OPEN

ORIGINAL ARTICLE
Breast

# A Multi-institutional Analysis of Insurance Status as a Predictor of Morbidity Following Breast Reconstruction

Brittany L. Vieira, BS*
Steven T. Lanier, MD*
Alexei S. Mlodinow, BA*
Kevin P. Bethke, MD†
Robert X. Murphy, Jr, MD, MS‡
Keith M. Hume, MA§
Karol A. Gutowski, MD¶
Neil A. Fine, MD*
John Y. S. Kim, MD*

**Background:** Although recent literature suggests that patients with Medicaid and Medicare are more likely than those with private insurance to experience complications following a variety of procedures, there has been limited evaluation of insurance-based disparities in reconstructive surgery outcomes. Using a large, multi-institutional database, we sought to evaluate the potential impact of insurance status on complications following breast reconstruction.
**Methods:** We identified all breast reconstructive cases in the 2008 to 2011 Tracking Operations and Outcomes for Plastic Surgeons clinical registry. Propensity scores were calculated for each case, and insurance cohorts were matched with regard to demographic and clinical characteristics. Outcomes of interest included 15 medical and 13 surgical complications.
**Results:** Propensity-score matching yielded 493 matched patients for evaluation of Medicaid and 670 matched patients for evaluation of Medicare. Overall complication rates did not significantly differ between patients with Medicaid or Medicare and those with private insurance ($P = 0.167$ and $P = 0.861$, respectively). Risk-adjusted multivariate regressions corroborated this finding, demonstrating that Medicaid and Medicare insurance status does not independently predict surgical site infection, seroma, hematoma, explantation, or wound dehiscence (all $P > 0.05$). Medicaid insurance status significantly predicted flap failure (odds ratio = 3.315, $P = 0.027$).
**Conclusions:** This study is the first to investigate the differential effects of payer status on outcomes following breast reconstruction. Our results suggest that Medicaid and Medicare insurance status does not independently predict increased overall complication rates following breast reconstruction. This finding underscores the commitment of the plastic surgery community to providing consistent care for patients, irrespective of insurance status. *(Plast Reconstr Surg Glob Open 2014;2:e255; doi: 10.1097/GOX.0000000000000207; Published online 21 October 2014.)*

An emerging body of literature suggests that Medicaid and Medicare insurance is independently associated with increased risk of complications for a variety of surgical procedures.[1–21] In recent years, authors have elucidated the role of payer status on outcomes for specialties ranging from colorectal to cardiovascular surgery. Reasons cited for inferior outcomes include delayed patient

*From the *Division of Plastic and Reconstructive Surgery, Feinberg School of Medicine, Northwestern University, Chicago, Ill.; †Lynn Sage Comprehensive Breast Center, Feinberg School of Medicine, Northwestern University, Chicago, Ill.; ‡Division of Plastic Surgery, Lehigh Valley Health Network, Allentown, Pa.; §American Society of Plastic Surgeons, Chicago, Ill.; and ¶Department of Plastic Surgery, The Ohio State University, Columbus, Ohio.*
*Received for publication March 20, 2014; accepted September 4, 2014.*


DOI: 10.1097/GOX.0000000000000207

presentation, higher rates of comorbidities, socioeconomic barriers, and restriction in choice of providers among government-insured patients.[1]

Does this disparity in outcomes persist for publically insured patients undergoing plastic and reconstructive surgery? The answer to this question is unknown. However, recent health policy changes have established an important platform to investigate the quality of care provided to women undergoing breast reconstruction. In response to lower rates of postmastectomy reconstruction among government-insured women, substantial resources have been devoted to expand access to breast reconstruction.[22,23] Specifically, the Women's Health and Cancer Rights Act (WHCRA) was enacted in 1998 to ensure financial coverage of reconstructive fees for all patients undergoing mastectomy.[24,25] Following this legislation, Medicaid and Medicare patients experienced the greatest relative rate of increase in immediate breast reconstructions.[26] These data provide evidence that the policy effectively expanded access to care for previously underinsured groups.[27]

Furthermore, recent implementation of the Patient Protection and Affordable Care Act expanded Medicaid coverage to an estimated 12–17 million people, encompassing all adults under 65 years old and below 133% of the federal poverty line.[28] In conjunction with the WHCRA, the legislation will ensure that the number of women undergoing breast reconstruction reimbursed by a government payer will continue to increase in the future. This trend underscores the importance of monitoring the outcomes of care given to publically insured patients in comparison to their privately insured counterparts.

The Tracking Operations and Outcomes for Plastic Surgeons (TOPS) registry established by the American Society of Plastic Surgeons (ASPS) offers a unique platform to evaluate our hypothesis that a government payer status confers an increased risk of complications following breast reconstruction. Importantly, unlike many other large, multi-institutional registries often used in the plastic surgery literature, TOPS collects information regarding primary payer type. Moreover, as a database specific to plastic and reconstructive surgery, TOPS both includes and appropriately defines those outcomes of greatest interest to the community, effectively capturing a large number of complications commonly not collected in other large surgical registries. Our study is the first to evaluate primary payer status as an independent predictor of complications following breast reconstruction.

**Disclosure:** *John Kim receives research funding from the Musculoskeletal Transplant Foundation. Keith Hume is employed by the American Society of Plastic Surgeons (ASPS). Robert Murphy Jr is the current president of the ASPS. Neil Fine receives research funding from Allergan. None of the other authors has any financial disclosures. The Article Processing Charge was paid for by Northwestern University, Feinberg School of Medicine.*

## METHODS

### Data Acquisition

The TOPS registry has been previously described in detail.[29] In short, the database is a prospectively collected patient registry that was established in 2002 by the ASPS. Since its inception, more than 1300 surgeons have reported outcomes data from over 1 million plastic surgery procedures nationwide. TOPS employs an electronic interface through which plastic surgeons or their staff can enter patient demographics, risk factors, surgical procedures, and a variety of 30-day outcomes. By removing the necessity of paid clinical reviewers, TOPS opens program participation to practices large or small, academic or private. The increased accessibility of TOPS is particularly important when considering the trending frequency of procedures being performed outside the hospital in private practice or ambulatory surgery centers. By capturing many patients outside large academic centers, TOPS effectively casts a broader net and includes a greater breadth of patients and procedures performed across the United States each year.

### Patient Population

We performed a retrospective analysis of patients who underwent breast reconstruction between 2008 and 2011. Cases were identified using primary or concurrent Current Procedural Terminology codes 19340 and 19357 for implant/expander reconstructions and 19361, 19364, 19367, 19368, and 19369 for autologous reconstructions. Procedures marked as "revision" and mixed procedures other than tissue expander placement with latissimus dorsi flap were excluded from analysis. Additionally, patients with self-pay or mixed insurance status, patients with a body mass index (BMI) of $<10\,kg/m^2$ or $>100\,kg/m^2$, and patients under 18 years old were excluded from the cohort. Patients with missing data regarding baseline covariates and clinical outcomes were excluded from the analysis.

### Clinical Characteristics and Outcomes

The primary preoperative variable assessed was insurance type. Additional variables of clinical interest analyzed included patient age, BMI, race, inpatient/

outpatient admission status, diabetes, active smoking, procedure type, and American Society of Anesthesiologists class. Primary 30-day outcomes of interest were categorized into surgical and medical complications according to the data point definitions provided by TOPS.[30] Surgical complications included seroma or hematoma requiring drainage, surgical site infection (SSI) (superficial, deep, or organ space), wound dehiscence (superficial or deep/fascia), flap loss (partial or total), and removal of prosthesis/implant. Medical complications included thromboembolic events (deep venous thrombosis or pulmonary embolism), cardiovascular incidents (cardiac arrest, myocardial infarction), neurologic complications (coma >24 hours, peripheral nerve injury, cerebrovascular accident), respiratory complications (mechanical ventilation >48 hours, pneumonia, unplanned intubation), genitourinary complications (acute renal failure, urinary tract infection), and multisystem complications (sepsis, septic shock, systemic inflammatory response syndrome). Reoperation was defined as an unplanned return to the operating room within 30 days of the index operation, whereas mortality included any death occurring within 30 days of the surgery, regardless of etiology.

### Statistical Analysis

Descriptive and comparative statistics were performed on patient demographics and clinical characteristics using Pearson's chi-square test for categorical variables and Student's *t* test for continuous variables. To optimally reconcile the uneven distribution of preoperative risk factors between the private and public insurance cohorts, patients with Medicare ($n$ = 239) or Medicaid ($n$ = 169) were independently propensity matched in a nearest neighbor one-to-two manner to patients with private insurance ($n$ = 4648). We used a caliper matching technique, with a 0.02 propensity score tolerance on the maximum propensity score distance (caliper) in our algorithm to systematically avoid inferior matches.[31,32]

The details and advantages of propensity matching have been previously described.[33–40] In short, propensity matching allows for a more accurate assessment of the effect of payer status by equilibrating inherent cohort differences in patient demographics, comorbidities, and operative details. The propensity scores were calculated using a multivariable logistic regression, with insurance status as the dependent variable and all measured preoperative variables as predictors. The models were tested for reliability and discriminatory capacity with Hosmer-Lemeshow tests and *C*-statistics, respectively. Covariate balance before and after propensity adjustment was checked using both the density distribution of the propensity score and Wald chi-square statistics to assess the quality of the match.

Measured covariates and operative outcomes of the matched groups were compared using paired *t* test or Wilcoxon signed rank test for continuous variables and McNemar's test for categorical variables. Multivariate logistic regression analyses were performed to determine the independent effect of insurance status on surgical complications. These models were also tested for reliability and discriminatory capacity by Hosmer-Lemeshow tests and *C*-statistics, respectively. All data analysis was performed in SPSS version 20.0 (IBM) while propensity score matching was performed using the R version 3.0.1 (R foundation for Statistical Computing) with the MatchIt Package.

This work is based on the TOPS program, which provides Health Insurance Portability and Accountability Act-compliant, de-identified databases to members and candidate members of the ASPS. No Institutional Review Board approval was required for the current study.

## RESULTS

### Patient Demographics

A total of 5056 breast reconstruction patients from the TOPS registry met inclusion criteria for propensity matching. Following propensity score matching, comorbidity profile and operative variables of the matched cohorts did not significantly differ with respect to age, BMI, race, diabetes, smoking status, American Society of Anesthesiologists class, inpatient/outpatient status, or procedure type (Tables 1 and 2, all $P > 0.05$). The standardized mean difference of propensity scores before and after matching are represented in Figures 1 and 2 for the Medicaid and Medicare cohorts, respectively.

### Comparison of 30-day Outcomes in Matched Population: Private versus Medicaid

The comparison of postoperative outcomes between the matched Medicaid and private insurance cohort is displayed in Table 3. No significant difference in overall morbidity was observed between privately insured patients and those insured by Medicaid ($P = 0.167$). The rate of medical complications was low (0.6%), regardless of payer type, and the majority of morbidity was attributable to wound complications.

Wound complications occurred around 20% of the time (18.6% vs 23.6%, $P = 0.189$) in both private and Medicaid cohorts. No significant difference was observed between the 2 cohorts in the rates of SSI

**Table 1. Private Insurance versus Medicaid: Population Demographic and Clinical Characteristics in Matched Cohorts**

| | Private Insurance ($n$ = 328) | | Medicaid ($n$ = 165) | | |
|---|---|---|---|---|---|
| | $n$ | % | $n$ | % | $P$ |
| Age, y | 47.4±9.3 | | 47.0±10.0 | | 0.613 |
| BMI, kg/m² | 27.4±6.5 | | 27.6±6.4 | | 0.768 |
| Race | | | | | 0.844 |
| White | 257 | 78.4 | 128 | 77.6 | |
| Other | 71 | 21.6 | 37 | 22.4 | |
| Diabetes | 11 | 3.4 | 6 | 3.6 | 0.871 |
| Current smoker | 95 | 29.0 | 48 | 29.1 | 0.977 |
| ASA Class | | | | | 0.696 |
| 1 or 2 | 280 | 85.4 | 143 | 86.7 | |
| 3 or 4 | 48 | 14.6 | 22 | 13.3 | |
| Outpatient status | 118 | 36.0 | 56 | 33.9 | 0.655 |
| Mode of reconstruction | | | | | |
| Prosthetic | 254 | 77.4 | 125 | 75.8 | 0.676 |
| Latissimus flap | 33 | 10.1 | 19 | 11.5 | 0.620 |
| Pedicled TRAM | 31 | 9.5 | 17 | 10.3 | 0.763 |
| Free flap | 10 | 3.0 | 4 | 2.4 | 0.694 |

Categorical variables are presented as $n$ and %, and continuous variables are reported as means ± SD.
ASA, American Society of Anesthesiology; TRAM, transverse rectus abdominis myocutaneous.

**Table 2. Private Insurance versus Medicare: Population Demographic and Clinical Characteristics in Matched Cohorts**

| | Private Insurance ($n$ = 437) | | Medicare ($n$ = 233) | | |
|---|---|---|---|---|---|
| | $n$ | % | $n$ | % | $P$ |
| Age, y | 63.7±9.5 | | 65.3±9.2 | | 0.035* |
| BMI, kg/m² | 28.8±7.0 | | 28.4±6.1 | | 0.537 |
| Race | | | | | 0.489 |
| White | 406 | 9.2 | 213 | 91.4 | |
| Other | 31 | 7.1 | 20 | 8.6 | |
| Diabetes | 42 | 9.6 | 27 | 11.6 | 0.423 |
| Current smoker | 40 | 9.2 | 20 | 8.6 | 0.806 |
| ASA Class | | | | | 0.788 |
| 1 or 2 | 360 | 82.4 | 190 | 81.5 | |
| 3 or 4 | 77 | 17.6 | 43 | 18.5 | |
| Outpatient status | 205 | 46.9 | 102 | 43.8 | 0.438 |
| Mode of reconstruction | | | | | |
| Prosthetic | 373 | 85.4 | 198 | 85.0 | 0.896 |
| Latissimus flap | 39 | 8.9 | 17 | 7.3 | 0.468 |
| Pedicled TRAM | 15 | 3.4 | 15 | 6.4 | 0.073 |
| Free flap | 10 | 2.3 | 3 | 1.3 | 0.371 |

Categorical variables presented are as $n$ and %, and continuous variables are reported as means ± SD.
*Denotes significance at $P < 0.05$ level.
ASA, American Society of Anesthesiology; TRAM, transverse rectus abdominis myocutaneous.

(4.0% vs 5.5%, $P = 0.449$), seroma (3.7% vs 6.1%, $P = 0.223$), or hematoma (2.1% vs 1.2%, $P = 0.471$). The most common complication observed was wound dehiscence, although rates did not differ significantly between private and Medicaid patients (7.6% vs 7.9%, $P = 0.920$). The only significant difference observed in outcomes was for flap loss. The rate of flap failure was significantly lower in the privately insured cohort (2.1% vs 6.1%, $P = 0.024$), although the overall reoperation rate did not differ between the 2 groups (9.1% for both, $P = 0.981$). Multivariable logistic regression analyses demonstrated that Medicaid insurance status did not independently increase the risk of surgical complication (Table 4; $P = 0.299$). Subanalyses of specific complications revealed that Medicaid insurance had no significant relationship with SSI, wound dehiscence, prosthesis loss, seroma, or hematoma (all $P > 0.05$) but conferred a significantly increased risk of flap failure [odds ratio (OR) = 3.315; $P = 0.027$].

### Comparison of 30-day Outcomes in Matched Population: Private versus Medicare

Table 5 shows the comparison of postoperative outcomes between the matched Medicare and private insurance cohort. Results of the outcome analysis mirrored the findings of the comparison between Medicaid and privately insured patients; no differ-

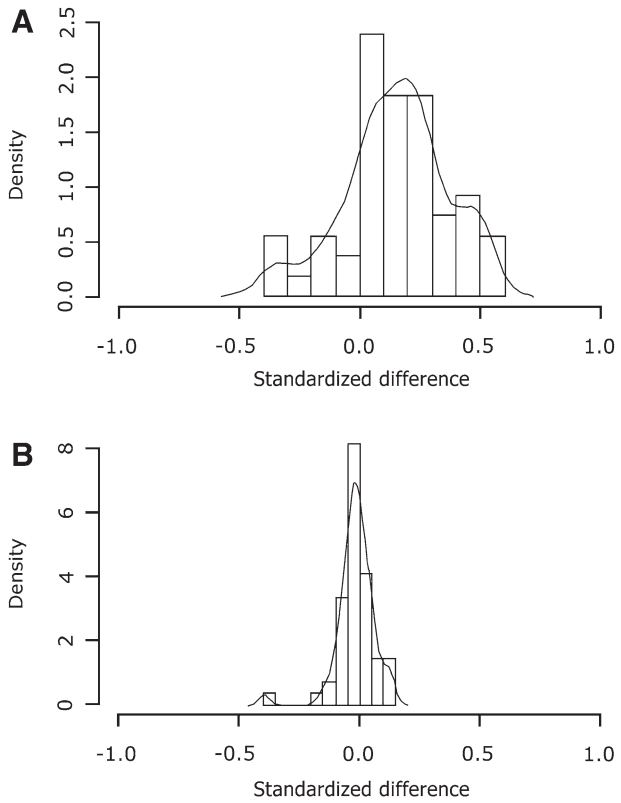


**Fig. 1.** Standardized mean difference of propensity scores before (A) and after (B) matching Medicaid and private insurance.

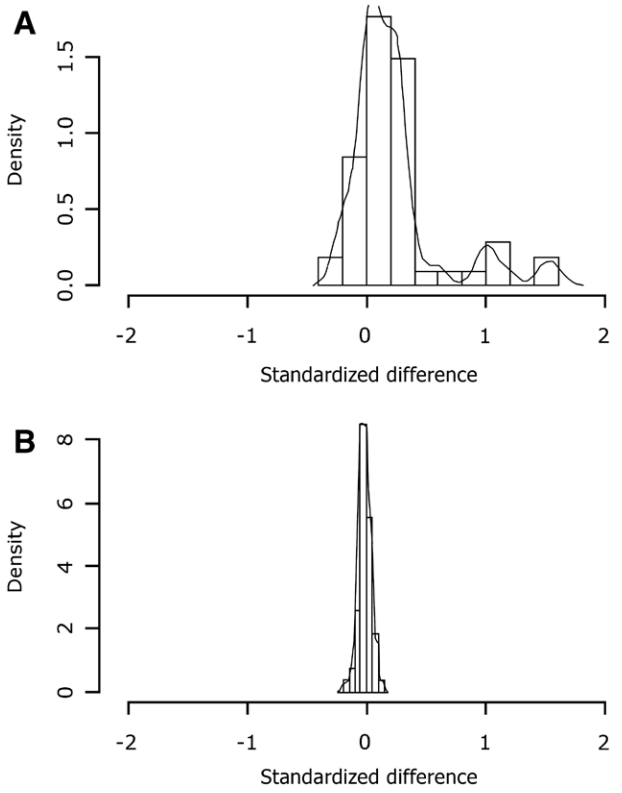


**Fig. 2.** Standardized mean difference of propensity scores before (A) and after (B) matching Medicare and private insurance.

ence in overall morbidity was observed between privately insured patients and those with Medicare (15.8% vs 16.3%, $P = 0.861$). Again, the rate of medical complications was low (0.9% vs 0.4%, $P = 0.486$), and the majority of morbidity was attributable to wound complications.

In both the private and Medicare cohorts, wound complications occurred less than 20% of the time (15.1% vs 16.3%, $P = 0.681$). No significant difference was observed between rates of SSI (3.0% vs 5.2%, $P = 0.157$), seroma (5.0% vs 4.3%, $P = 0.668$), hematoma (0.9% vs 1.7%, $P = 0.363$), wound dehiscence (6.4% vs 4.3%, $P = 0.260$), or reoperation (5.5% vs 6.9%, $P = 0.474$). Multivariable logistic regression analyses demonstrated that Medicare insurance status did not independently increase the risk of overall surgical complication or any individual complication (Table 6, all $P > 0.05$).

## DISCUSSION

Our study is the first to investigate the effect of payer status on surgical outcomes of breast reconstruction, and, to our knowledge, the first to examine this relationship in the plastic surgery literature. In contrast to studies in other surgical specialties that demonstrate higher complication rates in patients with government insurance, our results indicate that this is not the case for breast reconstruction. Our analysis suggests that Medicaid and Medicare insurance status does not independently predict inferior 30-day outcomes in breast reconstruction when compared with private insurance status. Many studies have investigated the effect of inherent patient characteristics and surgical factors on breast reconstruction outcomes. Few authors, however, have examined the role that systemic, health policy–related factors may play in outcomes of breast reconstruction. It is important for plastic surgeons to join this conversation.

In 2010, LaPar et al[1] performed the largest study to date comparing outcomes between Medicare, Medicaid, uninsured, and privately insured patients for 8 major, general surgical procedures. They found the odds of in-hospital mortality, wound complications, infection, and a number of medical complications to be independently higher for both the Medicare (OR, 1.54) and Medicaid (OR, 1.74) cohorts when compared to privately insured patients. Stone et al[2] recently corroborated these findings in pediatric surgery, and similar results have been reported in a number of other surgical specialties.[5–11]

Multiple factors likely explain the divergence of our findings from those in other surgical specialties. Patients with Medicaid have been shown to have a

**Table 3. Private Insurance versus Medicaid: Comparison of 30-day Outcomes in Matched Cohorts**

| | Private Insurance ($n$ = 328) | | Medicaid ($n$ = 165) | | |
|---|---|---|---|---|---|
| | $n$ | % | $n$ | % | $P$ |
| Overall morbidity | 62 | 18.9 | 40 | 24.2 | 0.167 |
| Wound complication | 61 | 18.6 | 39 | 23.6 | 0.189 |
| Surgical site infection | 13 | 4.0 | 9 | 5.5 | 0.449 |
| Superficial incisional | 4 | 1.2 | 2 | 0.0 | 0.994 |
| Deep incisional | 7 | 2.1 | 7 | 4.2 | 0.184 |
| Organ space | 2 | 0.6 | 0 | 0.0 | 0.315 |
| Wound dehiscence | 25 | 7.6 | 13 | 7.9 | 0.920 |
| Superficial | 18 | 5.5 | 8 | 4.9 | 0.764 |
| Deep fascia | 7 | 2.1 | 5 | 3.0 | 0.542 |
| Flap loss* | 7 | 2.1 | 10 | 6.1 | 0.024* |
| Partial* | 7 | 2.1 | 9 | 5.5 | 0.050* |
| Total | 0 | 0.0 | 1 | 0.6 | 0.158 |
| Explantation | 11 | 3.4 | 9 | 5.5 | 0.265 |
| Seroma | 12 | 3.7 | 10 | 6.1 | 0.223 |
| Hematoma | 7 | 2.1 | 2 | 1.2 | 0.471 |
| Medical complication | 1 | 0.6 | 1 | 0.6 | 0.620 |
| Reoperation | 30 | 9.1 | 15 | 9.1 | 0.984 |

Overall morbidity is equivalent to a wound complication and/or a medical complication.
*Denotes significance at $P < 0.05$ level.

**Table 4. Multivariate Logistic Regression Analysis of Medicaid Insurance Status as an Independent Predictor of Surgical Complications**

| | $P$ | Odds Ratio | 95% Confidence Interval |
|---|---|---|---|
| Surgical complication | 0.229 | 1.341 | 0.831–2.164 |
| Surgical site infection | 0.425 | 1.443 | 0.586–3.554 |
| Wound dehiscence | 0.912 | 0.959 | 0.458–2.011 |
| Flap failure* | 0.027 | 3.315 | 1.149–9.562 |
| Explantation | 0.298 | 1.648 | 0.643–4.225 |
| Seroma | 0.230 | 1.716 | 0.711–4.144 |
| Hematoma | 0.434 | 0.527 | 0.106–2.624 |

*Denotes significance at $P < 0.05$ level.

higher acuity on presentation and require nonelective, emergent operation more often than privately insured patients.[10] Although prior authors have attempted to control for elective versus emergent operative status, a number of additional factors, such as adequate resuscitation, are correlated with emergent operation and are difficult to quantify and control for retrospectively. In contrast to treatment of a ruptured aortic aneurysm, for example, breast reconstruction is always an elective procedure performed in hemodynamically stable patients. This is not to say that the issue of delayed and advanced presentation for Medicaid and Medicare is insignificant in patients with breast cancer. On the contrary, a 2010 analysis of the National Cancer Database showed that uninsured, Medicaid, and Medicare patients more frequently presented with advanced disease (stage III or IV) compared with stage I disease.[20] Nonetheless, higher acuity of breast cancer presentation rarely necessitates emergent operation or translates into higher surgical risk. Thus, the phenomenon of poor outcomes as a result of delayed presentation in Medicaid patients is relatively less important in this context.

In addition, it is well documented that patients with Medicaid have poorer overall health maintenance and significantly higher rates of comorbidities as a result of complex socioeconomic factors.[41,42] Similarly, as a result of advanced age, the Medicare population often presents with higher rates of cardiopulmonary and renal comorbidities. Our population reflects these findings. However, breast reconstruction patients are generally more likely to be healthier than the patient cohorts for vascular, cardiac, and general surgery that have been previously studied. Patients with significant medical comorbidities often have prohibitively high anesthetic risk and therefore are not candidates for elective breast reconstruction. Additionally, tissue expander reconstructions involve relatively short anesthesia times, are confined to the body wall, and involve minimal blood loss and fluid shifts, which limit the procedural risk of medical complications when compared to many major general surgical procedures. These considerations likely contribute to the divergence of our findings in breast reconstruction from those in other surgical procedures.

Furthermore, surgical outcomes depend not only on the operation itself but also on postoperative care. For tissue expander insertion, which represented nearly 80% of the reconstructions analyzed in our study, patients have far less acuity in the immediate postoperative period when compared to more invasive procedures such as coronary artery bypass grafting or major colon resection. Early postoperative mobilization in our patients translates to lower rates of medical complications such as pulmonary

**Table 5. Private Insurance versus Medicare: Comparison of 30-day Outcomes in Matched Cohorts**

| | Private Insurance ($n$ = 437) | | Medicare ($n$ = 233) | | |
|---|---|---|---|---|---|
| | *n* | % | *n* | % | *P* |
| Overall morbidity | 69 | 15.8 | 38 | 16.3 | 0.861 |
| Wound complication | 66 | 15.1 | 38 | 16.3 | 0.681 |
| Surgical site infection | 13 | 3.0 | 12 | 5.2 | 0.157 |
| Superficial incisional | 7 | 1.6 | 6 | 2.6 | 0.384 |
| Deep incisional | 5 | 1.1 | 4 | 1.7 | 0.540 |
| Organ space | 1 | 0.2 | 2 | 0.9 | 0.245 |
| Wound dehiscence | 28 | 6.4 | 10 | 4.3 | 0.260 |
| Superficial | 20 | 4.6 | 6 | 2.6 | 0.201 |
| Deep fascia | 8 | 1.8 | 4 | 1.7 | 0.916 |
| Flap loss | 6 | 1.4 | 6 | 2.6 | 0.264 |
| Partial | 4 | 0.9 | 5 | 2.1 | 0.188 |
| Total | 2 | 0.5 | 0 | 0.0 | 0.301 |
| Explantation | 10 | 2.3 | 9 | 3.9 | 0.242 |
| Seroma | 22 | 5.0 | 10 | 4.3 | 0.668 |
| Hematoma | 4 | 0.9 | 4 | 1.7 | 0.363 |
| Medical complication | 4 | 0.9 | 1 | 0.4 | 0.486 |
| Reoperation | 24 | 5.5 | 16 | 6.9 | 0.474 |

Overall morbidity is equivalent to a wound complication and/or a medical complication.

**Table 6. Multivariate Logistic Regression Analysis of Medicare Insurance Status as an Independent Predictor of Surgical Complications**

| | *P* | Odds Ratio | 95% Confidence Interval | |
|---|---|---|---|---|
| Surgical complication | 0.662 | 1.107 | 0.702 | 1.744 |
| Surgical site infection | 0.132 | 1.890 | 0.826 | 4.321 |
| Wound dehiscence | 0.125 | 0.544 | 0.25 | 1.184 |
| Flap failure | 0.299 | 1.926 | 0.559 | 6.629 |
| Explantation | 0.191 | 1.912 | 0.724 | 5.048 |
| Seroma | 0.720 | 0.865 | 0.391 | 1.911 |
| Hematoma | 0.453 | 1.733 | 0.413 | 7.276 |

embolism and pneumonia. Notably, the immediate postoperative care plays a more significant role in autologous reconstructions. Particularly, in cases requiring anastomotic revision or difficult dissections, anesthesia duration tends to be longer, increasing the risk of perioperative complications.

Interestingly, flap loss was the only complication in which a disparity was observed, with Medicaid patients demonstrating significantly higher rates than privately insured patients. Similarly, risk-adjusted multivariate regression revealed that Medicaid patients were 3 times as likely to experience flap failure. While the data do not yield an explanation as to why this one rate is higher, it may be that younger surgeons are more likely to perform flap reconstruction in Medicaid patients, as it has been shown that flap survival is related to surgeon experience. The TOPS registry does not provide comprehensive data on the type of hospital, specifically community versus academic, at which procedures were performed. Nor does it provide data on the experience of the surgeon or the case volume of the center where these procedures were performed.

This ties into the broader issue of discrepancies in access to quality care between government and privately insured patients across all specialties. Privately insured patients may have a more flexible network of providers, allowing them to seek out surgeons with higher level of expertise and centers with well-trained ancillary staff to provide perioperative care. Although reimbursement rates are similar between private insurance and Medicare, Medicaid reimbursement rates are consistently lower for both physicians and facilities. A growing number of physicians are declining to accept Medicaid reimbursement because of an inability to cover the basic costs of caring for these patients. An example of this is provided by a survey of otolaryngologists in southern California that found 97% would provide consultation for children with private insurance while only 27% would do so for children with public insurance.[43] These realities could have a substantial impact on healthcare access in the coming years as Medicaid coverage is expanded. A smaller network of providers and facilities available to the Medicaid population may contribute to the inferior surgical outcomes reported previously in other specialties.

Low reimbursement from Medicaid affects plastic surgeons in a manner analogous to other specialists. Data reported from a large academic center cite only a 13.0% collection rate for surgeon fees and a 20.4% collection rate for facility fees from Medicaid for breast reconstruction procedures compared to significantly higher numbers for Medicare (37.0% and 33.5%) and private insurance (40.0% and 63.4%).[44] Although the WHCRA mandated insurance coverage, it did not establish reimbursement rates or require that a given center provide breast reconstruc-

tion services if they find it to be unprofitable. The effect of these economic factors on the ability of Medicaid patients to find a breast reconstructive surgeon has been highlighted recently in the popular press.[45]

Despite these considerations, our data do not show inferior 30-day outcomes for breast reconstruction in patients with government insurance. As recent changes in health policy have expanded access to breast reconstruction, our data indicate that plastic surgeons have ensured consistent quality of care, irrespective of insurance status.

Our study is not without limitations. Although the methodology of propensity score matching allows us to minimize confounding, it is impossible to eliminate all bias inherent to a retrospective design. Moreover, we are unable to determine whether cases excluded due to incomplete data systematically differed from those with complete data, raising the possibility of selection bias. Although our analysis of 30-day postoperative outcomes likely captures the majority of perioperative wound and medical complications, our data likely underestimate complications, as events such as capsular contracture, reoperation, and explanation may not be fully accounted for within the 30-day postoperative period. Finally, information regarding facility type and subjective endpoints such as aesthetic outcome and patient satisfaction were not considered in our analysis, as TOPS does not record these data points.

## CONCLUSIONS

This study is the first to examine the effect of primary payer status on outcomes following breast reconstruction. Our results suggest that Medicaid and Medicare insurance do not independently predict increased overall complication rates in breast reconstruction. This finding underscores the efforts and commitment of the plastic surgeon to provide consistent care for patients, irrespective of insurance status. Further work should examine whether these cohorts of patients differ with respect to longer term and aesthetic outcomes.

***John Y. S. Kim, MD***
Division of Plastic and Reconstructive Surgery
Feinberg School of Medicine
Northwestern University
675 North Saint Clair Street
Galter Suite 19–250, Chicago
IL 60611
E-mail: jokim@nmh.org

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