The Association between Industry Payments and Brand-Name Prescriptions in Otolaryngologists

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Abstract

Objective. To associate pharmaceutical industry payments to brand-name prescriptions by otolaryngologists.

Study Design. Retrospective cross-sectional analysis.


Subjects and Methods. We identified otolaryngologists receiving nonresearch industry payments and prescribing to Medicare Part D recipients. Records were linked by physician name and state. The value of industry payments and the percentage of brand-name drugs prescribed per hospital referral region (HRR) were characterized as medians. Industry payments were correlated to the rate of brand-name prescription by Kendall's $\tau$ correlation. This was repeated at the individual physician level and stratified by payment type.

Results. In total, 8167 otolaryngologists received a median of $434 (interquartile range, $138-$1278) in industry compensation over 11 (3-26) payments. Brand-name drugs made up a median of 12.9% (8.6%-18.4%) of each physician’s drug claims. The number ($\tau = 0.05, P < .001$) and dollar amount ($\tau = 0.04, P < .001$) of industry payments were correlated with the rate of brand-name drug prescription at the individual physician level. The number of industry payments was also associated with the rate of brand-name prescription by HRR ($\tau = 0.14, P < .001$), but the dollar amount was not. By HRR, food and beverage payments received by physicians were associated with the rate of brand-name drug prescription ($\tau = 0.04, P < .001$), but travel and lodging payments were not.

Conclusions. Industry financial transactions are associated with brand-name drug prescriptions in otolaryngologists, and these associations are stronger at the regional level than at the individual physician level. These correlations are of modest strength and should be interpreted cautiously by readers.

Keywords

brand-name drugs, Open Payments Database, Sunshine Act, conflict of interest, industry, pharmaceutical industry

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Health care costs in the United States are increasing and currently account for 18% of gross domestic product (GDP). There has been increased interest in reducing costs without affecting care quality. Although prescription drug costs make up only 10% of health care expenditure, decreasing unnecessary prescriptions of costly brand-name drugs represents a prime target for cost-controlling measures. Approximately 80% of brand-name drugs have identical generic counterparts, and even more have therapeutically equivalent alternatives. There is no evidence that brand-name drugs are therapeutically superior, but many physicians prescribe brand-name drugs.

The decision to prescribe a brand-name drug is affected by many factors, including patient preference, insurance coverage, pharmacy stocking, and regional practices. In addition, recent studies have linked the prescription of brand-name drugs to financial interactions with pharmaceutical companies. Within otolaryngology, we have shown that physicians receiving industry compensation associated with brand-name nasal steroids and proton pump inhibitors were more likely to prescribe a higher percentage of these drugs. Other studies have found that region-specific industry payments for specific brand-name drugs and devices are associated with increased brand-name drug and device use.

Few studies, however, have linked overall rates of industry compensation to brand-name prescription patterns across drug classes. A recent ProPublica article suggested that physicians receiving high values of industry compensation

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were more likely to be in the top quartile of brand-name prescription rates; however, it only included a single year of data and did not examine regional trends. Furthermore, brand-name prescribing rates and rates of industry compensation vary significantly, but these variations have not been correlated to each other. Industry payments to otolaryngologists have been increasing and, given the boon of surgical devices entering the market, are likely to continue to increase. The continued exploration of the effects of industry marketing is therefore imperative to identify ways to maximize the benefits of these interactions while minimizing the conflicts of interest they may pose.

In this study, we used the Open Payments Database and Medicare Part D prescription files to examine the association between industry compensation and brand-name prescribing patterns in otolaryngologists. Specifically, we characterized variation in industry payments and brand-name prescriptions and correlated the number and dollar value of industry payments with the percentage of claims and costs of brand-name drugs. Correlations were identified both by hospital referral region and by physician.

Methods

Data Sources: Medicare Part D

The Centers for Medicare & Medicaid Services (CMS) Provider Utilization and Payment Data Public Use File (Part D PUF) provider summary tables are publicly available. They detail prescriptions written at each provider’s discretion to Medicare beneficiaries enrolled in the prescription drug program. For each prescriber, it identifies the total number and cost of prescriptions for all drugs and for brand-name drugs in each year. It also details physician name, specialty, and place of service. Providers with <10 claims are excluded. We included all physicians with a specialty of “Otolaryngology” with prescriptions from 2013 to 2016.

Data Sources: Open Payments Data

The Physician Payment Sunshine Act was passed in 2010 as a part of the Affordable Care Act and details transfers of value (“payments”) made to physicians by drug and device companies. It details all payments over $10. All nonresearch, nonownership payments made to otolaryngologists from 2013 to 2016 were identified. Only August to December 2013 are available; the remaining years contain 12 months of data. Payments were categorized as food/beverage, travel/lodging, consulting fees, speaking fees, education, and other (including gifts, honoraria, grants, royalties, entertainment, prospective ownership, and charitable contributions).

Statistical Analysis

Claims and open payments data (OPD) from the included years were summed, by physician, to provide a total for the 3.5 years (OPD) and 4 years (Part D PUF) included. Claims from the Part D PUF were linked to payments data from the OPD by physician full name. Only physicians with records in both databases were included. We characterized as medians the number and cost of claims, per otolaryngologist, for all drugs and for brand-name drugs. We calculated the percentage of drug claims and costs accounted for by brand-name drugs for each physician. Physicians were categorized into hospital referral regions (HRRs) using a zipcode-to-HRR crosswalk file, and the percentage of claims and costs made up by brand-name prescriptions was calculated by HRR. The total number of and dollar value of industry payments per physician and per HRR were characterized.

By physician, the number and dollar value of payments were associated with the percentage of brand-name drug claims via Kendall’s τ correlation. Similarly, the number and dollar value of payments were associated with the percentage of brand-name drug costs. This was repeated looking just at payments for food/beverages and travel. This analysis was repeated at the HRR level.

These data are publicly available and therefore did not require review by the Yale Institutional Review Board. All statistical analysis was performed in STATA 15.0 (StataCorp, College Station, Texas). Bonferroni correction was used to determine statistical significance at P < .001 (.05/52).

Results

Description of Cohort Prescription Rates and Payments

We identified 8167 otolaryngologists receiving industry payments and with recorded prescriptions to Medicare beneficiaries in the years between 2013 and 2016. Median number of claims per physician was 1351 (interquartile range [IQR], 566-2576), of which 155 (IQR, 53-321) were for brand-name drugs. Median total drug costs per prescribing otolaryngologist were $59,408 (IQR, $23,770-$117,848), of which $22,977 (IQR, $7301-$51,077) were for brand-name drugs. Median total drug costs per prescribing otolaryngologist were $59,408 (IQR, $23,770-$117,848), of which $22,977 (IQR, $7301-$51,077) were for brand-name drugs. Median total drug costs per prescribing otolaryngologist were $59,408 (IQR, $23,770-$117,848), of which $22,977 (IQR, $7301-$51,077) were for brand-name drugs. Brand-name drugs made up a median of 12.9% (IQR, 8.6%-18.4%) of each physician’s claims and 48.1% (IQR, 35.0%-59.6%) of drug costs.

There was a median of 87 (IQR, 39-138) otolaryngologists included in each HRR. By HRR, brand-name drugs made up a median of 11.7% (IQR, 10.2%-14.0%) of claims and 43.2% (IQR, 37.8%-49.4%) of costs. The distribution of the percentage of claims and costs accounted for by brand-name drugs in each HRR, stratified by region, is shown in Figure 1.

Each included (compensated) physician received a median of $434 (IQR, $138-$1278) in industry compensation over 11 (IQR, 3-26) payments. The median payments among all otolaryngologists, including those not receiving payments, included 8 (IQR, 2-23) payments, totaling $323 (IQR, $59-$1078). The total number and dollar amount of payments, stratified by payment type, are shown in Table 1. Industry payment and brand-name prescription rates by HRR are shown in Figure 2.
Association of Industry Payments with Brand-Name Prescriptions by Hospital Referral Region

By HRR, there was a significant correlation between the number ($t = 0.14, P = .001$) of industry payments and the percentage of claims accounted for by brand-name drugs ($\text{Figure 3A}$). No correlation was identified between the dollar amount of payments and percentage of claims ($t = 0.12, P = .002$; $\text{Figure 3B}$). Correlation was not reached between the percentage of costs for brand-name drugs and the number of industry payments ($t = 0.09, P = .024$) or dollar amount of payments ($t = 0.07, P = .088$).

When only looking at payments for food and beverage, there was a significant correlation between percentage of brand-name claims and the number of industry payments ($t = 0.14, P < .001$). Correlation between the percentage of claims and dollars of industry payment did not reach statistical significance ($t = 0.12, P = .002$), nor did correlation between the percentage of brand-name costs and the number ($t = 0.09, P = .017$) and dollar amount ($t = 0.08, P = .042$) of payments.

For speaking fees, there was no significant correlation between percentage of brand-name claims and the number or dollar amount of payment for speaking fees ($t = 0.14, P = .012$ and $t = 0.09, P = .082$, respectively). There was also no correlation between the percentage of brand-name claims and the number or dollar amount of payments for travel and lodging ($t = 0.08, P = .067$ and $t = 0.07, P = .064$, respectively). $\text{Table 2}$ shows the correlations between payments and brand-name prescriptions stratified by payment type.

Association of Industry Payments with Brand-Name Prescriptions by Individual Physicians

By physician, there was a significant correlation between the percentage of brand-name claims and the number ($t = 0.05, P < .001$; $\text{Figure 4A}$) and dollar amount ($t = 0.04, P < .001$; $\text{Figure 4B}$) of industry payments. The percentage of brand-name costs was significantly associated with the number ($t = 0.07, P < .001$) and dollar amount ($t = 0.05, P < .001$) of payments.

For food and beverage, there was a significant association between the percentage of brand-name claims and the number ($t = 0.05, P < .001$) and dollar amount ($t = 0.04, P < .001$) of payments, as well as between the percentage of brand-name costs and the number ($t = 0.07, P < .001$) and dollar amount ($t = 0.05, P < .001$) of payments. No significant associations were seen for travel/lodging, consulting, or speaking fees. The correlations stratified by payment types are shown in $\text{Table 3}$.

Discussion

We found here that there is significant regional variation in rates of brand-name prescriptions and industry payment to

$\text{Table 1. Total Number and Dollar Amount of Payments, by Payment Type, to Otolaryngologists}.^a$

<table>
<thead>
<tr>
<th>Payment Type</th>
<th>No. of Payments</th>
<th>Median Payment Amount (Interquartile Range)</th>
<th>Total Dollar Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulting fees</td>
<td>3018</td>
<td>$1250 ($350-$3000)</td>
<td>$6,761,128</td>
</tr>
<tr>
<td>Education</td>
<td>2547</td>
<td>$15 ($14-$134)</td>
<td>$1,073,068</td>
</tr>
<tr>
<td>Food and beverage</td>
<td>153,225</td>
<td>$17 ($12-$39)</td>
<td>$5,168,814</td>
</tr>
<tr>
<td>Travel and lodging</td>
<td>10,471</td>
<td>$209 ($79-$459)</td>
<td>$3,511,145</td>
</tr>
<tr>
<td>Speaking</td>
<td>2462</td>
<td>$1575 ($600-$2500)</td>
<td>$4,231,155</td>
</tr>
<tr>
<td>Other</td>
<td>614</td>
<td>$1000 ($140-$2500)</td>
<td>$2,570,736</td>
</tr>
</tbody>
</table>

$^a$Payment numbers and dollar amounts to included otolaryngologists from 2013 to 2016 are shown.
otolaryngologists and that industry compensation was associated with the percentage of brand-name claims and costs by physician and by HRR. While food and beverages received by individual physicians were linked to brand-name prescriptions, they were not linked to HRR-level brand-name prescription rates.

As Figures 1 and 2 show (by national geographic region and HRR, respectively), there is significant regional variation in brand-name prescription rates. While the bottom quartile of HRRs had less than 10% of brand-name claims, the top quartile had more than 14%. In the bottom quartile, brand-name costs accounted for 38% of costs; in the top quartile, they accounted for 49%. A prior study found that, within certain drug classes, brand-name drug prescription rates varied between 24% and 45% in different HRRs. Furthermore, these variations in brand-name prescriptions accounted for most of HRR-level variation in total prescription costs. By physician, there was an even broader spread, with the bottom quartile prescribing less than 9% brand-name drugs and the top quartile more than 18%.

Similarly, there was large variation in industry payments. The bottom quartile of HRRs examined had less than $5015 of total industry compensation, while the top quartile had more than $74,700. By physician, the bottom quartile of physicians received less than $138, while the top quartile received more than $1278. We have previously found that the distribution of industry payments within otolaryngology is very unequal in any given year and that there are disproportionately more payments in certain geographical regions and subspecialties. This has also been found in other specialties. This may result from the targeting of high-volume physicians or key opinion leaders who influence the practices of other physicians. In addition, cultural differences may make industry collaborations, such as for device development, more likely in certain regions. Furthermore, some states and hospitals, particularly academic institutions, have industry-interaction policies designed to reduce conflicts of interest; these may partially explain the variation seen here.

In addition, we confirmed in this study that industry payments were correlated to rates of brand-name prescriptions, at both the by-physician and by-HRR level. We examined all drugs together, including those that may not have therapeutically equivalent drugs. We did not show here that payments are associated with increased prescribing of the compensated-for drug, only that physicians and regions that received more payments tended to prescribe more brand-name drugs overall. We speculate that this is due to increased brand-name prescribing over therapeutically equivalent drugs, but it may be due to prescribing different drugs that do not have generic therapeutic equivalents. However, our findings have been replicated in multiple prior studies examining individual drug classes. In a study examining physicians prescribing nasal steroids, we found that physicians receiving

Figure 2. Hospital referral region variation in industry payments and brand-name claims. The (A) dollar value industry payments and (B) percentage of brand-name claims by hospital referral region, with lighter colors representing more payments and a higher percentage of claims, respectively.
industry compensation for the brand-name drugs Nasonex and Dymista prescribed a higher percentage of those drugs than physicians not receiving payments. Similar findings were found in prescriptions of the proton pump inhibitors dexlansoprazole and esomeprazole. By region, a study by DeJong et al examined prescriptions of brand-name selective serotonin reuptake inhibitors/selective norepinephrine reuptake inhibitors, beta blockers, angiotensin-converting enzyme inhibitors/angiotensin receptor blockers, and statins. They found that in HRRs receiving more industry meals associated with brand-name drugs of these classes, physicians prescribed a higher proportion of the compensated-for brands.

However, this is the first study to correlate overall brand-name prescription rates in a national cohort of Medicare Part D recipients and overall industry compensation. The correlation found here is most likely explained by the cumulative effect of industry marketing for individual drugs and the ensuing higher rates of brand-name prescriptions. When pharmaceutical companies choose physicians to target for payments, they typically target key opinion leaders in each specialty and region, who then influence the practice patterns of other physicians. As each physician is only likely to be targeted by a small handful of companies, an increasing number of payments to an individual physician are unlikely to heavily affect that individual’s prescribing patterns. This is reflected in the modest, albeit still statistically significant, correlation coefficient of 0.05 we found between number of payments and percentage of prescriptions by physician. At the regional level, however, when each physician is targeted by a handful of companies and then influences the practice patterns of those around them, more regional industry involvement translates to an appreciable increase in brand-name prescribing, as evidenced by the correlation coefficient of 0.14 between number of payments and percentage of prescriptions by HRR.

The correlation coefficients in this study are very modest and in some contexts could be considered negligible. However, many factors affect brand-name prescribing, and in this context, the presence of a statistically significant correlation between industry payments to physicians and the total percentage of brand-name prescriptions, despite being weak, is certainly notable. Furthermore, the nonparametric rank-order correlation coefficients minimize the influence of outlier values, ensuring that a few highly compensated physicians do not account for the trends seen. This is, however, an incomplete explanation of the causes of variations in brand-name prescribing rates and the potential effects of industry marketing on brand-name prescribing. While these authors consider our statistically significant but low-signal

### Table 2. Correlation between Industry Payments and Brand-Name Prescriptions by Hospital Referral Region, Stratified by Payment Type.

<table>
<thead>
<tr>
<th>Payment Type</th>
<th>Percentage of Claims</th>
<th>P Value</th>
<th>Percentage of Costs</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulting fees</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>.10</td>
<td>.052</td>
<td>.06</td>
<td>.1923</td>
</tr>
<tr>
<td>Dollar value</td>
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<td>.087</td>
<td>.05</td>
<td>.339</td>
</tr>
<tr>
<td>Education</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>.09</td>
<td>.038</td>
<td>.04</td>
<td>.431</td>
</tr>
<tr>
<td>Dollar value</td>
<td>.07</td>
<td>.131</td>
<td>.05</td>
<td>.264</td>
</tr>
<tr>
<td>Food and beverage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>.14^b</td>
<td>&lt;.001</td>
<td>.09</td>
<td>.017</td>
</tr>
<tr>
<td>Dollar value</td>
<td>.12</td>
<td>.002</td>
<td>.08</td>
<td>.042</td>
</tr>
<tr>
<td>Travel and lodging</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
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<td>.067</td>
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<td>.692</td>
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<tr>
<td>Dollar value</td>
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<td>.064</td>
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<td>Speaking</td>
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<tr>
<td>Number</td>
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<td>Dollar value</td>
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<tr>
<td>Number</td>
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<tr>
<td>Dollar value</td>
<td>.09</td>
<td>.148</td>
<td>.04</td>
<td>.502</td>
</tr>
</tbody>
</table>

^aCorrelations on median regression analysis. Statistical significance was determined at P < .001.

^bCorrelation reached statistical significance.
correlation coefficients to be meaningful, this is a highly subjective and contextual interpretation, and many readers may not agree. We invite readers to draw their own interpretations of these data.

There are multiple implications of this study. This study adds to the body of evidence that industry marketing to physicians likely affects physician practice patterns, both within and outside of otolaryngology. Our findings also suggest that the industry interactions of physicians in a given region may affect the practice patterns of other physicians in that region. While other studies have examined individual drug classes, in this study, we found that there may be a cumulative effect of many industry payments on overall brand-name prescription rates for physicians and within geographical regions, including for infrequently prescribed and compensated-for drugs. While we only examined brand-name drug prescriptions here, it is likely that these findings extend to costly surgical devices. System-wide policies limiting industry interactions may be beneficial in reducing prescription drug costs.3

However, physician-industry interactions serve many important purposes in both educating physicians about new treatments and directing industry innovation toward areas of clinical need. Policies enabling these benefits while reducing the harm of industry-physician interactions are needed and should be prospectively studied.21,22 Furthermore, safeguards to reduce expensive and unnecessary brand-name prescriptions, such as electronic medical record therapeutic exchange programs, should continue to be explored.23 The ways in which payments to one physician affect the practice patterns of others should continue to be explored, as this aspect on conflict of interest is often overlooked.10 Prior work has suggested that pharmaceutical targeting of key opinion leaders can inordinately affect knowledge dissemination and that this is particularly effective for companies with small and well-defined target populations.24 Otolaryngology is a small field, and much of the recent innovation has been by companies with a limited number of products treating specific problems.25 These products improve patient care in many ways, but the role of influential and oftentimes compensated physicians in smoothing their acceptance and approval cannot be understated.

There are multiple limitations to this study. First, this study is cross-sectional and retrospective and therefore subject to the limitations inherent to this design. We are unable to establish causal relationships and can simply show an association between industry payments and brand-name prescription rates. It is possible that another confounding factor accounts for this association. It is likely that some physicians who are less tolerant of industry presence are also less
likely to prescribe brand-name drugs due to ideological differences. This is also true at an HRR level: hospitals that are more likely to have strategies in place to reduce conflicts of interest may also be more likely to have systems to reduce unnecessary brand-name prescriptions, such as via electronic medical record therapeutic exchange or pharmaceutical defaults. Although many brand-name drugs have generic counterparts, some do not, and due to the nature of the data set, we were unable to examine drugs these groups separately. From post hoc assessment of another Medicare Part D data set, however, we found that all of the 15 drugs most commonly prescribed by otolaryngologists had generic therapeutic equivalents. Furthermore, some diseases do not have effective generic treatments available. Physicians who are experts in these diseases may be both more likely to receive industry payments and more likely to prescribe brand-name drugs. We are also only able to access prescription data for Medicare Part D, and prescribing patterns to this population may differ meaningfully from those covered with other Medicare plans (one-third of Medicare recipients), Medicaid, and private insurance. On post hoc analysis of 2016 claims, we found a high rate of brand-name prescription to Medicare Part D recipients by nonotolaryngologists (17% of claims and 64% of costs vs 11% of claims and 44% of costs). These figures are less than those previously reported in privately insured (80%) and Medicaid patients (80%).25,26 Data on prescriptions covered by private insurance and other forms of government insurance are not publicly available, but given the higher rates of brand-name prescribing, we suspect that the results found here would be replicated, if not amplified, in these data. We also did not assess differences between academic and nonacademic physicians; this should be examined in future work as it may have important implications for policies at academic institutions. Nevertheless, given these limitations, our results do suggest that industry compensation to physicians may increase brand-name prescription rates and is therefore important to consider in discussions about prescription drug costs.

Conclusions
In this study, we found that there was significant variation in rates of brand-name prescriptions and industry payments in otolaryngologists at both an individual physician and hospital referral region level. We found that there was a significant correlation between the number of payments and percentage of brand-name prescription claims for Medicare Part D recipients and that the correlations were stronger at a hospital referral region level than at an individual physician level. These correlations were of low strength, however, and these conclusions should be interpreted cautiously by readers.

Author Contributions
Elliot Morse, conception and design, acquisition and analysis, drafting and revision, final approval, agreement to be accountable; Jonathan Hanna, conception and design, critical revision for intellectual content, final approval, agreement to be accountable; Saral Mehra, conception and design, critical revision for intellectual content, final approval, agreement to be accountable.

Disclosures
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