

Direct Economic Burden of High-Risk and Metastatic Melanoma: Evidence From the SEER-Medicare Linked Database

Keith L. Davis,¹ Debanjali Mitra,¹
Srividya Kotapati²

¹RTI Health Solutions, 200 Park Offices Drive, Research Triangle Park, NC 27709; ²Bristol-Myers Squibb, 5 Research Parkway, Wallingford, CT 06492, US

Background

Current 5- and 10-year survival rates for persons with melanoma are 92% and 89%, respectively.¹ For localized melanoma, the 5-year survival rate is 99%, but drops to 65% and 15% for regional and distant stage diseases, respectively. With few effective therapeutic options available for late-stage melanoma, the disease carries significant morbidity. Little is known, however, about the direct costs incurred by third-party payers for persons with advanced melanoma. To address this knowledge gap, we analyzed a large retrospective claims database to document per patient monthly costs incurred by the Medicare system for enrollees with high-risk (stage IIB/C, IIIA/B, IIIC) or metastatic (stage IV) melanoma.

Methods

Study design

Retrospective database analysis.

Data source

Data were taken from the Surveillance, Epidemiology, and End Results (SEER)-Medicare linked database combining clinical information on incident cancer cases in the United States between 1991 and 2002 with longitudinal (1991–2005) Medicare claims.

Inclusion criteria

Patients included in the study met the following inclusion criteria

- Age ≥65 years
- ≥1 malignant melanoma diagnosis (ICD-O-2 code C44.x) of stage IIB or higher
- ≥6 months of continuous Medicare Part A and B benefits eligibility postdiagnosis
- Patients who died prior to 6 months post-index date were not excluded from the analysis.

Stratification by disease stage

Disease stage was assigned based on clinical criteria set forth by the American Joint Committee on Cancer (AJCC) TNM staging system for melanoma.² The AJCC stage for each diagnosis was determined using an algorithm comprising the raw SEER variables HSTST (historic stage: in situ, localized, regional, or distant), E10PN (number of positive lymph nodes), E10SZ (tumor size in mm), and E10EX (extent of disease: with or without ulceration). High-risk (IIB/C, IIIA/B, IIIC) and metastatic (IV) stages were then identified as follows

- Stage IV: HSTST = ‘Distant’
- Stage IIIC: HSTST = ‘Regional’ and E10PN ≥4
- Stage IIIA/B: HSTST = ‘Regional’ and E10PN <4
- Stage IIB/C: HSTST = ‘Localized’ and E10SZ >2 mm and E10EX = ‘With Ulceration’.

For each patient, an index date was defined as the date of the first observed stage IIB or higher diagnosis. Patients were then categorized into mutually exclusive categories based on the stage (IIB or higher) observed at the index date.

Primary outcomes

Total all-cause healthcare utilization and costs reimbursed by Medicare were aggregated across the entire follow-up period available for each patient. Variables examined included the following

- Hospitalizations
- Skilled nursing facility admissions
- Emergency room visits
- Physician office visits
- Other ancillary care (home health, hospice, all other ancillary visits).

Outcomes were evaluated from the index date until death, interruption of benefits coverage (≥6 months), or end of the database (12/31/2005). Utilization and costs were aggregated and reported at the level of per patient per month.

Statistical analyses

All analyses were carried out using SAS (Version 9) statistical software. Exploratory descriptive analyses were performed and entailed the tabular display of mean values, standard deviations, medians, and ranges of continuous variables of interest and frequency distributions for categorical variables of interest.

Results

Patient characteristics (Table 1)

- 6,470 patients met all inclusion criteria.
- Stage distribution was IIB/C (38%), IIIA/B (46%), IIIC (1%), and IV (15%).
- Median follow-up was 56, 39, 16, and 6 months for each stage, respectively.

Survival (Table 2)

- Post-index date death was observed for 68% of all patients; range: 54% (stage IIB/C) to 95% (stage IV).
- Overall 1-year survival rate post-index date was 81%; range: 35% (stage IV) to 94% (stage IIB/C).
- Among patients who died, median survival time post-index date was 23 months; range: 6 months (stage IV) to 38 months (stage IIB/C).

Table 1. Characteristics of the study sample.

	Melanoma stage at index date							
	IIB/C		IIIA/B		IIIC		IV	
	n	%	n	%	n	%	n	%
Total sample	2,431	37.57	2,971	45.92	88	1.36	980	15.15
Gender								
Male	1,495	61.50	1,765	59.41	61	69.32	619	63.16
Female	936	38.50	1,206	40.59	27	30.68	361	36.84
Age at index date								
65–69	534	21.97	537	18.07	25	28.41	189	19.29
70–74	594	24.43	621	20.90	25	28.41	240	24.49
75–79	528	21.72	679	22.85	20	22.73	210	21.43
80–84	429	17.65	570	19.19	12	13.64	189	19.29
≥85	346	14.23	564	18.98	6	6.82	152	15.51
Race/ethnicity								
White	2,388	98.23	2,874	96.74	81	92.05	935	95.41
Black	12	0.49	29	0.98	2	2.27	14	1.43
Other	31	1.27	68	2.28	5	5.68	31	3.16
Follow-up duration (months)*								
Mean (SD)	64.50 (41.76)		45.42 (35.42)		28.83 (31.92)		15.37 (22.80)	
Median	56		39		16		6	
Range (min, max)	0, 175		0, 177		3, 163		0, 171	

*Duration of follow-up defined as the number of continuous months following the index date in which a patient had non-HMO benefits coverage for all Part A and Part B Medicare claims. With the exception of patients with a record of death following index date, patients with <6 months of continuous non-HMO Part A and Part B benefits coverage following their index date were excluded. For patients who died <6 months following their index date, continuous non-HMO Part A and Part B benefits coverage was required during their surviving months. By definition, follow-up duration for patients who died in the same month of their index date had a follow-up duration of 0

Table 2. Post-index date survival.

	Melanoma stage at index date							
	IIB/C (N=2,431)		IIIA/B (N=2,971)		IIIC (N=88)		IV (N=980)	
	n	%	n	%	n	%	n	%
Died following index date	1,310	53.89	2,086	70.21	79	89.77	927	94.59
Survival time (months) among patients with record of death								
Mean (SD)	49.29 (38.92)		34.65 (29.88)		25.11 (31.07)		12.23 (17.23)	
Median	38		26		15		6	
Range (min, max)	0, 177		0, 176		3, 171		0, 142	

For patients at stage IIB/C, defined as advancement to stages III or IV, for patients at stage IIIA/B, defined as advancement to stage IIIC or IV, for patients at stage IIIC, defined as advancement to stage IV

Healthcare utilization and costs (Table 3)

- Patients with stage IV disease incurred 3.1 hospital days per month, compared with 0.5, 0.6, and 1.1 days per month for patients with stage IIB/C, IIIA/B, and IIIC melanoma, respectively (all $P<0.001$).
- Percentage of patients with at least one hospital admission, however, was highest (91%) among patients with stage IIIC disease at index.
- Mean inpatient costs for stage IV disease were \$3,337 per patient per month, versus \$589, \$880, and \$1,465 for stages IIB/C, IIIA/B, and IIIC, respectively (all $P<0.001$).
- Patients with stage IIIC disease incurred 2.4 office visits per month, compared with 1.3, 1.5, and 1.9 visits per month for patients with stage IIB/C, IIIA/B, and IV melanoma, respectively (all $P<0.001$).
- Mean office visit costs for patients with stage IIIC disease were \$1,827 per patient per month, versus \$471, \$680, and \$1,339 for stages IIB/C, IIIA/B, and IV, respectively (all $P<0.001$).
- Total healthcare costs, inclusive of all care settings, were \$8,190 per patient per month for stage IV disease, compared with \$1,703, \$2,536, and \$4,880 for stages IIB/C, IIIA/B, and IIIC, respectively (all $P<0.001$).

Limitations

- No data on prescription drug utilization or costs; therefore, total direct costs incurred by non-Medicare payers were likely to be higher than estimates shown in this study.
- Our study focused on direct costs incurred by the Medicare system and did not address costs incurred by commercial third-party payers (e.g. managed care plans) or the broader societal costs of melanoma, including caregiver burden and lost workplace productivity.
- This study included only patients aged 65 years or older. Findings may therefore not be representative of the general population with high-risk or metastatic melanoma.
- While subjects were stratified based on the disease stage observed at the index date, we did not identify subsequent progression to higher stages nor did we attempt to stratify costs incurred during initial versus subsequent stages.

Conclusions

- Our study is the first to provide stage-specific estimates of resource utilization and costs in high-risk and metastatic melanoma using real-world administrative data.
- Hospitalizations represented the largest component of overall healthcare costs across stages, although physician office visits and other ancillary services contributed significantly to the total cost burden.
- Efforts to address the large unmet treatment need in patients with advanced melanoma may result in cost savings for Medicare.

Table 3. Healthcare utilization and costs per patient per month following index date.

	Melanoma stage at index date							
	IIB/C (N=2,431)		IIIA/B (N=2,971)		IIIC (N=88)		IV (N=980)	
	n	%	n	%	n	%	n	%
Hospital								
Had ≥1 hospital admission	1,841	75.73	2,377	80.01	80	90.91	813	82.96
Days in hospital								
Mean (SD)	0.496 (1.375)		0.644 (1.424)		1.101 (2.00)		3.069 (4.659)	
Median	0.116		0.205		0.441		1.142	
Range (min, max)	0, 19		0, 22		0, 16		0, 31	
Costs (\$)								
Mean (SD)	589 (1,560)		880 (2,090)		1,465 (1,725)		3,337 (5,317)	
Median	198		355		792		1,609	
Range (min, max)	0, 32,535		0, 43,974		0, 8,572		0, 60,689	
SNF								
Had ≥1 SNF admission	665	27.35	861	28.98	27	30.68	240	24.49
Days in SNF								
Mean (SD)	0.292 (1.028)		0.458 (1.518)		0.533 (1.852)		1.049 (3.066)	
Median	0		0		0		0	
Range (min, max)	0, 13		0, 23		0, 16		0, 24	
Costs (\$)								
Mean (SD)	72 (224)		112 (352)		160 (551)		286 (841)	
Median	0		0		0		0	
Range (min, max)	0, 4,444		0, 6,606		0, 4,692		0, 7,557	
ED								
Had ≥1 ED visit	1,838	75.61	2,165	72.87	62	70.45	642	65.51
Costs (\$)								
Mean (SD)	12 (33)		15 (91)		18 (34)		48 (149)	
Median	4		4		8		9	
Range (min, max)	0, 806		0, 4,561		0, 238		0, 3,254	
Office visits								
Had ≥1 office visit	2,393	98.44	2,912	98.01	87	98.86	897	91.53
Number of visits								
Mean (SD)	1.338 (0.987)		1.457 (1.235)		2.356 (1.675)		1.974 (1.825)	
Median	1.111		1.182		2.000		1.500	
Range (min, max)	0, 8		0, 11		0, 8		0, 17	
Costs (\$)								
Mean (SD)	471 (968)		680 (1,609)		1,827 (2,970)		1,339 (3,180)	
Median	221		224		610		279	
Range (min, max)	0, 14,915		0, 22,469		0, 13,533		0, 30,869	
Home health								
Had ≥1 home health visit	984	40.48	1,380	46.45	48	54.55	402	41.02
Number of visits								
Mean (SD)	0.408 (1.519)		0.620 (1.831)		1.197 (2.565)		1.046 (2.986)	
Median	0		0		0.185		0	
Range (min, max)	0, 32		0, 42		0, 15		0, 55	
Costs (\$)								
Mean (SD)	57 (192)		85 (253)		136 (257)		167 (474)	
Median	0		0		12		0	
Range (min, max)	0, 2,901		0, 4,795		0, 1,788		0, 5,929	
Hospice								
Had ≥1 hospice admission	454	18.68	868	29.22	47	53.41	471	48.06
Days in hospice care								
Mean (SD)	0.339 (2.453)		0.629 (2.586)		1.434 (2.932)		2.643 (7.019)	
Median	0		0		0.128		0	
Range (min, max)	0, 31		0, 31		0, 31		0, 31	
Costs (\$)								
Mean (SD)	35 (179)		73 (255)		206 (408)		344 (787)	
Median	0		0		31		0	
Range (min, max)	0, 3,838		0, 3,793		0, 2,210		0, 10,376	
Other OP/ancillary services								
Had ≥1 other OP/ancillary encounter	2,404	98.89	2,956	99.50	88	100	970	98.98
Number of encounters								
Mean (SD)	1.000 (1.231)		1.300 (1.384)		1.954 (1.513)		3.718 (3.552)	
Median	0.625		0.901		1.636		2.571	
Range (min, max)	0, 15		0, 18		0, 9		0, 29	
Costs (\$)								
Mean (SD)	467 (820)		690 (1,196)		1,068 (1,107)		2,668 (4,112)	
Median	223		351		609		1,297	
Range (min, max)	0, 9,328		0, 18,714		30, 5,002		0, 51,696	
Total healthcare utilization and costs								
Had ≥1 medical encounter	2,419	99.51	2,964	99.76	88	100	976	99.59
Number of total encounters								
Mean (SD)	2.910 (2.701)		3.602 (3.150)		5.853 (3.669)		7.588 (5.958)	
Median	2.227		2.724		5.160		6.183	
Range (min, max)	0, 41		0, 46		0, 20		0, 62	
Costs (\$)								
Mean (SD)	1,703 (2,713)		2,536 (3,799)		4,880 (4,097)		8,190 (9,619)	
Median	902		1,395		3,733		5,158	
Range (min, max)	0, 42,695		0, 61,633		125, 16,594		0, 101,148	

ED = emergency department; max = maximum; min = minimum; OP = outpatient; SD = standard deviation; SNF = skilled nursing facility

Notes: Data exclude utilization and costs of medical services and products not covered by Medicare Parts A or B (primarily outpatient prescription drugs) that are not yet captured in Medicare claims. All cost data represent actual amounts paid (i