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Geographic and Age-Based Variations in Medicare Reimbursement Among ASSH Members.

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1 **ABSTRACT**

2 **BACKGROUND**

3 The purpose of this study was to investigate how American Society for Surgery of the
4 Hand (ASSH) members' Medicare reimbursement depends on their geographical location
5 and number of years in practice.

6

7 **METHODS**

8 Demographic data for surgeons who were active members of the ASSH in 2012 was
9 obtained using information publicly available through the United States Centers for
10 Medicare and Medicaid Services (CMS). "Hand-surgeons-per-capita" and average
11 reimbursement per surgeon were calculated for each state. Regression analysis was
12 performed to determine a relationship between (1) each state's average reimbursement
13 versus the number of ASSH members in that state, (2) average reimbursement versus
14 number of hand surgeons per capita and (3) total reimbursement from Medicare versus
15 number of years in practice. ANOVA analysis was used to detect a difference in
16 reimbursement based on categorical range of years as an ASSH member.

17

18 **RESULTS**

19 A total of 1,667 ASSH members satisfied inclusion in this study. Though there was
20 significant variation among states' average reimbursement, reimbursement was not
21 significantly correlated with the state's hand surgeons per capita or total number of hand
22 surgeons in that given state. Correlation between years as an ASSH member and average
23 reimbursement was significant, but non-linear; the highest reimbursements were seen in
24 surgeons who had been ASSH members from 8-20 years.

25

26 **CONCLUSIONS**

27 Peak reimbursement from Medicare for ASSH members appears to be related the time of
28 surgeons' peak operative volume, rather than any age-based bias for or against treating
29 Medicare beneficiaries. Additionally, though geographic variation in reimbursement does
30 exist, this does not appear to correlate with density or availability of hand surgeons.

31

32 **Introduction:**

33

34 In April 2014, the United States Centers for Medicare and Medicaid Services (CMS)
35 announced the release of information regarding services provided to Medicare
36 beneficiaries for 2012 in an effort to promote transparency of the United States health
37 care system. [7] This information includes data for payment and utilization of Medicare
38 Part B services, and provides a potentially powerful analytical tool not only for patients,
39 but for providers, policy-makers and invested businesses.

40

41 Studies across many fields of medicine have illustrated regional variations in treatment
42 and reimbursement rates. [10-12, 16, 20, 25] Among hand surgery patients, studies have
43 shown that patient demographic factors such as age can predict surgical timing, as well as
44 overall surgical volume for conditions such as Rheumatoid Arthritis (RA). [23, 26]
45 Specific to hand surgeons, other studies have demonstrated that surgeon-dependant
46 demographic factors, such as age or membership in the American Society for Surgery of
47 the Hand (ASSH) predict treatment selection for distal radius fractures (DRF). [9, 24]
48 However, no study to date has examined the direct relationship between hand surgeon
49 demographic factors and their rates of reimbursement.

50

51 The purpose of this study was to investigate which demographic factors may have an
52 impact on hand surgeons' reimbursement rates from Medicare. In particular, using the
53 data provided by the CMS, we aim to illustrate how ASSH-member hand surgeons'
54 reimbursement from Medicare depends on their geographical location and the number of
55 years they have been in practice.

56

57 **Methods:**

58

59 Data was obtained from the CMS Provider Utilization and Payment Data: Physician and
60 Other Supplier Public Use File ("Physician and Other Supplier PUF") covering the
61 calendar year 2012. [8] Because files contain no patient indentifying information and are
62 made publicly available by CMS, this study was exempt from institutional review board

63 approval. We identified all active American Society for Surgery of the Hand (ASSH)
64 members for the year 2012 and used each member's unique National Provider Identifier
65 (NPI) number to match ASSH members with corresponding CMS PUF data. [8]

66

67 International members of ASSH were excluded from this study. Additionally, providers
68 with inconsistent or inaccurate data between the two datasets were excluded. ASSH
69 members who did not accept Medicare payment as part of their practice in 2012 were not
70 found in the PUF, and thus excluded by design. After compiling a database for all ASSH
71 members with matching PUF data, the number of years as an ASSH member (as of 2012)
72 was calculated for each member based on the year they were elected into the ASSH (Year
73 elected = 2013 was designated as 0 years as ASSH member, year 2012 as 1 year, etc.).

74 This number was assumed to be a direct correlation with number of years in practice and
75 was analyzed as a both a continuous variable, and as a categorical variable (Group A = 0-
76 7 years, B = 8-20 years and C = Greater than 20 years) for the purpose of this study.

77

78 For geographic classification, each surgeon was designated to one state, as listed in the
79 CMS PUF. For surgeons with entries across multiple states, the state with the highest
80 total amount paid by Medicare was designated as their primary state of practice. An
81 estimate of each state's total population for 2012 was obtained using projections available
82 from the United States Census Bureau. [21] This census data was used in conjunction
83 with the number of ASSH members per state to determine each state's 'hand-surgeons-
84 per-capita.' Average reimbursement per surgeon was also calculated for each state.

85 Regression analysis was performed to determine a relationship between (1) each state's
86 average reimbursement versus the number of ASSH members in that state, (2) average
87 reimbursement versus number of hand surgeons per capita and (3) total reimbursement
88 from Medicare versus number of years in practice. ANOVA analysis was used to detect a
89 difference in mean reimbursement based on number of years as an ASSH member,
90 categorized into groups A, B and C as described above. For each state, the aggregate
91 amount of reimbursement from ancillary services and office visits relative to total
92 reimbursement was recorded, and compared using ANOVA.

93

94 **Results:**

95

96 A total of 1,667 ASSH members satisfied inclusion in this study. Mean total CMS
97 reimbursement among all ASSH members was 68,139.63 USD +/- 71,623.52
98 (distribution shown in Figure 1). Mean number of years as an ASSH Member was 14.21
99 +/- 9.88 across all members (Figure 2). Average reimbursement per surgeon for each
100 state and the corresponding number of ASSH member surgeons per state are shown
101 numerically in Table 1. Figure 3 depicts the total CMS reimbursement per surgeon across
102 the entire United States. Percentages of total Medicare reimbursement obtained from both
103 ancillary services and office visits were not significantly different between any states.
104 Correlation between state's average reimbursement per surgeon and its total number of
105 ASSH members was not found to be of statistical significance ($R^2 = 2.8\%$, $p = 0.238$).
106 Similarly, average reimbursement was not significantly correlated with hand surgeons per
107 capita ($R^2 = 2.5\%$, $p = 0.270$). When classifying number of years as an ASSH member as
108 a continuous variable, there was no significant relationship found between number of
109 years as an ASSH member and total CMS Reimbursement per surgeon. However, when
110 years as an ASSH member was analyzed as a categorical variable, surgeons in Group B
111 (\$74,952.34) had a significantly higher reimbursement per surgeon than both Groups A
112 (\$60,501.16) and C (\$64,352.63, $p = 0.005$).

113

114 **Discussion:**

115

116

117 With the continually changing landscape of the U.S. healthcare economy, increased
118 scrutiny has been placed on government expenditures, particularly regarding
119 reimbursement rates for care providers. The 2012 Medicare data released by the CMS is
120 the largest publicly accessible volume of data available to analyze these trends. For
121 surgeons in particular, this information is of major interest and concern. A 2004 report by
122 the American Academy of Orthopaedic Surgeons (AAOS), which surveyed over 10,000
123 practicing, board-certified (ABOS) orthopaedic surgeons, found that of the five issues
124 deemed most concerning to surgeons, "Insurance or CMS Reimbursement Levels" had
125 the highest percentage of surgeons endorsing concern, at 91%. [2] That same report also

126 demonstrated that proportion of total income for orthopaedic surgeons from
127 Medicare/Medicaid was at an all-time high, at 31.2%, with a concomitant decrease in
128 income from private insurance. [2] With the passage of the Affordable Care Act (ACA)
129 in 2010, some of these concerns may be magnified, particularly amongst hand surgeons.
130 [4, 18]

131

132 Among the many provisions of the ACA that may directly affect hand surgeons are tax
133 increases on medical devices, mandated reduction in payment for surgical services and
134 greater focus on funding for education of primary care physicians versus surgeons. [4]
135 Another mandate of the ACA was the establishment of a Patient-Centered Outcomes
136 Research Institute (PCORI). [4, 18] A priority of the PCORI has been the increased
137 funding of comparative effectiveness research, in an effort to promote “patient-
138 centeredness,” and is specifically prohibited from analyzing cost-effectiveness. [4, 18]
139 But with reimbursement tied closely to referral rates and treatment selection, it may be
140 unfeasible to compare the efficacy of different treatment options while simultaneously
141 excluding consideration of the associated costs. [14, 15, 19] Thus, it should be of interest
142 for hand surgeons to understand the impact of their own demographics on reimbursement
143 rates, and not just those of their patients.

144

145 Surgeon age has been shown to play a role in both treatment selection, as well as
146 outcomes for various of upper-extremity conditions. [1, 24] However, little is known
147 regarding the direct relationship between surgeon age and their respective reimbursement
148 levels. In our analysis, we used the surgeons’ number of years as an ASSH member as to
149 determine an approximation of their age: Assuming the average age for an entering
150 medical student to be 24 years, [3] one would expect the average age of a surgeon first
151 eligible to become an ASSH member to be roughly 35 years (24 + 4 years medical school
152 + minimum 6 years post-graduate training + minimum 1 year in practice for candidate
153 membership). Based on our analysis, this would suggest that among ASSH members, the
154 highest level of total Medicare reimbursement would be in surgeons 43 to 55 years of age
155 (designated as Group B in our analysis), which most closely aligns with surgeons’ period
156 of peak operative volume, as demonstrated in previous studies. [2, 5, 6, 22]

157

158 In addition to age, numerous studies have illustrated significant geographical variations in
159 Medicare spending. [10-12, 16, 20, 25] It has been suggested that regions with higher
160 levels of Medicare spending do not necessarily correlate to areas with patients of poorer
161 health or socioeconomic status, but rather these regions are associated with a larger
162 supply of care providers who perform higher-costing services. [11, 12, 16] Studies
163 looking specifically at RA patients found higher rates of wrist arthroplasty and
164 arthrodesis in regions with a higher density of orthopaedic surgeons, and an inverse
165 relationship between rates of those same surgeries and density of rheumatologists. [23,
166 26] This would suggest that regional variations in Medicare reimbursement among hand
167 surgeons would correlate with a measure of surgeon supply, such as our calculated hand
168 surgeons per capita. However, though this study does demonstrate geographic variations
169 in Medicare reimbursement among hand surgeons, we were unable to demonstrate any
170 dependence on hand surgeon density or availability. We were also unable to find any
171 difference in proportion of ancillary services provided that would explain these
172 geographic variations. Further study is warranted to determine which factors might
173 account for these regional variations among hand surgeons.

174

175 This study is certainly not without limitations. We found the data provided by CMS to
176 have a significant number of flaws regarding specialty designation, similar to the report
177 by Chung et al on the effect of ASSH membership on treatment choice for DRF. [9] Also,
178 missing data between the ASSH membership list and the CMS PUF forced us to exclude
179 some ASSH members from our analysis. In addition, as ASSH membership itself does
180 not include all hand surgeons or surgeons who treat conditions of the hand and wrist, this
181 data may not represent all surgeons whose practice is composed of a significant
182 proportion of hand and wrist patient-care. However, as the largest verifiable hand surgery
183 society, as well as the significant variability in training paths potentially leading to
184 certification as a hand surgeon, we feel it was the best option for collecting a maximal
185 cohort of U.S. hand surgeons. Another potential limitation is the use of year inducted as
186 an ASSH member to estimate the number of years in practice or surgeon age, particularly
187 in cases where surgeons decide to apply for membership later in their careers. However,

188 we do feel this number should provide an accurate correlation for the vast majority of
189 ASSH members. Of course, as with any study using Medicare data as the basis for
190 analysis, the ability to generalize this data to hand surgeon reimbursement from all
191 sources of payment and across multiple years, is debatable. Lastly, the general
192 breakdown of geographical region by states has some inherent flaws. This does not allow
193 us to account for variations between rural and urban populations, and how these
194 discrepancies may contribute to the state as a whole. In addition, states with a lower total
195 number of ASSH members are subject to data skewing by ASSH members with outlying
196 reimbursement rates. Thus, future studies of this nature may be best served by classifying
197 geographical regions in a broader manner than by state. However, despite these
198 limitations, we feel this study gives useful insight into geographic differences in
199 Medicare reimbursement among hand surgeons. Future studies should be aimed at
200 examining specific factors leading to reimbursement variation based on both geography
201 and surgeon-age, including total surgical volume and number of patients seen and treated
202 and the severity of disease of those patients treated.

203

204 **Acknowledgements**

205 No external funding was required for this study.

206

207 **Conflict of Interest**

208 All authors have declared no conflict(s) of interest.

209

210 **Statement of Human and Animal Rights**

211 This article does not contain any studies with human or animal subjects.

212

213 **Statement of Informed Consent**

214 There were no human subjects required for this study and therefore informed consent was
215 not required.

216

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297

FIGURE LEGEND:

298

299

1. Distribution amongst ASSH members of total CMS reimbursement (in USD) per surgeon in 2012.

300

301

2. Distribution amongst ASSH members of years of experience (as estimated by number of years as an ASSH member) as of 2012.

302

303

3. Geographic distribution of average CMS reimbursement per ASSH member in 2012.

304