' first black superhero.

During the heart of the Civil Rights movement, the Black Panther Party was founded in Oakland, California, by Huey Newton and Bobby Seale. One of the group's most influential members, Stokely Carmichael, explained the origin of the group's name: "We chose for the emblem a black panther, a beautiful black animal which symbolizes the strength and dignity of black people."[2(p317)] The captivating features of the black panther served to unify this powerful group.

During the same year that the Black Panther Party was founded, Stan Lee and Jack Kirby introduced the Black Panther as Marvel's first black superhero in the 52nd issue of the *Fantastic Four*. This superhero is the leader of a fictional African kingdom and plays various roles, including a character combatting racism in the United States, and another character opposing apartheid in Africa. Interestingly, it seems coincidental that both the Black Panther Party and Marvel's superhero were founded in the same year; in fact, the Marvel character was temporarily renamed when the party later gained prominence.[3]

The black panthers' pigmentation seems to be a function of polymorphisms at loci implicated in the *MC1R* signaling pathway. The resulting iconic features simultaneously captured the eyes of both a civil rights leader seeking to symbolize a political movement, and a comic book writer looking to introduce a new superhero into popular culture.

Author Affiliations: University of California, Berkeley (Ambastha); University of Maryland School of Medicine, Baltimore (Sood); University of Maryland Medical Center, Baltimore (Steinweg).

Corresponding Author: Anshum Sood, BS, University of Maryland School of Medicine, 817 S Hanover St, Baltimore, MD 21230 (anshum.sood@som.umaryland.edu).

1. Lund M. Marvel's *The Black Panther*: Then and Now. The Winnower. https://thewinnower.com/papers/4719-marvel-s-black-panther-then-and-now. Accessed July 2017.

2. Leeman RW, Duffy BK. *The Will of a People: A Critical Anthology of Great African American Speeches*. Carbondale: Southern Illinois University Press; 2012.

3. Schneider A, David VA, Johnson WE, et al. How the leopard hides its spots: *ASIP* mutations and melanism in wild cats. *PLoS One*. 2012;7(12):e50386.