

Why Do Reoperation Rates Vary So Much After Lumpectomy for Breast Cancer? Examining the Reoperation Puzzle at the Massachusetts General Hospital

Jeffrey Landercasper, MD

Gundersen Health System and Gundersen Medical Foundation, La Crosse, WI

Focusing on reoperations after initial lumpectomy for breast cancer, Valero and colleagues report the end results of the Massachusetts General Hospital (MGH) experience in this issue of the *Annals of Surgical Oncology*. Reoperations occurred for 114 (22.9%) of 490 patients with stage 1 or 2 breast cancer undergoing lumpectomy at MGH in 2014. The unadjusted reoperation rates among eight surgeons ranged from 16 to 40%. After multivariate risk adjustment, significant differences by individual surgeon persisted.

Worldwide, reoperations after lumpectomy range from 5% to more than 80%. In some regional reports, they average as high as 30–40%.^{1–5} As such, a recent international breast cancer consensus conference highlighted reoperation as one of the few surgical quality indicators that all breast centers should audit. They termed it a “disutility.”⁶

After selecting 12 independent variables to study, surgeons at MGH disentangled those patient, tumor, and process-of-care factors that were associated with reoperations from those that were not. Importantly, and unlike most other investigators, they placed eight individual surgeons into their statistical models as potential predictors of reoperations. After multivariate analysis, only two factors were found to be associated with reoperations: multifocal cancer and individual surgeon.

According to patient registries and meta-analyses, factors associated with lumpectomy reoperations include surgeon (volume, practice type), patient (age, race, economic status), tumor (size, nodal status, hormone receptor status, human epidermal growth factor receptor 2 [HER2] status, grade), intraoperative margin assessments (frozen section, margin devices, other), treatment (cavity shaves, excisional volume, neoadjuvant chemotherapy receipt, other), and margin status.^{1–5,7–9}

Given that trial, meta-analyses, and national registry studies have already identified many of the factors associated with reoperation, do single-institution audits still matter? Yes! After trials, there is a need to determine whether trial results can be generalized across different settings and whether successful trial interventions are effective and safe when adopted outside the trial restrictions. Single-institution studies aid these endeavors. For example, the authors of this study investigated whether a recent randomized trial demonstrating the utility of cavity shaves to lower reoperations was effective at MGH.¹⁰ After adjustment, the trial finding that linked receipt of shaves to fewer reoperations was not corroborated at MGH.

National patient registries such as the National Surgical Quality Improvement Program (NSQIP), the National Cancer Database (NCDB), and the Surveillance, Epidemiology, and End Results (SEER) program are important too, but they may lack some relevant data fields for specific surgical outcomes.

The response of interest in this MGH study was reoperations. For this outcome, the authors’ in-house database was able to provide information regarding “imaging occult status,” “tumor multifocal status,” and receipt of some of the “processes of care” endorsed by the American Society of Breast Surgeons (ASBrS) to lower reoperations.¹¹ Thus,

in-house studies, such as the reported study, will always remain relevant because they have access to data not otherwise available.

The authors' conclusions that reoperations differ by individual surgeon are impactful. They also have face value because their results were risk adjusted. In contrast, because NSQIP ceased their risk-adjusted reporting of reoperations after lumpectomy for "margin reasons" more than 5 years ago, most investigators have not provided risk-adjusted profiling of surgeons or facilities for reoperations. Without risk adjustment, surgeons or facilities with an unfavorable case mix may be unfairly penalized, and others may be erroneously labeled as exceptional.

I applaud the MGH surgeons for performing an adjusted in-house audit that identified a clinically significant and actionable finding. Eventually, I hope to learn about the action plans that MGH may undertake to lessen unwanted variation in care among their surgeons.

The MGH finding that patient outcomes differ by surgeon after risk adjustment suggests that published differences in surgeon and facility reoperations elsewhere cannot simply be attributed to differences in case mix between providers of care.

Moving forward, to reduce the number of women undergoing reoperations after lumpectomy, we should consider the following. First, be like MGH. Begin benchmarking. Audit performance, and then compare your results with those of others. Second, compare performance with target goals (benchmarks). Two societies have endorsed a target of 10%.^{11,12} Third, accelerate the diffusion of evidence-based practices into local care.^{11,13,14} If not already doing so, begin by increasing compliance with the seminal American Society for Radiation Oncology (ASTRO) and Society of Surgical Oncology (SSO) Margin Guidelines.^{13,14} Then review the American Society of Breast Surgeons Consensus toolbox.¹¹

And now, a caveat: if we stop efforts here, we may be missing an important finding of the MGH study. At MGH, all surgeons were experienced (had higher volume), and they all practiced in the same setting, limiting unmeasured confounders as a cause of variation. Moreover, I suspect the surgeons also were up-to-date with guidelines and consensus statements. Yet, after adjustment for known confounders, differences among and between surgeons persisted. This finding suggests that we have not yet discovered all the pieces of the reoperation puzzle.

To advance a solution to this conundrum, we need to become better sleuths, searching for previously unappreciated and unmeasured factors that cause reoperations. Moreover, we need to collaborate more effectively, becoming "coaches" and "mentors" for each other. Interestingly, and in contrast to studies suggesting that facilities with academic affiliation have better surgical

outcomes, some patient registries have demonstrated fewer reoperations outside the academic centers.^{2,15} Perhaps an academic-private sector collaboration would improve reoperations after lumpectomy more effectively than either sector working alone.

To lower rates, we also should recognize that a reoperation does not result from the actions or decisions of a single surgeon. Rather, it is a composite of performance and communication among imagers, oncologists, surgeons, and pathologists. A departure from optimal care in any single specialty can affect the outcome. For example, "en-face" instead of "perpendicular" specimen sectioning increases positive margin rates.¹⁶ Do you know how your pathologists are cutting the specimen for margin assessment?

Finally, if indeed they exist, we need to discover the key surgeon-specific technical variations in a lumpectomy operation and the nuances of practice differences between surgeons with low versus those with high rates.

Let us consider new approaches to de-escalate reoperations. Can a surgeon (system) with low rates successfully "coach" a surgeon (system) with higher rates? Can artificial intelligence strategies or crowd-sourcing of video reviews of lumpectomies identify heretofore unknown key components to achieving a negative margin?¹⁷ All the improvement strategies described in the preceding discussion are feasible. Many are already included in the plan-do-study-act plan for a new statewide initiative to lower reoperations.¹⁸

DISCLOSURES None.

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