

Inpatient versus Outpatient Immediate Alloplastic Breast Reconstruction: Recent Trends, Outcomes, and Safety

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Background: Immediate alloplastic breast reconstruction was traditionally performed as an inpatient procedure. Despite several reports in the literature demonstrating comparable safety outcomes, there remains hesitancy to accept breast reconstruction performed as an outpatient procedure.

Methods: A retrospective review of National Surgical Quality Improvement Program data from 2014 to 2018 was utilized to evaluate recent trends and 30-day postoperative complication rates for inpatient versus outpatient immediate prosthetic-based breast reconstruction. Propensity score matching was used to obtain comparable groups.

Results: During the study period, 33,587 patients underwent immediate alloplastic breast reconstruction. Of those, 67.5% of patients were discharged within 24 hours, and 32.4% of patients had a hospital stay of more than 24 hours. Immediate alloplastic reconstruction had an overall growth rate of 16.9% from 2014 to 2018. After propensity score matching, intraoperative variables that correlated with significantly increased inpatient status included increased work relative value units (16.3±2.3 versus 16.2±2.6; $P < 0.001$), longer operative times (228±86 versus 206±77; $P < 0.001$), and bilateral procedure (44.0% versus 43.5%; $P < 0.001$). There were higher rates of pulmonary embolism, wound dehiscence, urinary tract infection, transfusions, sepsis, readmissions, and reoperations in the group with the longer hospital stay.

Conclusion: Based on increased complication rates and costs in the inpatient setting, we propose outpatient reconstructive surgery as a safe and cost-effective alternative for immediate alloplastic breast reconstruction. (*Plast Reconstr Surg Glob Open* 2023; 11:e5135; doi: 10.1097/GOX.0000000000005135; Published online 21 September 2023.)

INTRODUCTION

The most commonly performed breast reconstructive procedure after mastectomy is implant-based reconstruction.¹ Immediate alloplastic breast reconstruction after mastectomy has historically involved inpatient admission for postoperative monitoring. This historical trend has been associated with higher health-care costs than other

standards of care in the inpatient setting.² Mastectomy alone without concurrent reconstructive procedures, however, is often done on an outpatient basis.¹ In an effort to decrease health-care spending, there has been increased interest in moving elective and semi-elective procedures to the outpatient setting.³

Previous studies have demonstrated comparable short-term outcomes for inpatient and outpatient breast reconstruction procedures.^{4–8} This study intends to investigate the recent national trends and safety outcomes of immediate alloplastic breast reconstruction performed on outpatient versus inpatient basis. Given recent advancements in perioperative care and push toward decreased health-care costs, we anticipate an increasing majority of immediate

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Received for publication April 16, 2022; accepted June 6, 2023.

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DOI: 10.1097/GOX.0000000000005135

Disclosure statements are at the end of this article, following the correspondence information.

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implant-based breast reconstruction to be performed as an outpatient procedure with overall decreased length of hospital stay postoperatively.

METHODS

A retrospective cohort study was performed using the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) national database. The ACS-NSQIP is a prospective, risk-adjusted, clinical outcomes-based, de-identified registry that records demographic, preoperative, perioperative, and 30-day postoperative patient information.⁷⁻⁹ The database is compliant with the Health Insurance Portability and Accountability Act of 1996. All participant user files were obtained and approved by the ACS-NSQIP. The institutional review board deemed this study exempt from institutional review, given all data are de-identified.

Data Collection

Current Procedural Terminology (CPT) codes were used to identify patients who underwent alloplastic breast reconstruction with insertion of breast prosthesis after mastectomy (19340) or breast reconstruction with tissue expander (19357). CPT codes used to identify concurrent mastectomy included simple mastectomy (19303), skin-sparing mastectomy (19304), modified radical mastectomy (19307), and radical mastectomy (19305 and 19306). (See table, Supplemental Digital Content 1, which displays the CPT codes. <http://links.lww.com/PRSGO/C673>.)

Patient demographics, comorbidities, admission status, operative details, and outcomes were collected. Inclusion criteria were women who underwent immediate alloplastic breast reconstruction at the time of mastectomy with placement of a tissue expander or permanent implant during the study period of 2014 to 2018. Exclusion criteria included age less than 18 years, male gender, delayed breast reconstruction (those without concurrent mastectomy CPT codes), and autologous reconstruction. The CPT codes used to identify autologous reconstruction included breast reconstruction with latissimus dorsi flap without prosthetic implant (19361); breast reconstruction with free flap (19364); breast reconstruction with transverse rectus abdominis myocutaneous (TRAM) flap, single pedicle, including closure of donor site (19367); breast reconstruction with TRAM flap; single pedicle, including closure of donor site, with microvascular anastomosis (supercharging) (19368); and breast reconstruction with TRAM flap, double pedicle, including closure of donor site (19369).

Patients were stratified into inpatient and outpatient groups determined by hospital length of stay. The NSQIP database allows the designation of inpatient versus outpatient status to be determined by the operating facility. To ensure consistency in our study, patients were allocated to inpatient versus outpatient status based on overall length of stay. Outpatient status was defined as patients receiving surgery who had a hospital stay of less than or equal to 24 hours, whereas all others were classified as inpatient.

Takeaways

Question: What are the recent trends in outpatient versus inpatient immediate alloplastic breast reconstruction? Is outpatient alloplastic reconstruction associated with fewer complications?

Findings: Outpatient immediate alloplastic breast reconstruction has grown 16.9% from 2014 to 2018 and is associated with fewer complications.

Meaning: Outpatient immediate alloplastic breast reconstruction is a safe alternative to inpatient procedures.

After stratification based on surgical setting, summary statistics were calculated. Quantitative data are expressed as the mean \pm SD, and nominal data are expressed as a percentage. Propensity score matching was then used to obtain comparable groups. A multiple logistic regression model was created to determine intraoperative and postoperative differences between groups. Comparisons between groups for quantitative variables were performed using two-tailed independent *t* test, whereas nominal variables were evaluated using chi-square test. Significance was assessed at a *P* value of less than 0.05.

NSQIP Variable Definitions

All variables were used as defined in the NSQIP user guide. The NSQIP defines patients at risk for bleeding due to any condition with deficiency of clotting elements (vitamin K deficiency, hemophilia, thrombocytopenia, or on chronic anticoagulation other than aspirin). Recent weight loss was defined as more than 10% unintentional loss of body weight. Hypertension had to be documented, and patients had to be on medication for more than 2 weeks before surgical intervention.

RESULTS

Between 2014 and 2018, 33,587 patients underwent immediate alloplastic breast reconstruction. Of those, 67.5% (22,668) were discharged within 24 hours, and 32.4% (10,889) had a hospital stay of more than 24 hours. During the study period, immediate alloplastic reconstruction had an overall growth rate of 16.9% (Fig. 1). There were 19,021 patients (56.6%) who underwent unilateral and 14,581 (43.4%) who underwent bilateral procedures; 27,540 patients (82.0%) underwent insertion of tissue expander, 5669 (16.9%) underwent direct-to-implant reconstruction, and 393 (1.2%) underwent a bilateral procedure with combination direct-to-implant and tissue expander reconstruction (Fig. 2). The percentage of patients who underwent tissue expander reconstruction initially increased from 2014 to 2017, during which there was an increase in direct-to-implant reconstruction (Fig. 3). The percentage of patients discharged within 24 hours increased from 59% in 2014 to 75.9% in 2018 (Fig. 4).

Before propensity score matching, several patient demographics and comorbidities were associated with longer length of stay, including younger age and slightly higher body mass index, particularly those in the obese categories. There were significant differences in race ($P < 0.001$), with

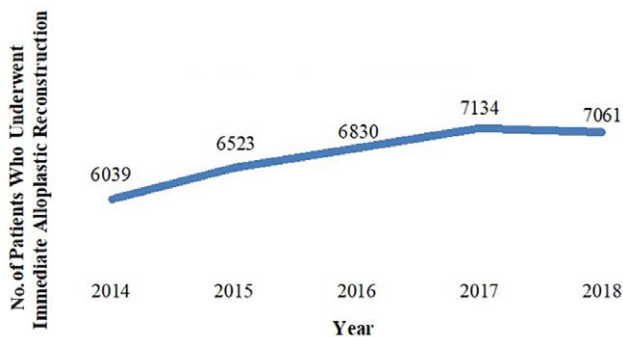


Fig. 1. Reconstructive trends by year: overall immediate alloplastic breast reconstruction.

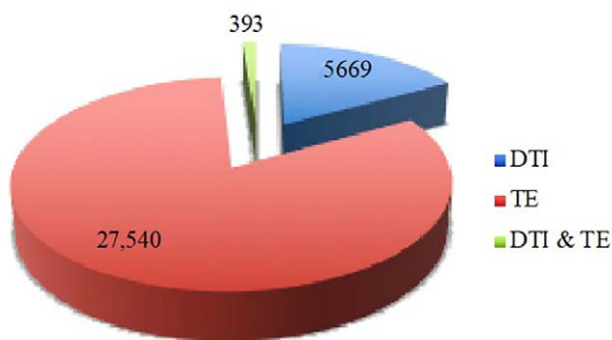


Fig. 2. Overall reconstructive trends: reconstructive type.

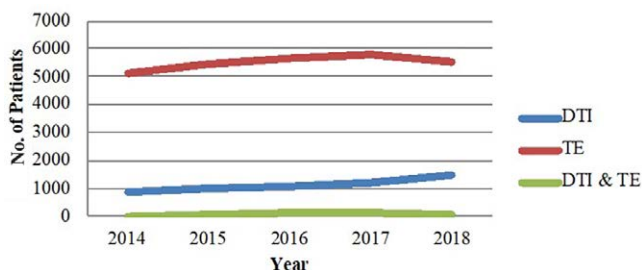


Fig. 3. Reconstructive trends by year: immediate reconstructive type.

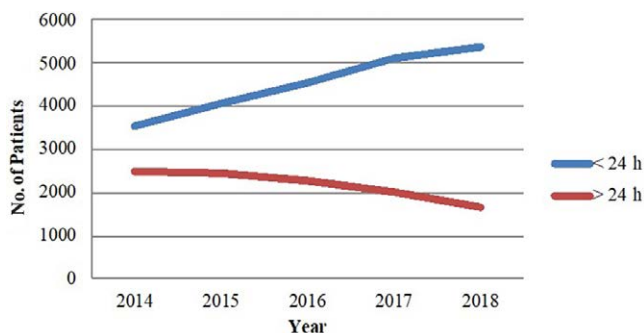


Fig. 4. Reconstructive trends by year: disposition status.

Table 1. Reconstructive Trends by Year

| | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------------|------|------|------|------|------|
| No. patients | 6040 | 6528 | 6834 | 7136 | 7064 |
| Inpatient | 3466 | 3543 | 3392 | 3124 | 2801 |
| Outpatient | 2574 | 2985 | 3442 | 4012 | 4263 |
| Reconstruction method | | | | | |
| DTI | 881 | 992 | 1069 | 1241 | 1486 |
| TE | 5127 | 5479 | 5663 | 5778 | 5493 |
| DTI & TE | 32 | 57 | 102 | 117 | 85 |

DTI, direct to implant; TE, tissue expander.

a higher percentage of White outpatients (86.4% versus 82.8%), and a higher proportion of African American inpatients (11.9% versus 8.2%). The proportion of Hispanic/Latino patients was significantly higher for inpatients than for outpatients (8.1% versus 6.9%; $P < 0.001$). Patients with active smoking, diabetes, dyspnea, chronic steroid use, history of a bleeding disorder, active cancer, and American Society of Anesthesiologists class 3 or 4 were more likely to be hospitalized for more than 24 hours (Table 1).

Propensity score matching was used to obtain comparable groups before looking at the intraoperative and outcome variables. After propensity score matching, there were 18,614 total subjects with no significant differences for demographics and comorbidities between the two groups. (See table, Supplemental Digital Content 2, which displays demographics/comorbidities before and after propensity score matching. <http://links.lww.com/PRSGO/C674>.)

Intraoperative variables that correlated with significantly increased inpatient status (Table 2) included longer operative times (238 ± 91 versus 207 ± 75 ; $P < 0.001$) and bilateral procedure (53.1% versus 40.7%; $P < 0.001$). There were higher rates of pulmonary embolism (PE), wound dehiscence, urinary tract infection (UTI), transfusions, sepsis, readmissions, and reoperations in the group with the longer hospital stay (Table 3). There were also higher incidences of deep vein thrombosis (DVT), PE, surgical site infection, transfusions, and reoperations in patients who underwent bilateral procedures (Table 4).

DISCUSSION

The incidence of breast cancer has been steadily increasing over the past several decades. The rate of

Table 2. Intraoperative Variables

| | ≤24 hours | >24 hours | P |
|----------------------------------|--------------|--------------|--------|
| Intraoperative variables | | | |
| Work RVU | 16.3 ± 2.5 | 16.2 ± 2.4 | 0.037 |
| Operative time (min) | 207 ± 75 | 238 ± 91 | <0.001 |
| Mastectomy type | | | |
| Simple | 4391 (47.2%) | 3418 (36.7%) | |
| Skin-sparing | 439 (4.7%) | 347 (3.7%) | |
| Radical | 26 (0.3%) | 53 (0.6%) | |
| Modified radical | 662 (7.1%) | 550 (5.9%) | |
| Bilateral | 3789 (40.7%) | 4939 (53.1%) | <0.001 |
| Hospitalization | | | |
| Hospital LOS | 1 (1, 1) | 2 (2, 2) | <0.001 |
| Days from operation to discharge | 1 (1, 1) | 2 (2, 2) | <0.001 |

LOS, length of stay; RVU, relative value units.

Table 3. Outcomes (Inpatient versus Outpatient)

| | ≤24 hours | >24 hours | P |
|---------------------------------|-----------|-----------|--------|
| DVT | 26 | 17 | 0.169 |
| PE | 14 | 34 | 0.004 |
| Superficial SSI | 114 | 139 | 0.114 |
| Deep SSI | 65 | 85 | 0.101 |
| Organ space SSI | 121 | 149 | 0.086 |
| Dehiscence | 50 | 82 | 0.005 |
| Pneumonia | 7 | 12 | 0.251 |
| Ventilator dependence | 1 | 2 | >0.999 |
| Progressive renal insufficiency | 3 | 3 | >0.999 |
| Acute renal failure | 0 | 2 | 0.5 |
| UTI | 10 | 21 | 0.048 |
| Stroke | 3 | 2 | >0.999 |
| Cardiac arrest | 1 | 2 | >0.999 |
| MI | 1 | 4 | 0.375 |
| Transfusions | 14 | 138 | <0.001 |
| Systemic sepsis | 32 | 53 | 0.022 |
| Septic shock | 2 | 2 | >0.999 |
| Readmission | 390 | 540 | <0.001 |
| Unplanned readmission | 365 | 514 | <0.001 |
| Reoperation | 511 | 959 | <0.001 |

SSI, surgical site infection.

Table 4. Outcomes (Unilateral versus Bilateral)

| | Unilateral | Bilateral | P |
|---------------------------------|------------|-----------|--------|
| DVT | 32 | 42 | 0.02 |
| PE | 32 | 43 | 0.015 |
| Superficial SSI | 277 | 201 | 0.551 |
| Deep SSI | 171 | 95 | 0.011 |
| Organ space SSI | 236 | 230 | 0.009 |
| Dehiscence | 141 | 111 | 0.833 |
| Pneumonia | 13 | 12 | 0.642 |
| Ventilator dependence | 1 | 3 | 0.323 |
| Progressive renal insufficiency | 2 | 4 | 0.25 |
| Acute renal failure | 0 | 3 | 0.082 |
| UTI | 38 | 21 | 0.226 |
| Stroke | 5 | 1 | 0.243 |
| Cardiac arrest | 2 | 2 | >0.999 |
| MI | 3 | 4 | 0.476 |
| Transfusions | 92 | 106 | 0.004 |
| Systemic sepsis | 68 | 67 | 0.143 |
| Septic shock | 2 | 5 | 0.251 |
| Readmission | 857 | 708 | 0.183 |
| Unplanned readmission | 804 | 660 | 0.183 |
| Reoperation | 1240 | 1146 | <0.001 |

alloplastic reconstructive surgery has simultaneously increased with tissue expansion implant-based reconstruction constituting approximately 65% of all reconstructions.¹⁰ With an estimated market size of approximately \$7 billion, there has been a push to decrease health-care spending associated with breast reconstruction by limiting postoperative readmissions after elective procedures.³ Smith et al demonstrated that reconstruction after mastectomy was associated with higher health-care costs than other standards of care.² Furthermore, breast reconstruction in the context of a recent global pandemic has called for improvements in efficiency while still providing quality and timely health care. In an effort to maximize bed

utilization for increased admissions related to COVID-19 while minimizing viral exposure to breast cancer patients, more hospital systems are requiring same-day breast surgery.^{11,12} This also potentially decreases additional risks associated with prolonged hospitalization.

It was not until 2001 that Medicare began reimbursing mastectomies performed in the outpatient setting.¹³ This set the stage for a slow transition to patient and surgeon acceptance of same-day discharge after mastectomy. Today, same-day discharge after mastectomy is the norm.^{14,15} The addition of simultaneous reconstructive procedures, however, can theoretically increase the complication profile, and thus, there has been a slow rate of adoption of outpatient immediate reconstructive procedures. From 2006 to 2009, inpatient reconstruction increased 35.5%, whereas outpatient reconstruction increased only 9.1%.¹⁶

A previous report using the NSQIP data from 2005 to 2012 demonstrated comparable safety outcomes between inpatient and outpatient alloplastic breast reconstruction.⁴ At that time, approximately 33% of immediate tissue expander reconstructions were performed on an outpatient basis. Despite comparable 30-day safety outcomes, we suspected mastectomy with immediate alloplastic reconstruction in the outpatient setting is still drastically underutilized. Utilizing a methodology similar to that in the study performed by Qin et al⁴, we reviewed NSQIP data from 2014 to 2018 to evaluate whether these trends held true. We found that although immediate breast reconstruction has trended toward an increase in outpatient procedures, nearly a third of immediate alloplastic reconstructions during the specified study period were still done on an inpatient basis. Similar to previous reports, our data show similar overall complication rates to previously published literature on immediate alloplastic breast reconstruction.

Inpatient admission was traditionally required due to postoperative pain, bleeding, nausea, and vomiting associated with extensive resections and reconstructions. Recently, however, improvements in reconstructive and anesthetic techniques have allowed for same-day surgery for patients undergoing mastectomy with prosthetic-based reconstruction.¹² Advancements in surgical technology and perioperative protocols have set the stage for the current need to expedite same-day breast reconstruction amidst a global pandemic. Perioperative planning using nonopioid pain management (eg, Exparel and TAP blocks) and postoperative recovery protocols (eg, Enhanced Recovery After Surgery protocols) can simplify surgical course and minimize patient morbidity. This enables hospitals to minimize resource utilization and improve surgical efficiency, allowing for patients to be discharged on the day of surgery.^{8,11} Initiating a standard same-day surgery program allowing patients to safely recover at home has the potential for improved outcomes.¹² Shahbazi and Woods noted improved psychological well-being, avoidance of exposure to nosocomial infections, alleviation of health care system burden, and cost savings.¹⁷ A recent pilot study from Kaiser Permanente Northern California demonstrated

the benefits of their same-day surgery program for mastectomy. Similar implementation led to an increase in same-day mastectomy from 23% to 61% without an associated increase in emergency room visits, reoperations, or readmission rates.¹⁸ Oxley et al conducted a retrospective review of 785 patients who received immediate post-mastectomy alloplastic breast reconstruction over a 5-year period.⁷ They concluded that more than 96% of patients receiving care at the day care facility were successfully discharged and found no difference between groups in complication rates of infection, dehiscence, seroma, and hematoma.⁷

Innovative postoperative support can aid in reducing the number of unnecessary emergency department visits or readmissions. As with any surgery, setting expectations in the preoperative period is the most opportune time to discuss the expected postoperative course with the patient. Periodic phone calls from the surgeon's office to answer patient questions and/or concerns can ease some of the anxiety associated with recovery at home for the patients and their caretakers. Advancements in technology have also made it much easier to monitor patients' recovery. For example, Semple et al described the use of smartphone applications for monitoring the recovery of patients with photographs and daily questionnaires, which greatly improved patient satisfaction postoperatively.¹⁹

A unique finding of our study is that African American, Asian, and Hispanic patients are more likely to receive inpatient alloplastic reconstruction, whereas White patients are overrepresented in outpatient operations. Several studies have demonstrated disparities in the rate of reconstruction after mastectomy in various minority groups, especially in the hospital setting.¹¹⁻¹³ Onega et al suggest that the geographic location of medical facilities may account for some of the racial disparities seen in the health-care utilization of minority groups.²⁰ Therefore, as outpatient surgical centers expand in number and popularity, it is imperative to engage with minority groups in the discussion of postmastectomy reconstruction.

There are several limitations to this study. Interpretation of the NSQIP is based on appropriate coding, which can be problematic. Only 30-day complications are recorded in the database, potentially skewing the final data by excluding long-term complications. The low overall complication rate can be attributed to the large sample size. Medical morbidities such as DVT/PE or UTI may be biased toward inpatient utilization. Additionally, although statistically significant differences were found in several comorbidity variables, these differences may not be clinically relevant due to the nature of the large sample size available in the NSQIP database.

CONCLUSIONS

Immediate prosthetic-based breast reconstruction performed on an outpatient basis can be considered at least as safe as inpatient with respect to 30-day outcomes in properly selected patients. Based on increased complication rates and health-care costs in the inpatient setting, we propose outpatient reconstructive surgery as a safe and

cost-effective alternative for immediate alloplastic breast reconstruction.

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DISCLOSURE

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

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