Are urologic surgeons performing robot-assisted radical prostatectomy at the University of Alberta meeting surgical quality performance benchmarks? The PROCURE-02 quality assurance study

Ben Beech, MD[1]; Graeme Follett, MD[1]; Sunita Ghosh, MD[2]; Jan K. Rudzinski, MD[1]; Ryan McLarty, MD[1]; Trevor Haines, MD[1]; Nick Dean, MD[1]; Steve Tong, MD[1]; Adrian S. Fairey, MD[1]

[1]Division of Urology, Department of Surgery, University of Alberta, Edmonton, AB, Canada; [2]Department of Oncology, University of Alberta, Edmonton, AB, Canada

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Abstract

Introduction: Robot-assisted radical prostatectomy (RARP) is a standard of care primary treatment for men with clinically localized prostate cancer (CLPC). The 2010 Canadian Urological Association (CUA) consensus guideline examining surgical quality performance for radical prostatectomy suggested benchmarks for surgical performance. To date, no study has examined whether Canadian surgeons are achieving these benchmarks. We determined the proportion of University of Alberta (UA) urologic surgeons achieving the CUA surgical quality performance outcome (SQPO) benchmarks.

Methods: A retrospective quality assurance analysis of prospectively collected data from the PROstate Cancer Urosurgery Repository of Edmonton (PROCURE) was performed. Men who underwent RARP for CLPC between September 2007 and May 2018 by one of seven surgeons were analyzed. SQPO were an unadjusted pT2–R1 resection rate <25%, blood transfusion rate <10%, rectal injury rate <1%, and 90-day mortality rate <1%. Descriptive statistics were used to determine the proportion of surgeons achieving the benchmarks.

Results: Data were evaluable for 2821 men. Seven of seven (100%) surgeons achieved a blood transfusion rate <10%, rectal injury rate <1%, and 90-day mortality rate <1%. However, only six of seven surgeons achieved an unadjusted pT2–R1 resection rate <25%; one surgeon had an unadjusted pT2–R1 resection rate of 27.9%. Limitations include the lack of centralized pathology review for surgical margin status by a dedicated genitourinary pathologist.

Conclusions: UA surgeons are achieving the CUA SQPO benchmarks for blood transfusion, rectal injury, and perioperative mortality. However, not all UA urologists are achieving a pT2–R1 resection rate <25%. Surgical quality performance initiatives designed to improve cancer control may be warranted.

Introduction

Radical prostatectomy is a standard of care primary treatment for men with clinically localized prostate cancer (CLPC).[1,2] Previous data has shown a learning curve for cancer control and established between-surgeon variation in both cancer control and functional preservation.[3-5] Surgical quality performance outcomes (SQPO) have been recognized across many surgical disciplines as there has been increased emphasis on quality assurance (QA) and quality improvement.[6-8] The 2010 Canadian Urological Association (CUA) consensus guideline examining surgical quality performance for radical prostatectomy suggested benchmarks for radical prostatectomy, including achieving an unadjusted pT2–R1 resection rate <25%, blood transfusion rate <10%, rectal injury rate <1%, and 90-day mortality rate <1%.[9] To date, no study has examined whether Canadian urologic surgeons are achieving these SQPO benchmarks. Therefore, the objective of the current QA study was to determine the proportion of University of Alberta (UA) urologic surgeons achieving the CUA 2010 SQPO benchmarks. We hypothesized that all surgeons were achieving these benchmarks.

Methods

Study cohort and design

The PROstate Cancer Urosurgery Repository of Edmonton (PROCURE) is a comprehensive database of men treated with radical prostatectomy (open or robot-assisted) for CLPC at the UA from September 2007 onwards. De-identified demographic, clinical, pathological, perioperative, and outcome data are abstracted from the medical record and entered in a REDCap registry.

This QA study (PROCURE-02) was a retrospective QA analysis of prospectively collected data. The final study cohort included 2821 consecutive men who underwent robot-assisted radical prostatectomy (RARP) for CLPC between September 2007 and May 2018 by one of seven urologic surgeons at one of two academic teaching hospitals in Edmonton, Alberta, Canada. All patient data used for this study were de-identified and, as per the UA Health Ethics

Research Board policy, did not meet the requirement for ethics board review.

Surgical technique

All men underwent RARP using the da Vinci® Surgical System. RARP was performed largely with adherence to the Ohio State University technique.[10] Performance of lymph node dissection and type of nerve-sparing surgery was at the discretion of the operating urologic surgeon.

Surgical quality performance outcomes

The 2010 CUA consensus guideline on radical prostatectomy identified SQPO. Only SQPO with specified benchmarks were selected as QA outcomes for the PROCURE-02 study. These SQPO were an unadjusted pT2–R1 resection rate <25%, blood transfusion rate <10%, rectal injury rate <1%, and 90-day mortality rate <1%. For the pT2–R1 pathology outcome, all radical prostatectomy specimens were submitted in total with standardized preparation, assessment, and reporting by general anatomic pathologists at our institutions. No dedicated genitourinary pathologist review was performed. A positive surgical margin (R1) was defined as extension of the tumor to the inked surface of the specimen.[11]

Statistical analysis

The database was closed for analysis on September 1, 2018. Data were analyzed using SAS 9.1.3 Service Pack 4 (Windows Platform). A sample size calculation was not relevant for the current QA analyses and, as such, the number of cases in the data set during the study period determined the sample size. Descriptive statistics were used to determine the proportion of urologic surgeons achieving the 2010 CUA consensus guideline SQPO benchmarks.

Results

Surgeon characteristics

Table 1 shows the surgeon characteristics. Three surgeons had performed >500 radical prostatectomy procedures prior to initiation of the study, whereas three surgeons had performed no prior radical prostatectomy procedures. The total number of radical prostatectomy cases performed by urologic surgeons during the study period ranged from 113–755.

Urologic surgeon training prior to initiation of clinical practice varied. All urologic surgeons had successfully completed Canadian urology surgery residency training programs. However, fellowship training was different; two surgeons had completed two-year Society of Urologic Oncology (SUO)-accredited fellowship training, two surgeons had completed one-year minimally invasive surgery fellowship training, one surgeon had completed three-year combined renal transplantation/minimally invasive surgery fellowship training, and two surgeons had completed one-year non-SUO-accredited urologic oncology fellowship training. In addition, only three of seven surgeons had completed robotic surgery training as a component of residency and/or fellowship.

Table 1. Surgeon characteristics

Surgeon no.	Prior surgeon experience, radical prostatectomy performed before study (n)	Total cases during study (n)
1	>500	734
2	>150	351
3	>500	755
4	>500	415
5	0	257
6	0	196
7	0	113

Baseline characteristics

Table 2 shows the preoperative baseline characteristics stratified by surgeon. The mean age at time of surgery ranged from 60–63 years. National Comprehensive Cancer Network (NCCN) very low-risk, low-risk, intermediate-risk, and high-risk disease ranged from 3–13%, 7–24%, 56–74%, and 7–15%, respectively.

Surgical quality performance outcomes

Table 3 shows the SQPO stratified by surgeon. Overall, seven of seven (100%) urologic surgeons achieved a blood transfusion rate <10%, rectal injury rate <1%, and 90-day mortality rate <1%. However, only six of seven urologic surgeons achieved an unadjusted pT2–R1 resection rate <25%; one urologic surgeon had an unadjusted pT2–R1 resection rate of 27.9%.

Discussion

The PROCURE-02 QA analysis is the first study to evaluate whether Canadian urologic surgeons are achieving the CUA 2010 SQPO benchmarks for radical prostatectomy. Two main findings emerged. First, UA urologic surgeons are achieving the SQPO benchmarks for blood transfusion, rectal injury, and perioperative mortality. Second, not all UA urologic surgeons are achieving a pT2–R1 resection rate <25%.

A main finding from the PROCURE-02 study was that UA urologic surgeons are achieving the SQPO benchmarks for blood transfusion, rectal injury, and perioperative mortal-

Table 2. Baseline patient characteristics stratified by surgeon

Baseline characteristic	Surgeon						
	1 (n=734)	2 (n=351)	3 (n=755)	4 (n=415)	5 (n=257)	6 (n=196)	7 (n=113)
Mean age in years (±SD)	63±7	61±6	60±7	62±7	63±7	61±6	62±6
NCCN risk group, n (%)*							
Very low-risk	61 (9)	42 (13)	73 (10)	42 (11)	8 (3)	16 (9)	3 (3)
Low-risk	145 (21)	81 (24)	118 (16)	77 (20)	45 (18)	12 (7)	10 (9)
Intermediate-risk	403 (59)	185 (56)	447 (62)	236 (61)	165 (66)	118 (69)	80 (74)
High-risk	71 (10)	23 (7)	87 (12)	35 (9)	30 (12)	26 (15)	15 (14)

*n=167 missing data. NCCN: National Comprehensive Cancer Network; SD, standard deviation.

ity. Comparison of our results is challenging, as no other RARP cohort has examined individual surgeon performance against published benchmarks. However, we can compare based on aggregate performance. In regard to blood transfusion, our aggregate rate was 1.6%. This is comparable to the published rates from other RARP cohorts, including 4% in the LAPPRO study,[12] 1.1% in the BAUS cohort,[13] 1% in the Australian RCT,[14] and 0.6% in the University of Ottawa cohort.[15] Consistent in the literature is that RARP leads to reduced rates of blood transfusion as compared to open radical prostatectomy.

A second finding from the current study was that not all UA urologic surgeons are achieving a pT2–R1 resection rate <25%. A single surgeon out of seven had a pT2–R1 rate of 27.9%, while all others met the benchmark. In our study, the aggregate rate for pT2–R1 resection was 17.4%. In comparison, the rate for the Ottawa group was 29.7%,[16] in the LAPPRO study it was 17%,[17] in the BAUS cohort it was 13%,[13] for the Global Robotics Institute it was 6.9%,[18] and in the Australian RCT it was 2%.[14] Positive surgical margin rate is known to be influenced by multiple factors, such as surgeon experience,[19] risk group,[20] and pathologist experience.[21] This may explain the wide range of reported rates in the literature. The Cancer Care Ontario experience demonstrates that a multipronged approach can improve performance in this domain.[22]

Our results have implications for clinical practice and research. Regarding clinical practice, they support the ongoing measurement and reporting of performance indicators as both QA and improvement measures. The Michigan Urological Surgery Improvement Collaborative (MUSIC) have provided an excellent example with their collaborative approach to quality improvement via the collection and sharing of outcome data.[23] Another would be the University of Ottawa group, who have recently published a study protocol using surgery report cards in an attempt to improve outcomes.[24] With regard to clinical research, our results suggest that ongoing work is needed to identify factors influencing between-surgeon variation in outcomes and methods to optimize the quality of care for all men undergoing surgery.

Our study has strengths and limitations that merit comment. Strengths include the prospective and comprehensive method of data collection, large sample size of Canadian men treated with robot-assisted surgery at a single academic center, and diversity of surgeons with regard to surgical experience, training, and case volume. Limitations include the lack of centralized pathology review for surgical margin status by a dedicated genitourinary pathologist and lack of data on functional preservation outcomes.

Conclusions

PROCURE-02 is the first study to determine whether Canadian urologic surgeons are achieving the CUA 2010 SQPO benchmarks for radical prostatectomy. We found that UA urologic surgeons are achieving the SQPO benchmarks for blood transfusion, rectal injury, and perioperative mortality but not all surgeons are achieving a pT2–R1 resection rate <25%. These data suggest that surgical quality performance initiatives designed to improve cancer control may be warranted.

Competing interests: Dr. Fairey has been a speaker on the topics of bladder cancer and prostate cancer for J&J and Roche. The remaining authors report no competing personal or financial interests related to this work.

Table 3. Surgical quality performance indicator outcomes stratified by surgeon

Baseline characteristic	Surgeon						
	1	2	3	4	5	6	7
Rectal injury, n (%)	2/734 (0.3)	0/351 (0)	2/755 (0.3)	3/415 (0.7)	1/257 (0.4)	0/196 (0)	0/113 (0)
Blood transfusion, n (%)	5/734 (0.7)	15/351 (4.3)	10/755 (1.3)	5/415 (1.2)	4/257 (1.6)	1/196 (0.5)	5/113 (4.4)
90-day mortality, n (%)	2/734 (0.3)	1/351 (0.3)	0/755 (0)	0/415 (0)	0/257 (0)	0/196 (0)	0/113 (0)
Unadjusted pT2-R1, n (%)	78/509 (15.3)	69/247 (27.9)	70/483 (14.5)	64/294 (21.8)	24/186 (12.9)	21/114 (18.4)	7/76 (9.2)

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This paper has been peer-reviewed

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Correspondence: Dr. Adrian S. Fairey, Division of Urology, Department of Surgery, University of Alberta, Edmonton, AB, Canada; afairey@ualberta.ca