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Impact of Physician Payments on Microvascular Breast Reconstruction: An All-Payer Claim Database Analysis

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Abstract

Background: Rates of autologous breast reconstruction are stagnant compared to prosthetic techniques. Insufficient physician payment for microsurgical autologous breast reconstruction (MABR) is one possible explanation. The payment difference between governmental and commercial payers creates a natural experiment to evaluate its impact on the method of reconstruction. The study aims to assess the influence of physician payment differences for MABR and implants by insurance type on the likelihood of undergoing MABR.

Methods: The Massachusetts All-Payer Claims Database was queried for women undergoing immediate autologous or implant breast reconstruction from 2010–2014. Univariate analyses compared demographic and clinical characteristics between different reconstructive approaches. Logistic regression explored the relative impact of insurance type and physician payments on breast reconstruction modality.

Results: 82.7% of women had commercial and 17.3% had governmental insurance. Implants were performed in 80% of women, whereas 20% underwent MABR. Women with Medicaid versus commercial insurance were less likely to undergo MABR (16.4% vs. 20.3%, $p=0.063$). Commercial insurance, older age, and obesity independently increased the odds of MABR ($p<0.01$). When comparing median physician payments, governmental payers reimbursed 78% and 63% less than commercial payers for MABR (\$1,831 versus \$8,435) and implants (\$1,249 versus \$3,359, respectively). Stratified analysis demonstrated that as physician payment increased, the likelihood of undergoing MABR increased, independent of insurance type ($p<0.001$).

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Conclusion: Women with governmental insurance had lower odds of undergoing MABR compared to commercial payers. Regardless of payer, greater reimbursement for MABR increased the likelihood of MABR. Current MABR reimbursements may not be commensurate with physician effort when compared to prosthetic techniques.

INTRODUCTION

Following passage of the Women's Health Cancer Right Act of 1998, the rate of post-mastectomy breast reconstruction has risen with up to 41-63% of women electing to undergo surgery^(1, 2). However, a number of healthcare disparities related to breast reconstruction have been documented⁽³⁾ including sociodemographic factors^(1, 4-6) along with access barriers such as travel distance⁽⁷⁾. Variations in the method of reconstruction performed adds another layer of disparity among women undergoing post-mastectomy breast reconstruction. For example, access to microvascular reconstruction has limited availability at many non-academic medical centers⁽⁸⁾. This is noteworthy due to stagnant, autologous breast reconstruction rates compared to rates of prosthetic techniques, despite superior long-term patient-reported outcomes (PROs)⁽⁹⁻¹¹⁾.

Differences in physician payment between microsurgical autologous breast reconstruction (MABR) and competing techniques has been proposed as an additional barrier, although there is limited data on this topic⁽¹²⁾. The opportunity cost of proportionately lower payments per hour for MABR has been negatively associated with utilization of MABR in both single institutional data⁽¹²⁾ and a single payer claims database^(13, 14). Moreover, physician payment differences between governmental and commercial payers sets up a natural experiment to evaluate the impact of payment on rates of MABR vs. prosthetic reconstruction. Therefore, the aim of this study is to assess variations in reconstruction rates and physician payments for MABR vs. implants by insurance type using an all-payer claims database. The hypothesis is that that physician payment for breast reconstruction type contributes to type of procedure performed regardless of insurance type.

METHODS

Massachusetts All-payer claims data (APCD) were obtained from the Center for Health Information and Analysis. This is a comprehensive claims database of both public and private payers for residents in the state of Massachusetts. Included in this database are individual-level medical, pharmacy, and member eligibility data⁽¹⁵⁾. The data were queried for women with a diagnosis of in situ or invasive breast cancer who were treated during the period of 2010–2014. Inclusion criteria were women who underwent post-mastectomy, immediate breast reconstruction using ICD9 ('85.3', '85.33', '85.34', '85.35', '85.36', '85.4', '85.41', '85.42', '85.43', '85.44', '85.45', '85.46', '85.47', '85.48') and CPT ('19180', '19182', '19200', '19220', '19240', '19303', '19304', '19305', '19306', '19307') codes. Type of reconstruction method was identified using CPT codes: '19364', 'S2068', '19367' for free and '19357' for tissue expanders. Henceforth, implants refer to tissue expanders. Cases using mixed-method reconstruction (e.g. latissimus flap) or with unclear/incomplete information were excluded. Cases claimed under "other" governmental program or who were uninsured were also excluded due to a sample size of less than 20.

From the selected cohort, the following clinically relevant variables were summarized and used for analysis: age, obesity (defined as Dx - ICD9 27.800 - Obesity, unspecified), smoking history, chemotherapy and radiotherapy within 90 days prior the surgery through 180 days post-surgery, and payer types including Medicare, Medicaid, and private insurance. Physician and hospital payments were studied separately. Payments for bilateral cases were normalized to unilateral by payer and reconstruction type. All payments were adjusted to 2014 dollars, thus controlling for inflation. Physician payments were adjusted to 2014 dollars based on the medical Consumer Price Index while hospital payments were adjusted based on inflation rate.

Statistical Analysis

Univariate analyses of categorical variables were performed using Chi-square or Fisher's exact test. Payment distributions and variation by procedure type and payer are presented using violin plots. Multivariable logistic regression analyses assessing the impact of payment on choice of MABR, and controlling for age, radiation, chemotherapy, obesity, and smoking status, were performed. All statistical tests were two-sided with an alpha of 0.05. All analyses were performed using SQL and R Statistical Software (packages: Tidyverse and Zoo).

RESULTS

A total of 2,879 women who underwent immediate breast reconstruction following mastectomy from October 2010 through September 2014 met the inclusion and exclusion criteria. Twenty percent received free-flaps and the majority (80%) received implants. Women who received implants were more likely to be younger and have history of smoking, radiotherapy, and systemic chemotherapy, while less likely to be obese compared to those who underwent MABR (Table 1).

A total of 2,382 (82.7%) claims were reimbursed by commercial payers whereas 497 (17.3%) claims were reimbursed by governmental insurance. Among patients with governmental insurance, 366 (12.7%) had Medicaid and 131 (4.6%) had Medicare (Table 1). For women with governmental insurance, the proportion of women who underwent MABR was lower than for those women with private payers (16.7% vs 20.3%; p value = 0.065; Table 1). More specifically, the proportion of Medicaid patients who underwent MABR was even lower at 16.4% compared to those privately insured.

After adjusting for patient age, obesity, history of smoking, radiotherapy and chemotherapy, women with governmental insurance were less likely to undergo MABR than prosthetic breast reconstruction (Odds Ratio (OR): 0.68; 95% Confidence Interval (CI): (0.51–0.89), $p=0.005$; Table 2).

When comparing median physician payments, governmental payers reimbursed 78% and 63% less than commercial payers for MABR (\$1,831 versus \$8,435) and implants (\$1,249 versus \$3,359), respectively (Figure 1). Additionally, physician payments for MABR by commercial payers varied more (mean: \$12,546; SD: \$12,208) than governmental payers (mean: \$4,175; SD: \$57,764; see Table, Supplemental Digital Content 1, which shows

physician payments by reconstruction method and payers (describing the mean (SD) and median (IQR) physician payment for each method of reconstruction, stratified by payer type), [INSERT HYPER LINK](#)).

In adjusted models that included payments and other clinically relevant variables, physician payments were shown to be an independent predictor of reconstruction method, regardless of insurance. For example, a \$1000 increase in physician payment increased the odds of women undergoing MABR by 103% for commercial and 86% for governmental payer beneficiaries ($p < 0.001$; Table 3). In contrast, hospital payments had minimal effect on the odds of MABR for commercial payers (3%, $p < 0.001$) and no effect for governmental payers (0%, $p = 0.964$).

DISCUSSION

Consistently lower reimbursement by Medicare and Medicaid compared to commercial insurers for both professional and facility fees allows for assessing the influence of payment on method of breast reconstruction ⁽¹⁶⁾. In the Massachusetts all-payer claims database, governmental payers reimbursed 22% and 37% of commercial payers for MABR and implants, respectively. Additionally, it appears that both payer and physician payments are associated with the likelihood of undergoing MABR. Overall, Medicare and Medicaid beneficiaries had lower rates of MABR compared to patients with commercial insurance even after adjusting for clinically relevant confounders, an association further supported by studies using the National Inpatient Sample database ^(5, 17). However, the novel contribution of the current study is the use of claims data to measure actual physician and hospital payments. After adjusting for relevant clinical variables and insurance type, we demonstrated that increases in physician payment were positively associated with higher odds of women receiving MABR for both commercial and governmental insurers (Table 3). These results are bolstered by a recent commercial analysis of Blue Health Intelligence claims (from Blue Cross/Blue Shield) across 122 unique markets, which demonstrated a positive relationship between physician payment and receipt of MABR ⁽¹³⁾. In contrast to physician payments, we also noted that the influence of hospital payment on method of reconstruction was marginal to none.

Given two competing alternatives (MABR vs. implants), at some remuneration threshold, the opportunity cost of providing autologous reconstruction (i.e. greater operative labor) could sway surgeons to consider the alternative method. This concept is partially reflected in the findings of several other studies. In a comparison of breast reconstruction procedure types at the University of Michigan across all payers, physician reimbursement by surgical time was highest for delayed tissue expander placement (\$1977.70/hour) and lowest for immediate transverse rectus abdominis myocutaneous flaps (\$327/hour) ⁽¹⁸⁾. A more specific study from Washington University demonstrated that hourly compensation for MABR was only 63% of that for implants among commercial payers, and 35% for government payers ⁽¹⁶⁾. Lastly, a survey of 325 surgeons from the American Society of Plastic Surgeons revealed an overall low proportion of U.S. plastic surgeons with a high-volume autologous or microsurgical breast reconstruction practice, citing the absence of residents, time constraints and reimbursement as primary deterrents ⁽¹⁹⁾. Using the current

dataset, commercial payments for implants was 46% of those for MABR. The payment differential was even less for governmental payers with implants paying 77% of the rate of MABR. Given the narrow payment differential and shorter operative time to complete a single breast reconstruction, economic principles regarding utility theory ⁽²⁰⁾ demonstrate surgeons may favor prosthetic methods.

Changes in health policy have also contributed to changes in rates of breast reconstruction among various payers. The introduction of the Women's Health Cancer Right Act of 1998 led to significant increases in immediate breast reconstruction rates among Medicare and Medicaid beneficiaries relative to privately insured beneficiaries ⁽²¹⁾. That said, despite MABR being associated with higher satisfaction and positive, long-term patient-reported outcomes, rates remain relatively stagnant compared to the rapid rise in rates of prosthetic reconstruction ^(9–11, 22). With the movement away from volume driven to value driven healthcare, there may be increasing pressure in some instances to perform autologous reconstruction. For example, Medicare Access and CHIP Reauthorization Act of 2015 (MACRA), which replaced the sustainable growth rate, requires value-based metrics when determining physician payments. As defined by Michael Porter, "value in health care is measured by the outcomes achieved" and is measured relative to costs, therefore encompassing efficiency⁽²³⁾. Enhanced PROs from autologous breast reconstruction compared to prosthetic techniques are one aspect of the value equation for consideration. Other aspects of breast reconstruction that fall under value-based health care may include cost-effectiveness, secondary revisionary procedures, and long-term complication rates^(24,25).

The current findings coupled with unchanged longitudinal rates of autologous transfer, compared to implants, support the hypothesis that physician payments impact access to MABR. Solutions may involve changes to the work relative value units (wRVUs) for breast reconstruction with free flap (CPT 19364) and breast reconstruction with a tissue expander (CPT 19357). Currently, CPT 19364 is valued at 42.40 work RVUs. This is comparable to kidney transplant (40.45), CABG (43.87) and arm replantation (42.30) ⁽²⁶⁾. Discussion with colleagues in other specialties at the AMA Relative Value Update Committee to increase the RVUs for 19364 is unlikely to be fruitful given the RVUs for these other procedures. Moreover, because of budget neutrality, increasing the RVUs for 19364 would cause a proportionate decrease in RVUs for other procedures including 19357, currently valued at 18.5 wRVU. Other possible solutions for appropriate reimbursement of MABR have included using a "22" modifier to 19364, using Healthcare Common Procedure Coding System "S codes" (Medicaid only), or directly negotiating with commercial payers to increase reimbursement (i.e. carve-outs) ⁽²⁶⁾.

This study comes with both strengths and limitations. A major strength is the use of claims data to elucidate the impact of physician payment on underlying trends in US breast reconstruction and the impact on reconstructive services. The current data is limited to one state; therefore, study findings may not be generalizable throughout the United States. This study also assumed that each patient had equal propensity towards receiving either reconstructive method after adjusting for patient-level confounders. The decision to pursue either type of reconstruction is nuanced and preference sensitive at the patient and provider

level. In addition, the study aggregated payer type as a single variable and did not assess how the payer-mix for an individual surgeon or practice might affect the choice of reconstruction. Lastly, we did not control for other variables that also can lead to MABR access disparities. Differences in surgeon training, lack of human capital (i.e. nursing teams, fellows, residents), different payment models, and carve-outs are example of variables not indicated in our data set but may contribute to the differences seen in this study.

CONCLUSIONS

Greater payment for microsurgical autologous breast reconstruction was associated with a greater likelihood of this method of reconstruction, regardless of payer type. The current focus on delivering high quality healthcare supports, in some instances, the use of autologous reconstruction because of superior patient reported outcomes; however, physician payment disparity compared to the competing alternative may be a disincentive. Creative solutions including policy and contract negotiations are needed to ensure access to microsurgical breast reconstruction. Bundled payments for MABR at higher than current rates, based upon improved long-term PROs, would be a possible starting point in negotiations with payers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1:

Physician Payments by Payer and Reconstruction Type

Red: MABR

Blue: Implan

Violin plots demonstrating distribution of physician payments by procedure and payer types.

Among commercial payers: median free-flap/MABR physician payment = \$8,435; median

implant physician payment = \$3,359. Among governmental payers: median free-flap/MABR physician payment = \$1,831; median implant physician payment = \$1,249

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Table 1:

Patient demographics and payers by method of immediate breast reconstruction

Characteristics	Total N= 2,879	Free-Flaps n= 567 (20%)	Implants n=2,312 (80%)	P-Value*
Age, median (IQR)	49 (43–56)	52 (46–59)	48 (42–55)	<0.001
Obesity, n (%)				
Yes	255 (8.9)	77 (13.6)	178 (7.7)	<0.001
No	2624 (91.1)	490(86.4)	2134 (92.3)	
Smoking, n (%)				
Yes	285 (9.9)	31(5)	254 (11.0)	<0.001
No	2594 (90.1)	536 (94.5)	2058 (89.0)	
Radiotherapy, n (%)				
Yes	434 (15.1)	28 (5)	406 (17.6)	<0.001
No	2445 (84.9)	539(95)	1906 (82.4)	
Chemotherapy, n (%)				
Yes	1183 (41.1)	167 (29.5)	1016 (44.0)	<0.001
No	1696 (58.9)	400 (70.5)	1296 (56.0)	
Payer Type				
Commercial ^a	2382 (82.7)	484 (85.3)	1898 (82.1)	0.065
Govenmental ^b	497 (17.3)	83 (14.7)	414 (17.9)	
Medicaid	366 (12.7)	60 (10.6)	306 (13.2)	
Medicare	131 (4.6)	23 (4.1)	108 (4.7)	

^aCommercial payer includes all commercial carriers in MA^bGovernment payer includes only Medicaid and Medicare

* Categorical variables analyzed using Chi-square or Fisher's exact test; age analyzed using Kruskal-Wallis test

Table 2:

Multivariable logistic regression analysis for the choice of microvascular autologous (compared to prosthetic) breast reconstruction

Predictors	Adjusted OR ^a	95 % CI	P-Value
Age, years	1.03	1.02–1.04	<0.001
Obesity	1.92	1.45–2.57	<0.001
Smoking	0.51	0.34–0.75	<0.001
Radiotherapy	0.30	0.20–0.46	<0.001
Chemotherapy	0.74	0.60–0.92	0.006
Payer type			
Commercial	Ref		
Governmental	0.68	0.51–0.89	0.005

OR: odds ratio, CI: confidence interval

^aAdjusted for inflation and laterality

Table 3:

Multivariable logistic regression analysis for the choice of microvascular autologous (compared to prosthetic) breast reconstruction stratified by payer

Predictors	Commercial Payer			Governmental Payer		
	Adjusted OR ^a	95 % CI	P-Value	Adjusted OR ^a	95 % CI	P-Value
Age, years	1.07	1.05–1.09	<0.001	1.03	1.01– 1.06	0.011
Obesity	1.97	1.25–3.10	0.003	1.26	0.59–2.71	0.552
Smoking	0.88	0.49–1.56	0.650	0.47	0.19–1.17	0.105
Radiotherapy	0.34	0.19–0.61	<0.001	0.25	0.07– 0.92	0.037
Chemotherapy	0.79	0.57–1.10	0.160	0.57	0.30– 1.10	0.094
Payments ^a , \$1000						
Physician	2.03	1.84–2.24	<0.001	1.86	1.41–2.45	<0.001
Hospital	1.03	1.01–1.05	<0.001	1.00	0.38–1.04	0.964

SE: Standard error, OR: odds ratio, CI: confidence interval

^a Adjusted for inflation and laterality