Real-life benchmarking bladder cancer care: A population-based study

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KEY MESSAGES

- Discrepancies in MIBC care between jurisdictions led to the creation of key quality-of-care indicators at national multidisciplinary meetings.
- We retrospectively analyzed MIBC performance (2009–2013) against current expert-derived benchmarks, using different benchmarking methodologies.
- Performance across most quality-of-care indicators fell short of expected benchmarks.
- Benchmarking using different methodologies allows us to better assess performance and validate consensus-derived benchmarks to improve MIBC care.

ABSTRACT

Introduction: Radical cystectomy (RC) is a complex oncological surgical procedure and population studies of routine surgical care have suggested suboptimal results compared to high-volume centers of excellence. A previous Canadian bladder cancer quality-of-care

consensus led to adoption of multiple key quality-of-care indicators, with associated benchmarks created using available evidence and expert opinion to inform and measure future performance. Herein, we report real-life benchmark performance for the management of muscle-invasive bladder cancer (MIBC) relative to expert opinion guidance.
Methods: This is a population-based, retrospective, cohort study that used the Ontario Cancer Registry (OCR) to identify all incident patients who underwent RC from 2009–2013. Electronic records of treatment from 1573 patients were linked to OCR; pathology records were obtained for all cases and reviewed by a team of trained data abstractors. The primary objective was to describe benchmarks for identified indicators, first as median values obtained across hospitals or providers, as well as a "pared-mean" approach to identify a benchmark population of "top performance," as defined as the best outcome accomplished for at least 10% of the population.
Results: Overall, performance in Ontario across all indicators fell short of expert opinion-determined benchmarks. Annual surgical volume by each surgeon performing a RC (benchmark >6, percent of institutions meeting benchmark=20%), percent of patients with MIBC referred preoperatively to medical oncology (MO; benchmark>90%, percent of institutions meeting benchmark=2%) and radiation oncology (RO; benchmark>50%, percent of institutions meeting benchmark=0%), time to cystectomy within six weeks of transurethral resection of bladder tumor (TURBT) in patients without neoadjuvant chemotherapy (benchmark <6 weeks, percent of institutions meeting benchmark=0%), percent of patients with adequate lymph node dissection (defined as >14 nodes, benchmark>85%, percent of institutions meeting benchmark=0%), percent of patients with positive margins post-RC (benchmark <10%, percent of institutions meeting benchmark=46%), and 90-day mortality (benchmark<5%, percent of institutions meeting benchmark=37%) fell considerably short. Simply evaluating benchmarks across the province as median performance significantly underestimated benchmarks that were possible by top-performing hospitals.
Conclusions: Performance through most bladder cancer quality-of-care indicators fall short of benchmarks proposed by expert opinion. Different methodologies, such as a pared-mean approach of top performers, may provide more realistic benchmarking.

INTRODUCTION

The management of muscle invasive bladder cancer (MIBC) is complex, requiring expedited diagnosis, referral to a coordinated multi-disciplinary care team, and subsequent delivery of optimized multi-modal treatment to maximize survival and maintain quality of life. Previous studies of routine MIBC surgical care in many different jurisdictions have suggested suboptimal outcomes as compared to high-volume, centers of excellence.[1–3] A multidisciplinary committee comprised of representatives from Bladder Cancer Canada (BCC), the Canadian Urological

Association (CUA), and the Canadian Urologic Oncology Group (CUOG) convened during subsequent Bladder Cancer Quality of care consensus Meetings (BCQM; 2014, 2016, 2019) to establish the importance of creating specific quality-of-care indicators, with corresponding consensus benchmarks, in order to evaluate and compare BC performance both within, and across, institutions and enhance care nationally. Thirteen key quality indicators were identified, 9 of which related to MIBC, and benchmarks were created utilizing expert-consensus and relevant supporting literature.[4–6]

Since its introduction by the Xerox company as a cost-reducing effort, benchmarking principles have been conceptualized in health care as a method for continuous quality improvement.[7] Various methodologies can be utilized but the process involves assessing standards, such as quality indicators of care, and then identifying potential areas of improvement. Foundational to these processes is the need for reliable and up-to-date data, sharing information and adopting best practices to modify performance.

In order to assess the real-world performance of MIBC care across Ontario, we herein report a limited number of processes and outcomes relative to the benchmarks set by the consensus meetings described above. Further we evaluate alternative benchmarking methodologies including median values across hospitals, and the "pared-mean" approach to identify top performers (The University of Alabama at Birmingham's Achievable Benchmarks of Care (ABC^{TM}) with this population-level data.[8]

METHODS

This is a population-based, retrospective, cohort study that utilized the Ontario Cancer Registry (OCR) to identify all incident patients who underwent radical cystectomy (RC) for localized MIBC from 2009 and 2013.[9] Electronic records of treatment from 1,573 patients were linked to OCR. Patient characteristics are as described in Lusty et al.[10] Pathology records were obtained for all cases and reviewed by a team of trained data abstractors. Hospital care and surgical intervention data was obtained from the Canadian Institute for Health Information,[10] and chemotherapy utilization information was obtained using treatment records from Ontario regional cancer centres and physician billing records as described in Booth et al (2017).[11] These datasets were linked using unique encoded identifiers and analyzed at ICES, Kingston, Ontario. The quality of the ICES database in terms of accuracy and coding has been previously discussed.[13] Surgical wait times were measured from time of diagnosis documented within OCR to the time of RC.

The main objectives were to provide a provincial-wide assessment of these identified quality indicator benchmarks and determine the overall number of institutions meeting these benchmarks over the time frame. After assessing the number of institutions meeting the proposed benchmark, we determined the number of patients that this represented. In other words, we report on the number of patients managed in those institutions attaining the benchmark over the entirety of the five years of the study period. Although a detailed institutional review is not

possible with ICES privacy policies, we felt that assessing this over a five-year horizon would give a more global assessment without concern for yearly variations, especially for some centers with relatively low volume. Further, indicators of care were compared to benchmarks utilizing average/median values across all patients treated in Ontario, and the ABC^{TM} method. For the latter, institutions were ranked in descending order of annual performance based on a specific quality indicator. Beginning with the best performing institution, patients in each hospital were then summed until the combined population of this group represented 10% of the total patient pool. As per institutional policy, cells with <6 patients were not reported due to privacy concerns.

Ethics for this study was obtained and approved by the Research Ethics Board of Queen's University.

RESULTS

A total of 1, 573 patients from 50 institutions were included in the analysis, representing all patients treated with radical cystectomy in the province. Data from institutions performing less than 10 procedures over the full 5-year time frame were excluded from the benchmarking exercises (n=9). Demographic data, as well as details of the cancer and treatment-related variables have been previously published. [10] The quality-of-care indicators and benchmarks for localized MIBC, defined by the BCQM meetings, are listed in Table 1. The number of institutions meeting the expert-opinion based benchmarks across Ontario over the entirety of the five-year period are outlined in Table 2. No institutions consistently met the benchmark for any of the 7 observed indicators and only a minority of the institutions were observed to meet some of the expert-opinion benchmarks, specifically positive margin rates and 90-day mortality.

We then assessed these seven indicators as a whole for all patients across the province (i.e. not per institution) in order to understand more globally how patients are managed across the province in routine care. Some proposed strategies have utilized such averaged values across jurisdictions as a benchmark. Table 3 describes the median value and interquartile range (IQR) including the percent of patients with clinical T2 or greater disease seen by medical oncology (31%) and radiation oncology (10%) prior to surgery across the province over the 5 years. Finally, we assessed the pared-mean approach to identifying top performers (ABC^{TM}) as an assessment of potentially attainable benchmarks (Table 3). As one example, no institution met the wait time benchmark for surgery (without preoperative chemotherapy) of >90% of patients having surgery within 6 weeks. The median wait time for all patients in Ontario was 9 weeks (Q1,Q3: 6,14). However, of the top performing hospitals from 2009-2013, 56% of patients received surgery within 6 weeks. Table 3 describes the expert opinion benchmark, the actual data for all patients treated in Ontario and the attainable benchmark for the top performing hospitals. Table 4 reports that detailed data for the top performing hospitals for each indicator.

DISCUSSION

This report is the first to examine performance of quality indicators of care for patients with non-metastatic MIBC in the province of Ontario relative to benchmarks derived from the BCQM meetings and alternative benchmarking methodologies. When evaluated at first glance, this reveals fairly significant discrepancies between the expert-derived consensus benchmarks and routine care throughout the province.

This is specifically evident by the fact that no institutions in Ontario achieved a wait time to RC within 6 weeks of TURBT (expert benchmark >90%). Alternate strategies to benchmark this wait time demonstrated that the median wait across the province was 9.14 weeks (Q1,Q3: 6,14). The top performing hospitals (involved with at least 10% of the patients treated over the 5 years) were able meet a benchmark of less than 6 weeks 56% of the time. As evidence points to an increased risk of BC mortality with increasing wait times to cystectomy,[11] this finding identifies significant gaps in care across the province and highlights the need to identify strategies to streamline cancer care that is guideline concordant,[12,13] despite ongoing stressors in this universal healthcare system. Although this data is somewhat historical, it is likely Ontario hospitals remain similarly stressed today for resources after the pandemic.

The percent of patients with MIBC referred to medical oncology and radiation oncology pre-operatively in Ontario fell short of the expert-opinion benchmarks with an observed overall rate from all centers of 31% and 10% values, respectively. Evaluation of the top performing institutions appeared closer to the expert-opinion benchmarks, with 71% of patients being referred to medical oncology and 45% to radiation oncology over the 5-year timeframe. The cohort described is now over a decade ago but nonetheless the current guideline concordant care outlining a multi-disciplinary approach to MIBC has been generally accepted during the era that this cohort represents.[14,15] Further, more contemporary series from major US centers have reported similar neoadjuvant chemotherapy rates to those reported here.[18]

This report shows that no institutions across Ontario met the target of adequate LN dissection (>14 nodes in >85% of patients), with the top performers achieving these pre-determined benchmarks on approximately 75% of their patients. Based on a large amount of evidence supporting the associations of higher LN yield and survival, and the performance of the top-performing institutions, it stands to reason that a target of >90% having more than 14 nodes removed is an appropriate goal for urologists to continue to work towards.[6] A similar conclusion, that the expert opinion benchmarks are attainable, could be made when the positive margin (1.3%) and 90-day mortality (0.2%) results of top-performing institutions are noted. However, the top performers identified for these two analyses were from lower-volume centres, and the results may not be representative of larger populations as they may represent significant selection biases.

Finally, although annual surgical volume by each surgeon performing a RC (benchmark>6) was achieved in only 20% of institutions across Ontario during the study period, this represented approximately 50% of the patients receiving RCs. The top performing hospitals, obviously all

high-volume centers, were able to ensure the annual surgeon volume was greater than 6 for 95% of their patients treated. With ongoing literature supporting the reduction of morbidity and mortality following major uro-oncological surgery when performed at high-volume centers,[2,3] this finding calls into question the need to re-evaluate the allocation of complex uro-oncological procedures to specific high-volume centers. Specifically, the median annual surgeon volume in Ontario over this time period was 3.8 cases (Q1, Q3; 1.8, 10.6). These results hopefully have changed with ongoing passive centralization of care.[2]

Overall, this analysis is the first to evaluate RC care across the province based on expert-derived consensus guidelines. By utilizing alternative benchmarking techniques to assess the data, we can provide a more thorough and in-depth commentary on real-life performance, appropriateness of these guidelines, and ultimately improve quality of care across the nation. Future studies will aim at addressing the limitations of this current work, which as a retrospective, static picture of care does not provide a commentary on the evolution of performance, the entirety of care indicators, direct quantification of referrals to oncological/multidisciplinary services, nor allow comparison of care against other Canadian provincial systems. Given the inherent limitations of this dataset with incomplete understanding of patient- or disease- related details, our goal for this manuscript was not necessarily to judge performance of institutions but rather to utilize different strategies to assess attainable performance of quality indicators, allowing us to better consider such benchmarks moving forward. Finally, despite some of the large gaps seen between suggested benchmarks and actual care delivered, it is not unreasonable to set benchmarks as a urological community high in order to drive optimized care. However, one of the principles of setting such benchmarks are to set realistically attainable goals to engage surgeons and hospitals to drive processes and structures of care.

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FIGURES AND TABLES

Table 1. Quality of care indicators and benchmarks for MIBC care as defined by expert opinion*		
Group	**Indicator**	**Benchmark**
Structure	Annual surgical volume of radical cystectomy by each performing surgeon	>6
Process	Percent of patients with no neoadjuvant chemotherapy who had radical cystectomy within six weeks of last TURBT	>90%
	For patients with MIBC, percent who received any curative intent definitive therapy (radical cystectomy or radiation-based therapy)	>80%
	Percent of patients with adequate lymph node dissection defined as >14 nodes	>85%
	Percent of patients with MIBC being seen by medical oncologist (or discussed at a multidisciplinary tumor board) preoperatively for consideration of neoadjuvant chemotherapy	>90%
	For patients with MIBC and receiving neoadjuvant chemotherapy, percent who completed a minimum of three cycles of cisplatin-based combination therapy	>80%
	Percent of patients with MIBC on TURBT being referred to radiation oncology preoperatively for consideration of radiotherapy	>50%
Outcome	Percent with positive soft tissue margin at radical cystectomy	<10%
	Percent of patients deceased within 90 days post-cystectomy	<5%

*Quality-of-care Indicators, adapted from the 3rd BCQM (2019).[6] MIBC: muscle-invasive bladder cancer; TURBT: transurethral resection of bladder tumor.

Table 2. Real-world performance of quality indicators of radical cystectomy care in Ontario: Percent of institutions meeting expert opinion benchmarks from 2008–2013

Indicator	Expe - opinion benchmark	% of institutions meeting benchmark (total n=41) [#]	% of patients within the whole cohort (n=1573) treated by those institutions meeting benchmark [*]
Annual surgical volume of radical cystectomy by each surgeon performing this procedure >6	100%	20%	50%
Percent of patients with no neoadjuvant chemotherapy who had radical cystectomy within six weeks of last TURBT	>90%	0%	0%
Percent of patients with adequate lymph node dissection defined as >14 nodes	>85%	0%	0%
Percent of patients with ≥cT2 seen by medical oncologist preoperatively for consideration of neoadjuvant chemotherapy	>90%	2%	0.5%
Percent of patients with ≥cT2 being referred to radiation oncology preoperatively for consideration of radiotherapy	>50%	0%	0%
Percent with positive soft tissue margin at radical cystectomy	<10%	46%	48%
Percent of patients deceased within 90 days post-cystectomy	<5%	37%	31%

[*]Any fields with missing data was excluded from the denominator. [#]Only including institutions with less >10 cases performed over the 5 years. MIBC: muscle-invasive bladder cancer; TURBT: transurethral bladder tumor.

Table 3. Exploring different benchmark methodologies for quality-of-care indicators. Overall provincial performance and ABC™ benchmark of top institutions[#]

Indicator	Expert opinion benchmark	Overall provincial performance,* median (IQR)	ABC™ benchmarks (Actual performance observed from top institutions)
Annual surgical volume of radical cystectomy by each surgeon performing this procedure >6	100%	3.8 annual cases (1.8, 10.6)	95%
Percent of patients with no neoadjuvant chemotherapy who had radical cystectomy within six weeks of last TURBT	>90%	9.1 weeks (6, 14)	56%
Percent of patients with adequate lymph node dissection defined as >14 nodes	>85%	12 nodes (7, 19)	75%
Percent of patients with ≥cT2 seen by medical oncologist preoperatively for consideration of neoadjuvant chemotherapy	>90%	31% (20, 44)^	71%
Percent of patients with ≥cT2 being referred to radiation oncology preoperatively for consideration of radiotherapy	>50%	10% (3.9, 14.9)^	45%
Percent with positive soft tissue margin at radical cystectomy	<10%	12% (7.1, 17.6)	1.3%
Percent of patients deceased within 90 days post-cystectomy	<5%	8% (3.2, 12.1)	0.2%

*For the entire province over 5 years. Median (IQR). #Institutions with less than 10 cases over the 5 years were excluded (n=9). ^Percent of cases per institution. IQR: interquartile range displayed as (Q1,Q3); MIBC: muscle-invasive bladder cancer. TURBT: transurethral bladder tumor.

Table 4. Benchmarking of top institutions performance for quality indicators.* Rank order of best performing institutions and actual quality indicator attained over 5 years		
Expert opinion benchmark	**Rank order**	**Actual performance observed by top institutions**
Percent of patients with adequate lymph node dissection defined as >14 nodes	1	80.0
	2	72.7
	3	70.8
	4	67.0
Percent with positive soft tissue margin at radical cystectomy	1	0.0
	2	0.0
	3	0.0
	4	0.0
	5	0.0
	6	0.0
	7	4.2
	8	6.3
Percent of patients with ≥cT2 bladder cancer seen by medical oncologist preoperatively for consideration of neoadjuvant chemotherapy	1	100
	2	83.3
	3	59.3
	4	57.1
	5	55.6
	6	51.9
Those with ≥cT2 bladder cancer seen by an RO pre-surgery	1	50.0
	2	45.2
	3	40.0
	4	37.0
Percent of patients deceased within 90 days post-cystectomy	1	0.0
	2	0.0
	3	0.0
	4	0.0
	5	0.0
	6	0.0
	7	0.0
	8	1.8

	9	2.9
Annual surgical volume of radical cystectomy by each surgeon performing this procedure (>6)	1	100
	2	94.6
	3	90.3
Percent of patients with no neoadjuvant chemotherapy who had radical cystectomy within six weeks of last TURBT	1	57.1
	2	55.6
	3	48.4
	4	45.0

*Best performing institutions ranked until at least 10% of patients involved in the province from 2009–2103. RO: radiation oncology; TURBT: transurethral bladder tumor.