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ORIGINAL ARTICLE

Business

A Comparative Analysis of the Common Injections Performed by Plastic Surgeons: 2012 and 2019

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Background: Plastic surgeons regularly perform injections for both cosmetic and functional purposes. This article examines the most common injections utilized by plastic surgeons under Medicare and how their usage and billing has changed between 2012 and 2019.

Methods: Using the earliest and latest data available on the Centers for Medicare and Medicaid Services' Provider Utilization and Payment Data File, we first determined Healthcare Common Procedure Coding System injection codes most billed to Medicare in 2012 and 2019. The number of services, amount of Medicare beneficiaries, and reimbursement rates were collected and analyzed for each Healthcare Common Procedure Coding System code from the Provider Utilization and Payment Data File for years 2012 and 2019. We compared the change in reimbursement rate for each injection to the rate of inflation in US dollars over the same period.

Results: The unadjusted Medicare reimbursement rate for eight included injection types increased an average of 31.63% during the study period. This was not significantly different from the rate of inflation during the same period (+11.33%, $P = 0.311$). When all Medicare reimbursement data were adjusted for inflation to 2019 dollars, the average percentage change in reimbursement for all included injections in this study increased by 17.58% from 2012 to 2019.

Conclusions: The findings from our study suggest that injections administered by plastic surgeons appear to be unique in their general stability in reimbursement rates as compared to rates in other fields. Further research should be performed to better understand the driving factors for usage and reimbursement changes.
(Plast Reconstr Surg Glob Open 2022;10:e4497; doi: 10.1097/GOX.0000000000004497; Published online 24 August 2022.)

INTRODUCTION

Plastic surgeons regularly perform injections in the clinic for both cosmetic and functional indications. These nonsurgical interventions have gained traction in recent years as they provide effective outcomes, often without the risk of permanent alterations. According to the American Society of Plastic Surgeons, minimally invasive cosmetic procedures (eg, neurotoxin and filler injections) have significantly grown in popularity over the last two decades. Specifically, the percentage change in use of botulinum toxin type A (ie, Botox) injections grew 845% from 2000 to 2018.[1]

Indications for functional injections, which remain largely under the discretion of the medical provider, have seen a rise in utilization in recent years.[2,3] Neurotoxins, for example, are used in the treatment of migraine headaches, hyperhidrosis, muscular dystonia, and dyskinesia.[4] Also, steroid and collagenase injections are routinely used in hand surgery clinics for numerous issues, including in the management of peripheral neuropathies[5] and Dupuytren contracture.[6] Although injections used for aesthetic indications are generally not covered by public or private payors,[7] functional injections are more likely to be paid for by health

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Received for publication April 26, 2022; accepted July 5, 2022.

Presented at Virtual Plastic Surgery the Meeting 2020, On Demand, October November 9–30, 2020.

DOI: 10.1097/GOX.0000000000004497

Disclosure: *The authors have no financial interest to declare in relation to the content of this article.*

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insurance providers. Thus, information collected on injections that are paid for by public payors like Medicare can be used to better understand trends in usage and billing of injections commonly administered by plastic surgeons.

Prior studies by our group and others assessing reimbursement across surgical and nonsurgical disciplines have revealed that Medicare reimbursement rates have been declining on a relative basis at a significant rate over the past 20 years.[8–11] However, there is a lack of literature examining reimbursement trends related to minimally invasive procedures such as injections performed by plastic surgeons. Thus, this article examines the most common injections utilized by plastic surgeons under Medicare and how usage and billing have changed from 2012 to 2019. Based on analyses from other aspects of plastic and reconstructive surgery as well as trends observed in other specialties, we hypothesize that reimbursements for functional injections will likewise see a decrease between the dates of 2012 and 2019.

METHODS

The Medicare Provider Utilization and Payment Data from the Centers for Medicare and Medicaid website was used to identify injections that were billed to Medicare by plastic surgeons in the years 2012 through 2019, which were specifically chosen due to earliest and latest available data, respectively.[12] This tool generates a file for a specific year that contains products, supplies, and services billed to the Centers for Medicare and Medicaid Services and associated information regarding utilization, reimbursement rates, and submitted charges by National Provider Identifiers (NPI), Healthcare Common Procedure Coding System (HCPCS) code, and place of service. Advanced filters were applied to the dataset to identify provider type as plastic surgeons and HCPCS descriptions to include injection procedures with Jcodes. This generated a list of injections performed by plastic surgeons which was then further refined to reflect injections of a particular substance (eg, onabotulinumtoxin A) and amount (eg, 1 unit) (Table 1). A number of codes include the same chemical content but different doses of injection. Thus, the various dosages of methylprednisolone acetate injections were combined (20, 40, and 80 mg) and the two codes for triamcinolone acetate (1 and 10 mg) were combined during data analysis. Antibiotics (ie, ceftriaxone injections) were excluded from the analysis as they are part of routine procedure rather than having a functional purpose in management or treatment.

The resultant list was retrospectively analyzed for the total number of services (TNS), the number of Medicare beneficiaries, average charges, and average Medicare reimbursement amounts (AMRA) for all HCPCS codes of interest in each respective year. The percent change over time between the years 2012 and 2019 in TNS, Medicare beneficiaries, and AMRA unadjusted data was calculated for injections that appeared in both years. To ensure there was a consistent increase or decrease in the trends of reimbursements each year from 2012 through 2019, the raw, unadjusted AMRA data were graphed with trendlines and coefficient of determination (R^2) for each injection included. The raw, unadjusted AMRA data were then compared to the percent change in consumer price index (CPI) between 2012 and 2019 using a two-tailed t-test comparison of the means ($P < 0.05$). To evaluate for trend analyses in comparable terms, the 2012 AMRA data were adjusted for inflation to 2019 US dollars (USD) using the CPI tool from the US Department of Labor, Bureau of Labor Statistics.[13]

Compound annual growth rate (CAGR) was analyzed as another metric of looking at the Medicare reimbursement rate changes over the years. CAGR is the mean annual rate of change over a specified time period that minimizes the effects of short-term variation. This was calculated with the adjusted AMRA data using the following formula[14]:

$$\text{CAGR} = (\text{EY}/\text{BY})^{1/n} 1 \times 100 \rightarrow (2019\ \text{value}/2012\ \text{value}) 1/(2019-2012)\, 1 \times 100$$

where EY = ending year; BY = beginning year; n = number of years.

Data analysis was completed with statistical significance set at P less than 0.05. Institutional review board approval was not required for this study as Medicare billing data are publicly available and do not contain protected patient information.

RESULTS

In 2019, there were 205,085 total injections performed, which was an 84.13% increase from 2012, during which 111,382 total injections were performed. The most

Table 1. List of Included Injections Performed by Plastic Surgeons by HCPCS Codes

HCPCS Code	Description
J0171	Injection, adrenalin, epinephrine, 0.1 mg
J0585	Injection, onabotulinumtoxin A, 1 unit
J0588	Injection, incobotulinumtoxin A, 1 unit
J0702	Injection, betamethasone acetate 3mg and betamethasone sodium phosphate 3 mg
J0775	Injection, collagenase, clostridium histolyticum, 0.01 mg
J1020*	Injection, methylprednisolone acetate, 20 mg
J1030*	Injection, methylprednisolone acetate, 40 mg
J1040*	Injection, methylprednisolone acetate, 80 mg
J1100	Injection, dexamethasone sodium phosphate, 1 mg
J2001	Injection, lidocaine HCL for intravenous infusion, 10 mg
J3300†	Injection, triamcinolone acetonide, preservative free, 1 mg
J3301†	Injection, triamcinolone acetonide, not otherwise specified, 10 mg

*Codes J1020, J1030, J1040 were analyzed together.
†Codes J3300 and J3301 were analyzed together.

common injection for both years was onabotulinumtoxin A, which constituted 37.4% of total injections in 2012 and 39.8% of total injections in 2019 (+2.4%). However, a comparable neurotoxin injection, incobotulinumtoxin A, saw a decline in usage from 2012 (7.95% of total injections) to 2019 (2.81% of total injections), representing a change of −5.14%. The second most common injection in 2012 was triamcinolone acetonide (19.7%), commonly used for pain relief. In 2019, the second most common injection was testosterone cypionate (32.95%), often utilized for hormone replacement in cases such as hypogonadism,[15] which was not offered in 2012 by plastic surgeons. Dexamethasone sodium phosphate injections increased from 445 injections in 2012 to 1797 injections in 2019, which constitutes the largest percent increase from 2012 to 2019 (+303.82%).

When analyzing the raw unadjusted AMRA graphed with trendlines from 2012 to 2019, we see that injections that saw an increase in reimbursement had clear annual increases and strong positive trendlines. The injections that saw a decrease in reimbursement from 2012 to 2019 had either a positive or a flattened negative trendline which were both generally weaker. Two out of the three injections that had an overall negative change in reimbursement had an outlier point either in 2012 (unusually high; incobotulinomtoxinA) or in 2019 (unusually low; triamcinolone) that caused the net negative result. (**See figure, Supplemental Digital Content 1,** which shows scatterplots with trendlines of the unadjusted average medicare payment amount for each injection included from 2012 to 2019, **http://links.lww.com/PRSGO/C146**.)

Analysis of the unadjusted percentage change in Medicare reimbursement from 2012 to 2019 showed an average increase of 31.63% for eight included types of injections. This was not significantly different from the rate of inflation during the same time period (+11.33%, $P = 0.242$) (Table 2). When adjusted for inflation and compared in 2019 USD, the average percentage change in reimbursement was an increase of 17.58%. The adjusted average year-to-year change in reimbursement was an increase of 2.51%, and the average adjusted CAGR was an increase of 1.63%.

Looking at specific comparable neurotoxin injections, Medicare reimbursement for incobotulinumtoxin A has declined from an adjusted $4.33 per unit in 2012 to $3.87 per unit in 2019. Meanwhile, onabotulinumtoxin A received stable inflation adjusted Medicare reimbursement, from an adjusted $4.80 per unit in 2012 to $4.85 per unit in 2019. Other injections that saw a decline in Medicare reimbursements were dexamethasone sodium phosphate and triamcinolone acetate. The other included injections all saw an increase in adjusted reimbursement amounts (Table 2).

DISCUSSION

At large, the analysis of Medicare reimbursement trends is important for legislators, healthcare systems, and practicing physicians, as consideration of these trends may provide insight as advising committees such as MedPAC propose recommendations[16] and Congress drafts future reimbursement schedules. It is important for plastic surgeons to understand how these trends apply to the field of plastic and reconstructive surgery as they impact physician compensation. In the interest of sustainability and growth of the specialty, the findings of the current study may help to support continued access to care and restitution for providers. With that in mind, this is the first study to evaluate trends in Medicare reimbursement rates among common injections performed by plastic and reconstructive surgeons.

Our results demonstrate that the average adjusted Medicare reimbursement rates for included injections between the dates 2012 and 2019 align with the rate of inflation over the same time period. The data reported in this study are inconsistent with several previous evaluations of monetary trends in plastic surgery.[11,17–19] The current landscape of literature suggests that adjusted Medicare reimbursement is downtrending for various reconstructive procedures, with changes not keeping pace with the rate of inflation. These prior studies coincide with general findings that Medicare payment rates are lagging far behind general inflation and physician practice expenses.[20] Thus, the findings in this study show that injections appear to be unique in their general stability in reimbursement rates as compared to other reconstructive and hand procedures.

Table 2. Adjusted Reimbursement Overall Trends, CAGR, and Year-to-year Changes and the Unadjusted Average Reimbursement for Common Injections from 2012 to 2019

HCPCS Code	% Change in the No. Services	Adjusted CAGR, %	Average % Change Year-to-year Adjusted* (2012–2019)	Adjusted* % Change in Reimbursement (2012–2019)	Unadjusted % Change in Reimbursement (2012–2019)
J0585	+95.94	+0.09	+0.09	+0.66	+12.06
J0588	−34.95	−1.93	−1.82	−12.74	−0.68
J0702	+102.51	+1.27	+1.32	+9.23	+21.60
J0775	−24.51	+0.94	+0.96	+6.74	+18.83
J1020					
J1030	−8.45	+5.84	+6.96	+48.75	+69.22
J1040					
J1100	+303.82	−2.96	−2.71	−18.87	−9.80
J2001	−21.74	−2.20	−2.06	−14.42	+146.43
J3300 J3301	+28.26	+12.02	+17.34	+121.36	−4.83
Averages	+49.03	+1.63*	+2.51*	+17.58*	+31.63*
Unadjusted percent change in CPI (2012–2019)					+11.33%
P value of comparison between % change in unadjusted reimbursement and CPI					$P = 0.311$*

*J0171 was excluded from the table and averages calculations because it is an outlier.

Although it is unclear why there is a general increase in Medicare reimbursement for the injections in this study, this finding is not the first of its kind. A prior study also found increased reimbursement rates for botulinum toxin injections, and justified this finding in that the neurotoxin was a more cost-effective treatment for spasticity in physical medicine and rehabilitation.[21] Another study looking at common dermatology services also reported a few significant increases in reimbursement for noninvasive procedures (ultraviolet light treatments) despite an overall decreasing trend in Medicare reimbursement.[22] Overall, there may be a trend in Medicare reimbursement toward minimally invasive, cost-effective treatments. Previous studies have shown that Medicare reimbursement impacts physician demand and utilization[23–25]; thus, by reimbursing procedures like injections at a consistent or higher rate than more invasive options, it may aim to incentivize the use of those particular practices in favor of others.

The results of this study also reveal that there is no significant correlation between the Medicare reimbursement rate and service utilization rate. About half of the included injections individually experienced congruent increase or decrease in the percentage of adjusted Medicare reimbursement rate and reciprocal percentage change in the number of services. Since this finding is equivalent to chance, this demonstrates that Medicare reimbursement rates for these injections appear to have little to no significant influence on driving service utilization trends of common injections. This may be explained by the relatively low cost of injections, which tend to range close to $3–$4. When compared to the costs and reimbursement rates of other procedures or office visits ($30+), the potential financial gains from increasing usage of injections is minimal. Further studies on other forms of noninvasive procedures, such as vaccines or injections in other specialties, may need to be done to better understand the trends described in this study.

There are limitations to this study that must be considered. Data collected from the CMS website includes procedures and injections billed to the federal health insurance plan, Medicare, while excluding others billed through private insurance or cash-pay. Since Medicare only includes patients over 65 years old, the data contained in this study are not fully representative of the true population of patients, especially younger patients, receiving injections from plastic surgeons. Thus, exclusion of fee-for-service procedures and injections is a major limitation that curtails from generalizing these data to plastic surgery as a whole. However, CMS reimbursement policy decisions tend to influence both the public and private sectors of the market; thus, findings from this study may be generalized to a larger scale.

A second limitation is the relatively short time period investigated within this study. Although a period longer than 7 years would allow for a more thorough investigation of injection usage and reimbursement, there is a value in comparing a snapshot of reimbursement data in two discrete years. The years 2012 and 2019 were specifically chosen due to the earliest and latest available data at the time of analysis and drafting, respectively. Future studies may consider analyzing trends with updated years as data are released.

A third limitation is the inability to analyze trends for several injections due to either discontinuation by 2019 or lack of data on an injection in 2012, which contributed to a relatively small sample size. Examples of injections no longer in use and/or not covered under Medicare in 2019 include hydromorphone, morphine sulfate, and potassium chloride while injections such as fluorouracil, methylprednisolone acetate, vitamin B-12 cyanocobalamin, etc., are newly utilized as a noninvasive service or are now available to be reimbursed under Medicare.

Yet, another limitation may be the use of HCPCS codes rather than CPT codes which are often used in other studies. However, it is important to understand the relationship between these codes. HCPCS codes are a standardized code that encompasses two main categories; the first being all CPT codes and the second being products, services, and supplies that are not covered by the American Medical Association (AMA) generated CPT codes.[26] Since CPT-code procedures contribute to HCPCS reimbursements, the trends for hospital reimbursements via CPTs are comparable to those presented in this study of HCPCS codes. Thus, the findings in this study can be analyzed along with studies utilizing CPT codes.

CONCLUSIONS

This study demonstrates that Medicare reimbursement for the HCPCS codes of common injections has increased from 2012 to 2019 and is keeping up with the rate of inflation. Analysis of reimbursement trends within different realms of plastic surgery is important when evaluating legislation and the impact it has on access to commonly utilized injections. Further research should be performed to better understand the driving factors for usage and reimbursement changes.

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