Clinical Science

The implementation of a surgeon-directed quality improvement strategy in breast cancer surgery

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KEYWORDS:
Breast cancer surgery; Quality indicators; Audit and feedback; Tailoring; Continuing medical education; Core biopsy

Abstract

BACKGROUND: The investigators designed a sustained, surgeon-directed, iterative project to improve the quality of breast cancer surgery in south central Ontario.

METHODS: The strategy included audit and feedback of surgeon-selected quality indicators, workshops, and tailoring interviews. Workshops were held to discuss quality improvement strategies, select quality indicators, review audited results, and select interventions for subsequent implementation. Semi-structured tailoring interviews were conducted to identify facilitators and barriers to improved quality. All presentations and results were disseminated to all surgeons performing breast surgery in the study region.

RESULTS: Forty-four surgeons performing breast surgery across 12 hospitals are involved in the project. Five workshops have been held since 2005. Surgeons’ enthusiasm and involvement in the project have been positive. Interim results demonstrated that over 4 audit cycles (2006–2010), the preoperative core biopsy rate increased from 73% to 92%. The tailoring interviews indicated that 18 of 21 surgeons performed preoperative core biopsies.

CONCLUSIONS: This project highlights the feasibility of a surgeon-directed, iterative quality improvement strategy in breast cancer surgery. Interim results demonstrate consistent improvements in a key selected quality indicator.

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Quality gaps in BC surgical care have been identified in southern central Ontario. Hanley and Kessaram reported a positive margin rate of 60% at their community hospital, while Lovrics et al reported a positive margin rate of 26% in a cohort of randomly selected BC patients referred to the Hamilton Regional Cancer Centre between 2000 and 2002. The rate of preoperative diagnosis (by core biopsy or fine needle aspiration) was 69%, and the rate of specimen orientation labeling was only 53% in this cohort. The objective of our study was to determine the feasibility of implementing a surgeon-directed, sustained (multiyear), population-based quality improvement strategy to improve outcomes and QIs in BC surgery in our region (Quality Initiative in Breast Cancer Surgery in Local Health Integration Network 4 [QIBCS-L4]). The study interventions included A&F, workshops, and tailoring. We also describe the feasibility of the implementation and its impact on preoperative core biopsy rates in early-stage BC. In particular, we describe a surgeon-directed process that encompasses a large geographic population in southern central Ontario that includes both high-volume and low-volume surgeons in community and academic settings.

Methods

Setting

This project was conducted in Local Health Integration Network 4 (LHIN4) in southern central Ontario, with a population of 1.4 million residents and covering 6,600 km². There are 10 hospital corporations with 21 hospital sites, of which 12 provide BC surgery. Four hospitals are affiliated with an academic center (McMaster University). Approximately 1,200 BC surgical cases are performed yearly in LHIN4 by approximately 44 surgeons. Research ethics board approval was obtained from the 12 hospital sites performing breast surgery.

Interventions

Quality Initiative in Breast Cancer Surgery in Local Health Integration Network 4 strategy. A planning team comprising 6 surgeons, an epidemiologist, a statistician, and a project coordinator developed and organized the QIBCS-L4 project. Quarterly planning meetings were held to review progress and results. The QIBCS-L4 strategy included 3 interventions: yearly workshops, A&F, and tailoring interviews.

Workshops. All surgeons performing BC surgery and LHIN4 oncology administrative leaders were invited to workshops held outside of the urban academic center. The format included presentations on topics selected by surgeons and interactive small-group sessions. At the first workshop (2005), selected regional outcomes of BC
surgery were presented (Lovrics et al20). At 2 subsequent workshops (2007 and 2008), the concepts of a quality improvement project were outlined, and specific QIs and interventions were selected by surgeons. In 2009 and 2010, workshops included A&F on the selected QIs (see additional details in the following section). At each workshop, the continued relevance of QIs and intervention was considered, and new QIs and interventions were selected. Attendance at the workshops and participation in QIBCS-L4 activities was voluntary.

Audit and feedback. QIs were selected by consensus, on the basis of review of the available evidence and appropriateness for a quality improvement strategy. Consecutive BC surgery cases for a 4-month time interval for each of 4 years (2006, 2008, 2009, and 2010) were identified at each site on the basis of Canadian Classification of Health Intervention codes37 and International Classification of Diseases, Ninth Revision, and International Classification of Diseases, 10th Revision, diagnosis codes for inpatient and day surgery cases. Cases were excluded if the patients had locally advanced BC and received neoadjuvant chemotherapy, were male, underwent surgery for recurrence or benign breast changes, or underwent their first surgery outside designated time frame. Accurate identification of all cases was confirmed by comparison with a separate provincially maintained database of wait times. Trained data abstractors performed on-site chart reviews. Data for QIs were abstracted from consultation notes and reports (radiology, operative, and pathology). The 2002 time period was composed of data for LHIN4 cases extracted from the Hamilton Regional Cancer Centre Database study (Lovrics et al20), which was a random sample of BCS cases between 2000 and 2002.

For each A&F cycle, each surgeon performing BC surgery was mailed the audit results for the entire region and his or her specific hospital within 6 months of surgery. At each workshop, the audit results for the entire region and individual hospitals, without surgeon or hospital identifiers, were presented and discussed. Repeated A&F cycles were used to monitor improvements in chosen QIs over time.

Tailoring interviews. Two key concepts used in our intervention were the prospective identification of barriers to practice change and tailoring of implementation strategies to overcome perceived barriers.5,38 A tailoring intervention was discussed at a workshop, and 4 topics were selected by surgeons: preoperative core biopsies, positive margin rates, reoperation rates after positive margins, and the implementation of sentinel lymph node biopsy. An interview guide based on the Pathman model of behavior change (awareness, acceptance, adoption, and adherence)39 was developed and tested on a small sample of surgeons. A letter from the project leader was sent to all surgeons in LHIN4 inviting them to participate in a single personal tailoring interview. Surgeons’ offices were contacted twice; if no response was received, they were not contacted again. Interviews were conducted either in person or by telephone by a trained interviewer. A summary was created immediately after each interview. Counts and percentages were used to summarize the responses to closed-ended questions. A thematic analysis was conducted for the responses to open-ended questions.40,41 Interview results were presented at a subsequent workshop.

Statistical analysis and process control charts

The results of patient demographics and outcome variables (QIs) were summarized using descriptive summary measures, expressed as mean ± SD or median (range) for continuous variables and as number (percentage) for categorical variables. We used process control charts (PCCs)32 to assess change over time in the use of preoperative core biopsy. A target core biopsy rate of 95% was used, and stabilized PCCs were centered at a rate of .05 for “no core biopsy.” All analyses were performed using SAS version 9.2 (SAS Institute Inc, Cary, NC).

Results

Workshop and audit and feedback

A timeline for the project is outlined in Table 1. Workshop attendance ranged from 22 to 25 participants, with representation of all academic and community sites. Six QIs were selected at the 2007 workshop and 5 new QIs at the 2009 workshop. The initial 6 chosen indicators were (1) positive margins after BCS; (2) mastectomies for T1 and T2 cancers; (3) preoperative core biopsy; (4) preoperative imaging; (5) intraoperative specimen orientation labeling by surgeon; and (6) intraoperative specimen imaging for nonpalpable lesions. Details of a typical A&F cycle (2010) are as follows. Consecutive surgical cases occurring from January 1 to April 30, 2010, were identified. The chart review was performed between July and September 2010, and audit results were forwarded to surgeons in November 2010. In this cycle, 419 BC cases were identified; 127 were excluded (ie, locally advanced, recurrence). Accordingly, 293 charts were reviewed, with 304 cancers (11 bilateral cases). Data for 2002 and 2006 were collected retrospectively. Over the 5 data collection periods, 1,608 eligible charts were reviewed. Examination of intrarater reliability was performed on 5% of charts from 2010 A&F cycle. Intrarater reliability was high, with κ values ranging from .900 to 1.00. Fig. 1 shows overall LHIN4 preoperative core biopsy rates for all time periods. The initial rate of preoperative core biopsy in 2002 was 53%; this increased to 73% in 2006 and further increased to 92% in 2010. Fig. 2 depicts the preoperative core biopsy rates for all 12 hospital sites over the study period.
Process control charts

PCCs were calculated to distinguish between normal and unusual variation. Results are presented for preoperative core biopsy rates over 3 time periods in Fig. 3. In 2002, 10 hospitals were >3 standard deviations. In 2008 and 2010, 3 hospitals were >3 standard deviations, though closer to the target rate in 2010. Two hospitals (3 and 9) were low-volume sites. Hospital 3 had no BC cases during the 2010 data collection period, while hospitals 9 and 12 had 15 and 39 cases, respectively. Hospitals 3 and 9 were rural and did not have on-site access to core biopsies by radiologists. The changes over time reflect improvement in preoperative core biopsy rates. Fig. 4 illustrates a PCC of 3 sites, representing almost one-third of the total study population, over the study period. All 3 sites show improvement in core biopsy rates, with 2 of the sites reaching ≥95%.

Tailoring interviews

Thirty-one surgeons’ offices (78%) were contacted; 21 interviews were completed (52% of surgeons in LHIN4 and 68% of those contacted). Four interviews were face to face, while 17 were by telephone. Eight academic and 13 community surgeons were interviewed, and 11 of the 12 hospitals were represented. Eighteen of 21 surgeons performed preoperative core biopsies, while the other 3 used fine needle aspiration. Perceived advantages for preoperative core biopsies were improved decision making about the type of surgery, reduced reoperation rates, and better surgeon-patient communication about the proposed surgery.

Comments

We report initial observations and results from QIBCS-L4. The objective of our study was to determine whether a surgeon-directed, sustained (multiyear), population-based quality improvement strategy can improve outcomes and QIs in BC surgery in our region. Previous studies have shown mixed outcomes in quality improvement in BC care. Our study included timely A&F of surgeon-selected QIs, structured workshops, and tailoring interviews. In contrast to most other QI projects, data were collected at the patient chart level, not solely from administrative databases.

Our study demonstrated 2 major findings. Implementation of a surgeon-directed, population-based, quality improvement project was feasible, and meaningful improvement in a specific QI (preoperative core biopsy rate) was achieved in this LHIN4 project. The project was characterized by broad and sustained representation of all hospital sites offering BC surgery within the region of 1.4 million people, over the 5 years of this project. The surgeons selected QIs by consensus, on the basis of review

![Figure 1](image-url)  
**Figure 1** Results for preoperative core biopsy for A&F cycles 2002 to 2010. Sample sizes of audit cycles: 2002, n = 368; 2006, n = 282; 2008, n = 342; 2009, n = 312; 2010, n = 304.
of the available evidence and appropriateness for a quality improvement strategy (e.g., positive margin rates after BCS, preoperative core biopsy rates). These chart-level data were presented to surgeons within 6 to 10 months of the surgery. Specifically regarding preoperative core biopsy rates, data were also presented for different time periods using PCCs.

Three previous studies similar to ours have been completed in BC surgery. Breslin et al described a regional quality initiative in Michigan in which 18 hospitals participated from 2006 to 2009. Surgical biopsy rate was the QI. Data from participating sites were sent to project directors and institutions in A&F cycles. How data were presented to individual surgeons, their degree of participation, and what if any ancillary activities occurred were not outlined. The investigators found that the surgical biopsy rate decreased from 21% to 15% ($P < .001$). They acknowledged that the cause for improvement was “likely multifactorial,” but the intervention is considered a combination of A&F and opinion leaders. Veerbeek et al described a similar intervention at all 9 hospitals in 1 region of the Netherlands between 2002 and 2008. Nine QIs were selected from published national guidelines. The QIs were generally related to timelines but also included sentinel lymph identification rates and proportion of patients with only 1 surgical intervention (this may be a surrogate for the performance of preoperative core biopsies and positive margin rates). Surgeons were provided a yearly report of overall regional QI outcomes. Every 2 years surgeons attended training sessions at which individual hospital scores were compared with regional benchmarks. All 9 indicators exhibited significant improvement. Guadagnoli et al completed a cluster-randomized trial involving 28 hospital sites in Minnesota from 1993 to 1995. Eighteen hospitals were randomized to A&F plus opinion leaders and 10 hospitals to A&F. However, audit results were forwarded to hospitals, and it is not clear if or how individual surgeons saw outcome data. Opinion leaders were selected by the surgeons at each site, but the strategies used by opinion leaders at each site were at their discretion. The main QI (discussion of surgical options with patient and mastectomy rates) improved over the study period, but the change was similar in the 2 study groups.

In contrast to the previous studies, our study is novel in a few respects. It captures all sites offering BC surgery within a region of the province using data extracted from individual patient charts, rather than administrative databases. The quality improvement process is surgeon directed, whereby surgeons select the QIs and interventions. The selected QIs are of interest to surgeons, under their control, and reflect important aspects of surgical care. The A&F cycle is completed within months, and surgeons see their hospital data compared with all other sites. The focus of the workshops is essentially quality improvement, while tailoring interviews specifically examine issues relevant to the QI selected by surgeons. The study demonstrates that such a project is feasible and that surgeons are keenly interested in QI. The baseline rate of preoperative core biopsy use was similar to numerous published reports and improved to $\geq 90\%$. It is suggested that these improvements are due to the implementation of this multifaceted project. The inclusion of PCCs allows comparison with a defined standard and a measurement of variation around this standard. A PCC can help distinguish between normal (common cause) and unusual (special

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**Figure 2** Preoperative core biopsy rates for the 12 individual hospitals in LHIN4 for A&F cycles 2002 to 2010.
cause) variation. In this project, the standard was set at a preoperative core biopsy rate of 95%. By convention, performance within 3 standard deviations can be considered normal variation. Performance outside of 3 standard deviations can be a signal of other causes. In quality initiatives, PCC can be essential in identifying quality issues and

Figure 3  PCCs of preoperative core biopsy results for the 12 hospitals in LHIN4 for time periods 2002, 2008, and 2010. Zero indicates a target rate of .05 for "no core biopsy"; dashed lines indicate 3 standard deviations above and below target.
References


Figure 4 PCC for preoperative core biopsy results for hospitals 1, 2, and 7 for the 5 audit time periods. Zero indicates a target rate of .05 for “no core biopsy”; dashed lines indicate 3 standard deviations above and below target.


