Using Surgeon-Specific Outcome Reports and Positive Deviance for Continuous Quality Improvement

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Background. **Using the thoracic morbidity and mortality classification to document all postoperative adverse events between October 2012 and February 2014, we created surgeon-specific outcome reports (SSORs) to promote self-assessment and to implement a divisional continuous quality improvement (CQI) program, on the construct of positive deviance, to improve individual surgeon's clinical performance.**

Methods. **Mixed-methods study within a division of six thoracic surgeons, involving (1) development of real-time, Web-based, risk-adjusted SSORs; (2) implementation of CQI seminars (n = 6; September 2013 to June 2014) for evaluation of results, collegial discussion on quality improvement based on identification of positive outliers, and selection of quality indicators for future discussion; and (3) in-person interviews to identify facilitators and barriers to using SSORs and CQI. Interview transcripts were analyzed using thematic analysis.**

Results. **Interviews revealed enthusiastic support for SSORs as a means to improve patient care through awareness of personal outcomes with blinded divisional comparison for similar operations and diseases, and apply the learning objectives to continuous professional development and maintenance of certification. Perceived limitations of SSORs included difficulty measuring surgeon expertise, limited understanding of risk adjustment, resistance to change, and belief that knowledge of sensitive data could lead to punitive actions. All surgeons believed CQI seminars led to collegial discussions, whereas perceived limitations included quorum participation and failing to circle back on actionable items.**

Conclusions. **Real-time performance feedback using SSORs can motivate surgeons to improve their practice, and CQI seminars offer the opportunity to review and interpret results and address issues in a supportive environment. Whether SSORs and CQI can lead to improvements in rates of postoperative adverse events is a matter of ongoing research.**

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The rate of postoperative adverse events (AEs) is often used to evaluate both the effectiveness of treatment and the quality of surgical care. The selection of patients for operation, patient factors, disease factors, and surgical expertise are all important considerations for AEs. These are serious considerations as the occurrence of postoperative AEs has been directly linked to mortality [1], hospital length of stay [2], and postoperative quality of life [3]. There is also evidence demonstrating that postoperative AEs affect the overall costs and resource utilization in major surgery [2]. Postoperative AEs are a major influence on both clinical and economic outcomes of surgical care, and methodologies to better categorize, report, and monitor their incidence are essential for ongoing efforts to minimize their occurrence and impact [4]. It is the responsibility of the surgeon to be diligent in reporting, assessing, and improving the quality of surgical care delivered at all times.

A number of strategies have been advocated to promote improvement in the quality of care, including performance measurement and feedback, and positive deviance (PD) and dissemination of best practice measures. Specifically, performance measurement and feedback are increasingly being used as a strategy to provide surgeons with benchmarking information to use for individual quality improvement [5]. Performance measurement and feedback are intended to increase accountability and enhance clinical performance, and thereby improve the quality of care [6]. However, lack of transparent, systematic, data-driven performance measurement and feedback mechanisms for surgeons has

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been considered to be an impediment in fully adopting this strategy.

The concept of PD originated in international public health initiatives and was based on the observation that in most communities, there were individual persons and groups whose uncommon practices produce better outcomes than their peers [7]. The PD approach has recently been used to improve quality of healthcare delivery in a number of settings [8, 9]. To date, no studies have used the approach of PD as means to promote improvement in surgical quality.

Using the thoracic morbidity and mortality (TM&M) classification of AEs [10], the objectives of this study were threefold. First, to create risk-adjusted surgeon-specific outcome reports (SSORs) to enable individualized performance measurement and feedback. Second, to implement a divisionally focused, continuous quality improvement (CQI) program, based on the approach of PD, to review results, select procedures and outcomes in need of improvement, and discuss quality improvement strategies based on identification of positive outliers along with best practice measures. Third, to understand surgeons' perceptions, including the benefits and limitations, on the use of SSORs and a CQI/PD program, as a means for surgeons to actively participate in assessment of their performance.

Material and Methods

Study Design

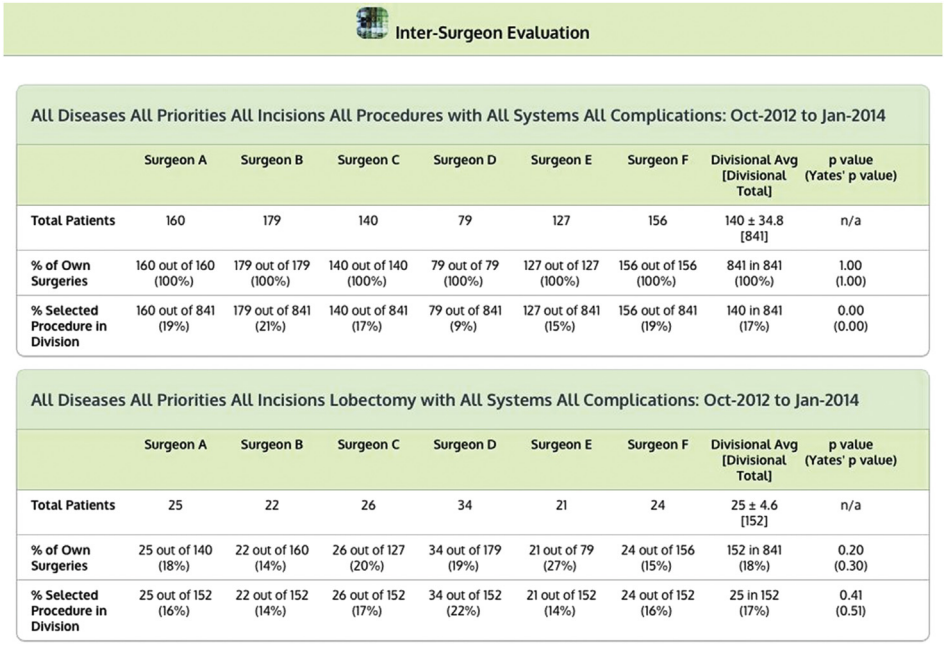
We performed a mixed-methods study within a division of six thoracic surgeons (Division of Thoracic Surgery, The Ottawa Hospital, Ottawa, Canada) involving (1) development of real-time, Web-based, risk-adjusted SSORs; (2) implementation of CQI/PD seminars (n = 6; September 2013 to June 2014); and (3) confidential interviews to identify facilitators and barriers of using SSORs and CQI/PD. The study was approved by The Ottawa Hospital Research Ethics Board.

The TM&M Classification System of Postoperative AEs

The TM&M classification system is a prospective inhospital database that provides a summary of the absolute rate of postoperative AEs and quantifies their severity. The TM&M system was developed according to the Clavien-Dindo classification schema of postoperative AEs [11]. The process for TM&M data collection has been previously described [10]. The process has been facilitated by a point-of-care, iPad-optimized software application (https://ottawatmm.org/).

Volume Report, Complication Report, and Surgeon-Specific Outcomes Reports (SSORs)

The software application was derived from the TM&M classification of AEs based on data from thoracic surgical patients who underwent surgery at The Ottawa Hospital between October 1, 2012 and February 28, 2014, spanning a 16-month period. The software application comprises three reports, including a divisional volume report, a divisional outcomes report, and a SSOR, all created to be dynamic, interactive, and anonymous. Surgeons can filter the results by selecting a specific time period, procedure, surgical approach/incision, and the postoperative complication(s) of interest, including the severity of the complication, as well as the organ system affected (Figs 1 and 2). Throughout both the volume and the outcomes report, a χ^2 test, along with the Yates' correction, were added to identify significant



Inter-Surgeon Evaluation

All Diseases All Priorities All Incisions All Procedures with All Systems All Complications: Oct-2012 to Jan-2014

	Surgeon A	Surgeon B	Surgeon C	Surgeon D	Surgeon E	Surgeon F	Divisional Avg [Divisional Total]	p value (Yates' p value)
Total Patients	160	179	140	79	127	156	140 ± 34.8 [841]	n/a
% of Own Surgeries	160 out of 160 (100%)	179 out of 179 (100%)	140 out of 140 (100%)	79 out of 79 (100%)	127 out of 127 (100%)	156 out of 156 (100%)	841 in 841 (100%)	1.00 (1.00)
% Selected Procedure in Division	160 out of 841 (19%)	179 out of 841 (21%)	140 out of 841 (17%)	79 out of 841 (9%)	127 out of 841 (15%)	156 out of 841 (19%)	140 in 841 (17%)	0.00 (0.00)

All Diseases All Priorities All Incisions Lobectomy with All Systems All Complications: Oct-2012 to Jan-2014

	Surgeon A	Surgeon B	Surgeon C	Surgeon D	Surgeon E	Surgeon F	Divisional Avg [Divisional Total]	p value (Yates' p value)
Total Patients	25	22	26	34	21	24	25 ± 4.6 [152]	n/a
% of Own Surgeries	25 out of 140 (18%)	22 out of 160 (14%)	26 out of 127 (20%)	34 out of 179 (19%)	21 out of 79 (27%)	24 out of 156 (15%)	152 in 841 (18%)	0.20 (0.30)
% Selected Procedure in Division	25 out of 152 (16%)	22 out of 152 (14%)	26 out of 152 (17%)	34 out of 152 (22%)	21 out of 152 (14%)	24 out of 152 (16%)	25 in 152 (17%)	0.41 (0.51)

Fig 1. Surgeon-specific volumes of all procedures (upper panel) and lobectomies (lower panel) performed since October 2012. (Avg = average.)

All Diseases All Priorities All Incisions Lobectomy with All Systems Prolonged Air Leak: Oct-2012 to Jan-2014

	Surgeon A	Surgeon B	Surgeon C	Surgeon D	Surgeon E	Surgeon F	Divisional Avg [Divisional Total]	p value (Yates' p value)
Pts w Complications	27%	23%	43%	12%	12%	25%	6 in 25 (23%) [34 in 152 (22%)]	0.10 (0.24)
Pts w Minor Complications	27%	23%	38%	12%	12%	25%	6 in 25 (24%) [33 in 152 (22%)]	0.20 (0.43)
Pts w Major Complications	0%	0%	5%	0%	3%	4%	1 in 25 (4%) [3 in 152 (2%)]	0.69 (1.00)
Pts w Grade V Complications	0%	0%	0%	0%	0%	0%	0 in 25 (0%) [0 in 152 (0%)]	1.00 (1.00)

All Diseases All Priorities All Incisions Lobectomy with All Systems Prolonged Air Leak: Oct-2012 to Jan-2014

NSQIP	Surgeon A	Surgeon B	Surgeon C	Surgeon D	Surgeon E	Surgeon F	Divisional Avg
Maker-Wasserman (Occurence) 95% CI	0.49 0.30 - 0.68	0.49 0.29 - 0.69	0.22 0.13 - 0.31	0.27 0.18 - 0.36	0.55 0.32 - 0.78	0.87 0.50 - 1.24	0.48
Maker-Wasserman (Severity) 95% CI	0.49 0.30 - 0.68	0.77 0.46 - 1.08	0.22 0.13 - 0.31	0.34 0.23 - 0.45	0.55 0.32 - 0.78	1.06 0.61 - 1.51	0.57
EVAD (Age, DLCO, FEV1)	Surgeon A	Surgeon B	Surgeon C	Surgeon D	Surgeon E	Surgeon F	Divisional Avg
O/E 95% CI	0.41 0.38 - 1.07	0.32 0.94 - 1.39	0.22 0.29 - 1.01	0.19 0.43 - 1.01	0.45 0.37 - 1.10	0.69 0.64 - 1.33	0.38
Dynamic Risk Picker (Age,Sex,ASAClass)	Surgeon A	Surgeon B	Surgeon C	Surgeon D	Surgeon E	Surgeon F	Divisional Avg
... 3							
Complications - O/E 95% CI	0.5 0.49 - 1.35	0.44 1.32 - 1.94	0.26 0.35 - 1.21	0.24 0.53 - 1.23	0.55 0.46 - 1.36	0.9 0.84 - 1.76	0.48

Fig 2. Surgeon-specific rates of raw and risk-adjusted air leaks are shown for the period between October 2012 and January 2014. (ASA = American Society of Anesthesiologists; Avg = average; CI = confidence interval; DLCO = diffusing capacity of lung for carbon monoxide; EVAD = expiratory volume, age, and diffusing capacity score; FEV1 = forced expiratory volume in 1 second; NSQIP = National Surgical Quality Improvement Program; O/E = observed to expected ratio; Pts = patients; w = with.)

intersurgeon differences, where a p value of less than 0.05 is considered statistically significant (Figs 1 and 2). To maintain confidentiality of these reports, surgeons were each assigned unique identifiers, to which access was limited to a database programmer performing the querying. The SSORs are available for surgeons to view their personal data and benchmark themselves to the divisional average. These reports allow surgeons to perform additional analyses of their individual performance data.

Within the outcomes report, three different risk-adjustment scores were applied to account for differences in case-mix for patients undergoing major lung resection (Fig 2). The Maker-Wasserman score is used by American College of Surgeons–National Surgical Quality Improvement Program (ACS-NSQIP) to compare surgeon-specific data and identify positive outliers, where the lowest score indicates better outcome based on the calculation of the risk index/outcome index [12]. Factors for inclusion in the score were based on those used in the universal ACS-NSQIP risk calculator [13].

The expiratory volume, age, and diffusing capacity score was selected because it was demonstrated as easier to use, and at least as accurate as other scoring systems used in the thoracic surgical setting to predict the risk of postoperative complications after major lung resection [14].

The dynamic risk picker was internally developed and based on a study by Dimick and colleagues [15], in which the researchers demonstrated that procedure-specific quality measures can be adequately risk adjusted using five risk factors appropriate for the procedure.

For the expiratory volume, age, and diffusing capacity score and the dynamic risk picker, established statistical methods were used to develop a logistic regression model. Once the logistic regression equation is computed, the equation is then used to calculate a probability of the AE for each patient. These probabilities are then summed for each individual surgeon to obtain the expected (E) number of AEs for the patient sample for that individual surgeon. An O/E ratio and confidence interval is then calculated for the patient sample for the individual surgeon, where O is the number of patients observed to have the AE. If the surgeon's O/E ratio is less than 1 and the upper limit of the confidence interval is less than 1, then the surgeon has a statistically significant smaller number of AEs than would be expected on the basis of his or her patient characteristics, namely, a positive outlier/deviant.

Positive Deviance and Implementation of a CQI Program

A divisional, surgeon-led, CQI program (n = 6 seminars; September 2013 to June 2014) based on the construct of

PD was implemented to serve as a complement to SSORs and to give surgeons an opportunity to anonymously review group results, select procedures and outcomes in need of improvement, and discuss best practice strategies based on the consented deidentification of positive deviants/outliers. An expert in the field of PD was invited to lead the introductory seminar and highlighted the approaches' relevance to a range of quality improvement issues, and its use in identifying practical solutions in healthcare [16]. Subsequent seminars were limited to staff surgeons, a database manager, and a research associate. All seminars were scheduled on operating room–free days to ensure that all or the majority of surgeons could attend, and were generally 1.5 to 2 hours long.

Structured Interviews

After completion of the sixth CQI/PD seminar, confidential, structured in-person interviews of 30 minutes were conducted by two of the studies investigators (J.I. and C.A.). These individuals were in the best position to conduct the interviews to increase response rates, maintain motivation with longer questions, probe for responses, clarify ambiguous questions, and aid in the recall of events. Questions were open ended and intended to evaluate adoption, usefulness of SSORs and PD, and suggested improvements. Interviews were audiorecorded and transcribed. Transcripts were systematically analyzed and clustered to form themes [17].

Results

Volume of Procedures

During the study, 258 patients underwent 279 major lung operations by six thoracic surgeons. The number of cases ranged from 79 to 179 per surgeon for all procedures performed, and from 32 (11%) to 61 (22%) cases of major lung resections.

Attendance Rate for CQI/PD Seminars and Discussion Topics

Six seminars were held over a 10-month period, with attendance rate varying from 50% to 100%. Topics of discussion were based on management options for reducing rates of postoperative atrial fibrillation and prolonged air leak.

Structured Interviews

All surgeons agreed to participate in structured, in-person confidential interviews, and consented to having their responses audiorecorded and transcribed for research purposes. Experience level of the surgeons ranged from 2 to 32 years.

Benefits, Limitations, and Suggestions for Improvement of SSORs

Individual interviews revealed that the majority of surgeons believed SSORs can lead to improvements in care through knowledge of personal outcomes with comparison to division for similar operations (Table 1). Other reported benefits included the platform through which the data were presented, real-time data access and performance monitoring, team-building through collegial discussions, and use of reports for continuous professional development and maintenance of certification. Perceived limitations of SSORs included potential for erroneous data, inaccurate representation of performance, limited understanding of risk-adjustment metrics, increase risk for liability, discouragement of surgeons, failing to circle back on actionable items, avoidance of high-risk patients, and resource requirements for database maintenance. Most surgeons suggested that

Table 1. Perceived Benefits and Limitations of Surgeon-Specific Outcome Reports and Continuous Quality Improvement/Positive Deviance Seminars, and Suggestions for Improvement

Surgeon-specific outcome reports
Benefits
Self-assessment; self-improvement
Real-time data access and performance monitoring
Team building
Collegial discussion
Balancing of outcomes
Platform
Maintenance of certification; continuous professional development
Closing the loop
Limitations
Potential for erroneous data
Inaccurate representation of performance
Lack of variables specific to practice
Limited understanding of risk-adjustment metrics
Increase risk for liability
Discouragement of surgeons
Failing to circle back on actionable items
Avoidance of high-risk patients
Resource requirements for local database maintenance
Suggestions for improvement
Supplementary information
Continuous quality improvement/positive deviance seminars
Benefits
Team building
Change management
Stimulates further personal study
Collegial discussion
Limitations
Quorum participation
Scheduling
Resistance to change
Failing to circle back on actionable items
Suggestions for improvement
Quorum participation
Scheduling
Supplementary information
Closing the loop

descriptions of risk-adjustment metrics would be valuable to improve their understanding of the reports. Surgeons recommended that this additional information would be valuable if available as an optional tab within the report. Surgeons also reported a need to have access to the complete medical record of patients reported in their data.

Benefits, Limitations, and Suggestions for Improvement of CQI/PD Seminars

Most surgeons believed a program of CQI/PD has stimulated further personal study on topics and encouraged change management based on best practice measures. All surgeons believed that a program of CQI/PD has led to team or capacity building through collegial discussions. Perceived limitations of a CQI/PD program included resistance to change, and several surgeons suggested that adopting new approaches can pose serious challenges. Other limitations included scheduling of CQI/PD seminars and quorum participation. To improve the conduct of CQI/PD seminars, surgeons suggested that seminars should be held quarterly to facilitate participation by all staff. Seminars should be supplemented with supporting literature of evidence-based best measures. Closing the loop was reported as another suggestion for improving the conduct of CQI/PD seminars, where future discussions would circle back to previous recommendations as a means to evaluate what impact changes have had on patient outcomes.

Comment

Various methodologies are being increasingly used to enhance the quality of surgical care. SSORs and confidential peer discussions represent distinct yet complimentary approaches to quality assessment and improvement. An absence of literature regarding the reliability of SSORs, together with ongoing peer discussions, on their impact on the quality of surgical care prompted us to create SSORs to enable self-assessment and to implement a complementary CQI program, on the premise of PD, as a means to assess and improve clinical performance. Structured interviews were conducted to assess limitations and benefits of SSORs, and surgeons' overall impression of the CQI/PD program.

Perceived Limitations of SSORs and CQI/PD Seminars

The potential for erroneous data and small sample size of AEs, which can lead to inaccurate representation of performance, were identified as impediments to SSOR use. Small numbers mean that a large amount of cases need to be aggregated to reach a reliable number of AEs to conduct meaningful statistical comparisons. That may be especially applicable to surgeons at the start and end of their career when case volumes may be lower, and particularly for less experienced surgeons, whose techniques may be changing. As SSORs are continued over time, volumes for surgeons with initially small sample sizes will increase and offer more reliable evaluations of their performance, and for a single division as a whole.

Limited understanding of risk adjustment was identified as another barrier to SSOR use. Ultimately, the entire division has to agree upon which risk-adjustment score best fits the purpose for driving improvement [18]. The ideal score should be simple, reproducible, objective, applicable to all patients and operations, sensitive and specific [19], and be used in conjunction with the surgeon's own intuition to answer the following questions: Does the patient need the operation? Is the patient fit for the operation? What is the margin between life and death for the patient if an operation is to be undertaken? Are we taking into consideration intraoperative mishaps? Studies demonstrate, and support interview findings, that if individual reports are not adequately adjusted to account for variations case-mix, surgeons may avoid caring for high-risk patients [20].

Surgeons also feared that sensitive data within SSORs could be used for punitive actions, jeopardizing the culture of quality improvement. Surgeons believed that proper mechanisms should be in place in this environment of open discussions about AEs. Surgeons further believed that comparison of outcomes should not be made in a punitive fashion, but in a constructive spirit that fosters continued professional development and collegial mentorship to improve care for patients. As long as respective medical protective associations give support to the concept, and the hospital administration is at arm's length without risk of withdrawal of privileges, the increase risk for liability, discouragement of surgeons, and avoidance of high-risk patients should not be barriers to adopting SSORs.

Scheduling, quorum participation, and resistance to change were identified as limitations of complementary CQI/PD seminars. First, studies have shown that educational-type seminars alone or in combination with other interventions can improve performance and patient outcomes. Suggested strategies to increase attendance include using interactive formats and focusing on high-impact outcomes [21]. Topics of discussion at CQI/PD seminars were thus largely based on management options for reducing rates of postoperative atrial fibrillation and prolonged air leak, which pose the highest burden on our patient population. Second, resistance to change by surgeons is an established finding in the literature. Resistance to change is a wide issue within healthcare and requires communication, participation in decision making, support, and negotiation [22, 23].

Perceived Benefits of SSORs and CQI/PD Seminars

Transcripts revealed that the majority of surgeons believed SSORs can lead to improvements in care through self-assessment and knowledge of personal outcomes with divisional comparison. A study of primary care physicians showed that they considered performance reports an important part of practice and supported its continuation; more than half of the participants acknowledged the reports had influenced them to make positive changes [24]. It is also commonly believed that by inspecting their own results, surgeons would make their practices better, a concept known as the Hawthorne

effect [25]. Similarly, medical specialties use various methods to examine physician performance, including clinical dashboards, evaluation of simulated patient encounters, care observation, medical record audits, and peer-assessment [26]. The SSOR can serve as an additional strategy for clinical performance evaluation.

Other reported benefits of SSORs included the platform through which the data were presented, allowing for real-time data access and performance monitoring. When initially creating the SSOR, a major objective was to ensure that metrics used were consistent with thoracic surgical practice, centered on patient care, and easy to extract to help guide current and future goals in quality improvement. To minimize the effect of bias in our measurements, the division decided to focus on the measurement and extraction of readily available electronic TM&M data, thereby enabling the creation of an automatic, reliable, and cost-effective process. Maintaining the benefits of ongoing automated data gathering and reporting, however, involves substantial information technology expertise and local resource requirements, and ultimately depends on the buy-in, size, and intricacy of the division.

Transcripts revealed that the majority of surgeons believed a program of CQI/PD has stimulated personal study or continuing education on best practice measures. Continuing education and personal reflection have been cited as ways to respond to the results of performance evaluation if an area of practice is found not to meet expectations [27]. Given its inherent self-assessment nature, SSORs are also eligible for maintenance of certification credits in surgery in support of lifelong learning needs.

Interview transcripts also revealed that all surgeons believed that a program of CQI/PD has led to team building through collegial discussions. Discussions were marked by camaraderie and respect, and were conducted in a manner that maintained confidentiality. We believe that discussing performance data in a nonthreatening way, colleague to colleague, is an effective method of bringing about change. Supporting evidence suggests that many surgeons seek information from colleagues over other sources, highlighting the important role of collaboration and professionalism in quality improvement [28]. Gagliardi and colleagues [29] found that sharing of clinical experience made possible collective decision making for complex cases and improved awareness of current evidence and appropriate care delivery.

Future Endeavors

We believe that this initiative can be extrapolated into a larger, multiinstitutional effort, but only with appropriate technical infrastructure, statistical expertise, and precise collection and review of 100% of a surgeon's cases—anything less could result in inaccurate reporting of individual surgeon performance, highlighting the utility and significance of complete databases. Birkmeyer and colleagues [30] have further suggested that the procedure may be the most important factor in deciding about the most effective approach to quality measurement. Two attributes are particularly important: the baseline risks and the volume of the procedure. Focusing intersurgeon comparisons on procedures that are both common and relatively high risk (lobectomy) is best assessed using risk-adjusted measures of TM&M, and focusing on actionable items that could be used to drive change.

Study Limitations

A number of limitations are noted in this work. First, this is a single-center study and is susceptible to sampling and response bias owing to the small sample size of our division. As such, it is possible that theoretical saturation [31] was not reached from the six interview transcripts that were analyzed. We recognize that a larger group of surgeons may provide further useful data on the benefits and limitations of the use of SSORs and a complementary CQI/PD program. Collation of individual surgeon data to create SSORs is another concern. Data from a 16-month period do not provide statistically meaningful results because of low volumes and AE rates; risk-adjusted outcomes, therefore, do not meet reliable benchmarks for distinguishing individual surgeon performance. The PD approach was intended to be a springboard for collegial discussion, and not a true depiction of exemplary individual outcomes.

Other quality indicators, including patient feedback on communication skills and professionalism, long-term outcomes, and wait-time measurements, are valuable but difficult to measure. All, however, are needed for improving the quality of care, and will be included in future iterations of SSORs. Recording of TM&M relies on vigilance and team involvement and may be susceptible to reporting bias; this vigilance in reporting also applies to risk factors. Ongoing feedback plays an essential role in maintaining accuracy and completeness of data.

In conclusion, we created dynamic SSORs for reporting information on several quality indicators. By monitoring individual outcomes and providing feedback, SSORs allow surgeons to evaluate their performance over time and in comparison with colleagues, provide real-time data monitoring, and are a fundamental component of contemporary efforts to improve the quality of surgical care. Unique to our study is an effort to link performance results with ongoing CQI seminars, based on the concept of PD, to provide an additional forum for discussion. Whether SSORs and a complementary program of CQI/PD can lead to improvements in rates of postoperative AEs is a matter of ongoing research.

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DISCUSSION

DR DANIEL L. MILLER (Marietta, GA): For disclosures, I am on the thoracic advisory board for Ethicon and Bard. Dr Ivanovic, that was an excellent presentation. You and your colleagues at The Ottawa Hospital have gone where no other general thoracic surgery service has in North America of reporting your data and your new thoracic mortality and morbidity (TM&M) classification.

As you know, reporting of postoperative adverse events has traditionally been accomplished at morbidity and mortality (M&M) conferences and retrospective case series. Unfortunately, those approaches are susceptible to selective bias and underreporting. I think it's excellent that your adverse events are reported by the resident and then it's clarified and audited by the attending surgeon later in the week. What is unique about your system, it's real time and it's not a retrospective look. So your data are very succinct. The generation of your surgeon outcome report is a perfect tool not only to improve a surgeon's own practice but also the total division's.

I have three questions. It was interesting to find out how you handle your M&M conference, because it's a very select group. A lot of times in academic institutions we have anesthesia, nursing, the whole gambit of the specialties there that take care of their patients. So a lot of time when we get down to these exact numbers, we can't discuss that in an open atmosphere. And my one question, which you showed on one of your slides, do you focus on the bad or do you focus on the good? It sounds like you focus on the good. I would like you to explain how you achieve that. A lot of times we will go after the bad, but you focus on the good. How did you achieve that?

DR IVANOVIC: Thank you, Dr Miller, for your excellent, and indeed, positively reaffirming discussion and feedback. I will start by first explaining the approach that we take to conduct our M&M conferences. Using data from the TM&M database, each M&M conference starts with an overview of surgical case volume and quality reporting for the preceding month. After the statistical overview, the chief thoracic surgical fellow then identifies specific cases for discussion using a structured format. Up to three cases are discussed at M&M conferences, and are selected according to lessons to be learned about

cognitive and system issues. Discussion is followed by creation and dissemination of bottom lines or action items related to each case. The structured case analysis is an approach that we have adapted from our colleagues in the emergency department of The Ottawa Hospital.

Indeed, we focus on the good, we have taken on the approach of positive deviance because it is not punitive in its nature, fosters open and collegial interactions, and because in our division we have ingrained a culture of both safety and quality improvement over many years, where improving patient outcomes have always been at the forefront of discussion. Furthermore, the complementary nature of aggregated surgical volume and quality reporting, with structured case selection and analysis at M&M conferences, leads to powerful quality assessment and improvement opportunities.

DR MILLER: So the second question is, I know your data right now are only for during the hospital stay. What are your plans for in the future to get 30 days, 90 days, because you look at readmission rates, you look at wound infections, prolonged air leaks. How are you going to incorporate that into your system?

DR IVANOVIC: That is an excellent question. The TM&M classification system is a prospective inhospital system that provides a reliable summary of the absolute rate of postoperative adverse events and quantifies their severity. We have done comparisons in previous studies, in which we compared our TM&M classification of adverse events to the retrospective National Surgical Quality Improvement Program (NSQIP) system, which captures complications up to 30 days postoperatively. Our data have shown that the overall rate of postoperative adverse events captured between the two systems is very similar, but differences exist in specific types of complications. For example, we capture more cardiac complications, whereas NSQIP captures more wound complications. Wound infections can be acquired after hospital discharge (for example, in follow-up clinic visits, with visits to the general practitioner, or emergency room visits) and recorded in NSQIP, but may not be picked up by TM&M.

As far as our plans going forward with capturing and recording postdischarge complications, perhaps Dr Seely would be better poised to answer what the future holds.

DR SEELY: We tried to capture those complications when they come back to clinic, but the staff has to remember to report them to our database manager. That is one of the areas that we are seeking to improve upon. It's a small number of cases where the patient goes back to their family doctor for a wound infection or other complication and they don't get back to us.

The only thing to add to the M&M rounds discussion is key things we do is, we choose our cases for presentation based on the preventability. The concept is to identify if a complication was possibly preventable in the eyes of the residents and the staff. That is our current selection criterion. In addition, recommendations from M&M rounds are tabled for discussion at our divisional rounds, to create actionable plans if necessary.

DR MILLER: And the last question, and you have kind of already went about this, you are going for the positive. If somebody has done 100 esophagectomies and no anastomotic leak, but everybody says let's do our anastomoses his way. Well, you do that and everybody can get close or they can't achieve it, and the one thing you did not look at is risk stratification in regard to clinical data up front and whether the patients have gotten neoadjuvant treatment or diabetes and so forth. How are you implementing the clinical data to help risk stratify?

DR SEELY: Jelena knows the science of risk adjustment exceptionally well. The difficult thing is that, to perform risk adjustment, you have to input the data for all those patients. So all the data regarding induction therapy, their FEV1 and various other factors, have to be entered into the system, and unless we input it, we don't have all of those data. But for this study, we did enter a key number of variables and did risk adjustment. Interestingly, we didn't find the risk adjustment changed the data significantly, but it's just a matter of having the wherewithal to get that data into your collection system to do the risk adjustment. But it's an excellent question.

DR MILLER: And, again, an excellent presentation, incredible work. I know you have been on numerous of those papers from your institution. I think that is the gold standard now for reporting of M&M with the severity impact and so forth and that it will go on down the road to generate more interest. Thank you.