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Characteristics and comorbidities of Medicare beneficiaries receiving care from Mohs micrographic surgeons based on fellowship training and practice setting

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Abstract

The characteristics and medical conditions of patients being managed by Mohs micrographic surgeons (MMS) have not been extensively established. In this cross-sectional review of 2017 Medicare Public Use data, we compared patient demographics and medical comorbidities among dermatologists billing for MMS based on surgeon fellowship training and practice settings. Overall patient complexity, as measured through Medicare's Hierarchical Condition Category (HCC) score, did not significantly differ by fellowship training status. However, among fellowship-trained surgeons, those in academic centers managed a higher proportion of dual Medicare-Medicaid beneficiaries (9.4% versus 5.4%, $P < 0.0001$) with higher mean HCC scores (1.33 versus 1.13, $P < 0.0001$). Depression and chronic kidney disease were notably more common among academic beneficiaries. These findings help to establish the patient complexity distribution among dermatologic surgeons, which may have important implications for perioperative management and monitoring given the growing prevalence of skin cancer and other medical comorbidities.

Keywords: hierarchical condition category score, Medicaid, medical complexity, Medicare, Mohs micrographic surgery, patient comorbidities, socioeconomics

Introduction

Mohs micrographic surgery (MMS) is a highly efficient and effective treatment option for non-

melanoma skin cancer. However, patient medical and social factors can influence surgical access [1,2], post-surgery quality of life, development of adverse events [3], and overall survival [4]. Given little data exist regarding patient characteristics and comorbidities treated by Mohs micrographic surgeons and how they differ based on surgeon fellowship training and practice setting, we referenced national Medicare data to describe these factors.

We reviewed the 2017 Medicare Public Use File to identify all dermatologists billing for MMS through Current Procedural Terminology (CPT) codes 17311 and 17313. We ultimately limited our assessment to individuals performing these MMS services for $\geq 20\%$ of annual beneficiaries [5], a threshold that was selected to limit potential confounding from general dermatology beneficiaries that Mohs surgeons may also manage. Of note, sensitivity analysis of different inclusion thresholds (e.g., 30%) did not yield appreciably different results. Mohs micrographic surgery fellowship training was determined through the American College of Mohs Surgery website, whereas academic setting was identified from dataset group affiliation. We compared patient demographics and medical comorbidities across three surgeon groups based on MMS fellowship status and practice setting. Overall comorbidity burden was assessed using the mean beneficiary Hierarchical Condition Category (HCC) score, a Medicare-developed, risk-adjustment measure.

Statistical significance of overall group differences was assessed through a one-way analysis of variance test (continuous variables) or a chi-squared test (categorical variables). Specific inter-group comparisons were surveyed through a post-hoc Tukey's test (continuous variables) or adjusted chi-squared residuals (categorical variables). All statistical analyses were performed with Stata 16.0 (College Station, TX). As this study utilized publicly available online datasets, institutional review board approval was not required at the University of Connecticut Health Center.

Discussion

We identified 1,538 dermatologic surgeons who met inclusion criteria. Among those in non-academic settings, mean beneficiary HCC scores did not meaningfully differ by fellowship training experience. However, non-fellowship-trained dermatologic surgeons treated a relatively higher proportion of beneficiaries from non-metro counties (6.1% versus 3.2%, $P=0.0070$). Among fellowship-trained surgeons, those in academic centers managed a higher proportion of dual Medicare-Medicaid beneficiaries (9.4% versus 5.4%, $P<0.0001$) who had modestly higher mean HCC scores (1.33 versus 1.13, $P<0.0001$). Depression (16.4% versus 14.5%, $P<0.0001$) and chronic kidney disease (27.7% versus 24.8%, $P<0.0001$) were more prevalent among academic beneficiaries (**Table 1**).

Although important differences exist, the findings overall suggest modest variation in patient complexity among dermatologists performing MMS in the Medicare population. This may reflect equitable access to MMS among Medicare beneficiaries or possibly the similar age range of patients who develop non-melanoma skin cancer and are appropriate surgical candidates.

The higher prevalence of several specific comorbidities in academic settings could stem from targeted referrals or preferences of complex patients to seek care in large medical systems and may have potential implications for perioperative management and patient monitoring. Chronic kidney disease has been correlated with

development of surgical site infections, potentially warranting close review of beneficiary medical records at academic institutions and additional monitoring for patients with identified comorbidities [3]. Mental health conditions may influence patient expectations and need for additional post-operative support. Greater overall comorbidity burden has been correlated with decreased survival following MMS and sometimes prompts consideration of non-surgical management [4].

The greater proportion of dual Medicare-Medicaid beneficiaries in academic settings underscores the role of these institutions in managing underserved patients who may have poorer survival [6]. As such, academic institutions may benefit from additional resources to further promote management of these patients, especially as these individuals often experience more restricted dermatologic access [2].

The importance of non-fellowship-trained Mohs surgeons in non-metro regions with an overall lower density of Mohs micrographic surgeons may help to alleviate shortages [1]. This could promote access to MMS and minimize travel burden for patients who live far from academic institutions. However, the potential benefit of this heightened access should be weighed against the more limited experience and training that non-fellowship-trained surgeons may have. As such, the ultimate impact of this expanded care on patient outcomes is not clear from this study.

There are several limitations to this analysis. Beneficiary data may also reflect general dermatology patients for select surgeons, although a sensitivity analysis using more stringent MMS inclusion thresholds (e.g., 30%) did not yield appreciably different results. Additionally, although this study represents recently released Medicare data, it is cross-sectional in nature and cannot evaluate temporal trends.

Conclusion

In this cross-sectional review of dermatologists performing MMS in the Medicare population, we established similar overall patient complexity, as measured through Medicare's HCC score, among fellowship- and non-fellowship-trained surgeons.

Table 1. Demographics and medical comorbidities of patients receiving Mohs micrographic surgery (MMS) by dermatologists (stratified by fellowship training and practice type).

Patient Factor	Dermatologists performing MMS for ≥20% of beneficiaries			P value
	Non-fellowship-trained, non-academic (n=379)	Fellowship-trained, non-academic (n=915)	Fellowship-trained, academic (n=244)	
Demographics				
Dual Medicare-Medicaid, % (SD)	7.3 (7.9) ^{*2,3}	5.4 (5.2) ^{*1,3}	9.4 (6.2) ^{*1,2}	<0.0001
Male, % (SD)	53.7 (6.6) ^{*2,3}	55.3 (6.7) ^{*1,3}	57.7 (6.0) ^{*1,2}	<0.0001
>75 Years of age, % (SD)	51.5 (8.2) ^{*2}	54.6 (7.1) ^{*1,3}	52.5 (7.1) ^{*2}	<0.0001
Non-Hispanic White, % (SD)	92.2 (11.3) ^{*2}	94.9 (4.2) ^{*1,3}	92.3 (6.0) ^{*2}	0.0008
Rurality, frequency (%)				
Metro	353 (93.9) ^{*2,3}	886 (96.8) ^{*1}	240 (98.4) ^{*1}	0.0070
Non-metro	23 (6.1) ^{*2,3}	29 (3.2) ^{*1}	4 (1.6) ^{*1}	
Medical Comorbidities				
HCC score, mean (SD)	1.11 (0.15) ^{*2,3}	1.13 (0.13) ^{*1,3}	1.33 (0.22) ^{*1,2}	<0.0001
Specific comorbidities, % (SD)				
Schizophrenia	1.6 (1.7)	1.1 (1.8)	1.4 (1.4)	0.0699
Depression	15.1 (3.4) ^{*2,3}	14.5 (2.8) ^{*1,3}	16.4 (3.7) ^{*1,2}	<0.0001
Asthma	5.4 (1.5) ^{*2}	5.1 (1.4) ^{*1,3}	5.6 (1.8) ^{*2}	0.0001
Chronic kidney disease	25.0 (5.5) ^{*3}	24.8 (5.0) ^{*3}	27.7 (5.5) ^{*1,2}	<0.0001
Congestive heart failure	13.6 (3.6) ^{*3}	14.0 (3.5) ^{*3}	15.5 (3.1) ^{*1,2}	<0.0001
Cancer	11.6 (2.1) ^{*2,3}	12.4 (2.7) ^{*1,3}	13.1 (2.7) ^{*1,2}	<0.0001
Osteoporosis	8.0 (2.2) ^{*3}	7.8 (2.1) ^{*3}	8.5 (2.1) ^{*1,2}	<0.0001
COPD	11.2 (3.3) ^{*2,3}	10.5 (2.9) ^{*1}	10.5 (2.8) ^{*1}	0.0015
Alzheimer disease	8.4 (2.6) ^{*3}	8.7 (2.4)	9.0 (2.3) ^{*1}	0.0063
Diabetes	25.4 (7.0) ^{*2}	24.2 (5.6) ^{*1}	24.9 (4.7)	0.0012
Ischemic or hemorrhagic stroke	4.0 (1.1)	4.1 (1.2)	4.1 (1.2)	0.1253
Atrial fibrillation	12.1 (2.4) ^{*2,3}	13.4 (2.5) ^{*1}	13.5 (2.3) ^{*1}	<0.0001
Hypertension	63.3 (8.2)	63.4 (7.8)	63.5 (6.7)	0.9566
Hyperlipidemia	50.3 (9.2) ^{*2,3}	48.7 (8.1) ^{*1,3}	46.1 (8.1) ^{*1,2}	0.0001

P values indicate the overall statistical significance across groups from an analysis of variance (ANOVA) or Chi-squared test. The asterisk (*) indicates a significant difference between the value in the respective column and the specified column (in superscript), as determined through a post-hoc Tukey's test or Chi-squared residual.

HCC, Hierarchical Condition Category; MMS, Mohs micrographic surgery; SD, standard deviation.

However, among fellowship-trained surgeons, those in academic centers managed a higher proportion of dual Medicare-Medicaid beneficiaries with higher mean HCC scores and a greater prevalence of beneficiaries with depression and chronic kidney disease. In the context of an aging population with a growing prevalence of skin cancer and other medical conditions, these data are important in highlighting

the existing patient complexity distribution across Mohs micrographic surgeons.

Potential conflicts of interest

Hao Feng has served as a consultant for Cytrellis Biosystems, Inc., and Soliton, Inc.

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