Self-reported practice patterns and knowledge of rectal cancer care among Canadian general surgeons

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Background: Our objective was to examine the knowledge and treatment decision practice patterns of Canadian surgeons who treat patients with rectal cancer.

Methods: A mail survey with 6 questions on staging investigations, management of low rectal cancer, lymph node harvest, surgical margins and use of adjuvant therapies was sent to all general surgeons in Canada. Appropriate responses to survey questions were defined a priori. We compared survey responses according to surgeon training (colorectal/surgical oncology v. others) and geographic region (Atlantic, Central, West).

Results: The survey was sent to 2143 general surgeons; of the 1312 respondents, 703 treat patients with rectal cancer. Most surgeons responded appropriately to the questions regarding staging investigations (88%) and management of low rectal cancer (88%). Only 55% of surgeons correctly identified the recommended lymph node harvest as 12 or more nodes, 45% identified 5 cm as the recommended distal margin for upper rectal cancer, and 70% appropriately identified which patients should be referred for adjuvant therapy. Surgeons with subspecialty training were significantly more likely to provide correct responses to all of the survey questions than other surgeons. There was limited variation in responses according to geographic region. Subspecialty-trained surgeons and recent graduates were more likely to answer all of the survey questions correctly than other surgeons.

Conclusion: Initiatives are needed to ensure that all surgeons who treat patients with rectal cancer, regardless of training, maintain a thorough and accurate knowledge of rectal cancer treatment issues.

Contexte : Notre objectif était d'évaluer les connaissances et les processus décisionnels thérapeutiques des chirurgiens canadiens qui traitent des patients atteints de cancer rectal.

Méthodes : Un sondage envoyé par la poste comportant 6 questions sur les épreuves de stadification, la prise en charge du cancer du bas rectum, le prélèvement des ganglions lymphatiques, les marges chirurgicales et l'utilisation de traitements adjuvants a été envoyé à tous les chirurgiens généraux au Canada. Les réponses appropriées aux questions du sondage avaient été définies au préalable. Nous avons comparé les réponses au sondage selon la formation des chirurgiens (oncologie colorectale/chirurgicale c. autres) et selon la région (Atlantique, Centre, Ouest).

Résultats : Le sondage a été envoyé à 2143 chirurgiens généraux; parmi les 1312 répondants, 703 traitent des patients atteints de cancer rectal. La plupart des chirurgiens ont répondu de façon appropriée aux questions concernant les épreuves de stadification (88 %) et la prise en charge du cancer du bas rectum (88 %). Seulement 55 % des chirurgiens ont correctement répondu à la question sur le nombre optimal de ganglions lymphatiques à prélever, soit 12 ganglions ou plus, 45 % ont donné 5 cm comme marge distale recommandée pour le cancer du haut rectum et 70 % ont déterminé de manière appropriée quels patients il faut orienter vers un traitement adjuvant. Les chirurgiens qui avaient reçu une formation spécialisée étaient significativement plus susceptibles de fournir des réponses exactes à toutes les questions du sondage comparativement aux autres chirurgiens. On a noté une variation limitée entre les réponses selon les régions. Les chirurgiens spécialisés et les nouveaux diplômés étaient plus susceptibles de répondre correctement à toutes les questions du sondage comparativement aux autres chirurgiens.

Conclusion : Des initiatives s'imposent pour s'assurer qu'indépendamment de leur formation tous les chirurgiens qui traitent des patients atteints d'un cancer rectal maintiennent des connaissances complètes et exactes sur les enjeux thérapeutiques entourant le cancer rectal.

The management of rectal cancer has evolved considerably over the past 2 decades with significant advances in many areas, such as preoperative staging investigations, use of and timing of adjuvant therapies, surgical technique, reconstructive options and surveillance protocols.[1–5] As a result, the management of patients with rectal cancer has become increasingly complex. In order to make good treatment decisions and counsel patients appropriately, it is essential that surgeons acquire and maintain a comprehensive knowledge of rectal cancer treatment issues. The importance of surgeon knowledge was illustrated in a recent study in which patients with rectal cancer were more likely to receive sphincter-preserving surgery and a total mesorectal excision and were less likely to experience local recurrence if they were treated by a surgeon with greater knowledge of rectal cancer care.[6] However, very little is currently known about how much variation may exist in surgeon practice patterns and knowledge of rectal cancer care.

Two prior Canadian survey studies have suggested that there is variation in practice patterns among surgeons who treat rectal cancer and that there may be differences according to surgical training (fellowship v. non–fellowship trained).[7,8] However, these studies were small and examined regional patterns of care, and it is unknown if these findings reflect trends in other parts of the country or if there is geographic variation. Therefore, the purpose of the present research was to examine knowledge of rectal cancer care and treatment decision practice patterns among all surgeons who treat rectal cancer in Canada and to determine if there are differences in care according to geographic region or subspecialty training.

Methods

A mail questionnaire was sent to all practising general surgeons in Canada. A second questionnaire was mailed to nonresponders after 6 weeks. The survey was developed by the study investigators, and the content was reviewed by 2 colorectal surgeons who were not affiliated with the study. The survey collected information regarding surgical training, years in clinical practice and practice location. It consisted of 6 questions pertaining to preoperative staging investigations, surgical management of low rectal cancer, surgical margins, lymph node harvest and adjuvant therapy. The questions and response choices were developed in such a way that the response could be scored as "appropriate" or "inappropriate." The survey was translated into French, and surgeons in Quebec were sent both the English and French versions so they could complete the survey in the language of their choice.

Appropriate responses to the survey questions were defined a priori. Specifically, we defined appropriate preoperative staging investigations as complete assessment of the colon (colonoscopy or sigmoidoscopy with barium enema), imaging of the chest (computed tomography [CT] or chest radiography) and imaging of the liver and pelvis (abdominal and pelvic CT or magnetic resonance imaging [MRI]) based on National Comprehensice Cancer Network (NCCN) guidelines.[9] Two clinical scenarios regarding the management of low rectal cancer were presented to evaluate treatment decision practice patterns. Appropriate management of a healthy 55-year-old woman with normal continence and a mid-rectal cancer with T3N1 staging on preoperative imaging was defined as a low anterior resection (with or without loop ileostomy) and either neoadjuvant chemotherapy and radiation or adjuvant therapy based on the final pathology. Referral to a specialized treatment centre was also considered an acceptable response. Appropriate treatment for a healthy 55-year-old woman with normal continence and a midrectal cancer that was 3 cm in diameter and encompassed 20% of the lumen staged as T2N0 was defined as a low anterior resection (with or without loop ileostomy) followed by adjuvant therapy if indicated by pathology or referral of the patient for surgical treatment at a specialized centre. An adequate lymph node harvest was defined as 12 nodes.[10] An adequate distal resection margin for upper rectal cancer was defined as 5 cm.[11] Use of adjuvant therapy was defined as appropriate if surgeons indicated that they would refer patients with stage II and III rectal cancer for chemotherapy and radiation.

Approval for this study was obtained from our institutional research ethics board.

Statistical analysis

Analysis of survey responses was performed according to geographic region and according to fellowship training. Surgeons were grouped into 1 of 3 geographic regions: Atlantic (N.L., N.S., N.B., P.E.I.), Central (Que., Ont.) and West (Sask., Man., Alta., B.C.). We compared the responses of surgeons who indicated they had colorectal or surgical oncology fellowship training with those of surgeons without this type of fellowship training. Proportions of correct responses were compared using the χ^2 test, with significance set at $p < 0.05$. If a 2×2 table contained a cell count less than 5, we used the Fisher exact test. Multivariate logistic regression was performed to determine which factors were associated with correct responses to all of the items in the mail survey of practice patterns and knowledge of rectal cancer care. Factors entered into the multivariate model were determined a priori and included colorectal or surgical oncology fellowship training, region of practice, practice setting and years in practice. No significant interaction terms were identified. We considered results to be significant at $p < 0.05$. Analyses were performed using SAS software version 9.2 (SAS Institute).

Results

Surveys were sent to 2143 general surgeons in Canada, and the overall response rate was 61% (1312 of 2143).

Response rates ranged from 54% to 89% across the 10 provinces. Of the 1312 respondents, 703 indicated that they treated patients with rectal cancer and formed the study cohort. The demographic and practice characteristics of these surgeons are reported in Table 1. Only 7.5% of surgeons in the Atlantic region worked in an academic centre compared with 26% and 28% in the Central and West regions, respectively. Similarly, fewer surgeons in Atlantic Canada than in the rest of the country had fellowship training (11% v. 18%, respectively).

Regarding knowledge, 88% of surgeons correctly identified appropriate staging investigations for the evaluation of a new patient with rectal cancer. There were no differences in the correct response rate across practice regions (Atlantic 90%, Central 88%, West 88%, $p = 0.85$). However, surgeons with colorectal or surgical oncology fellowship training were more likely to select appropriate staging investigations than non–fellowship trained surgeons (94% v. 87%, respectively, $p = 0.032$). Among those who responded incorrectly, 95% omitted imaging of the chest.

Table 1. Demographic and practice characteristics of 703 Canadian general surgeons who treat patients with rectal cancer

Characteristic	Median (range) or %
Years in practice	12 (1–44)
Self-reported annual procedure volume	10 (1–100)
Subspecialty (colorectal or surgical oncology) training	
Yes	17
No	83
Practice location	
Atlantic	11
Central	61
West	28
Practice type	
Academic	27
Community hospital serving > 500 000	15
Community hospital serving 100 000–499 999	31
Community hospital serving < 100 000	27

The majority of surgeons (88%) selected an appropriate treatment for the clinical scenario involving a healthy 55-year-old patient with a rectal cancer 5 cm above the anorectal ring and T2N1 staging on preoperative imaging (Table 2). There was no significant difference in responses according to practice region (Atlantic 82%, Central 91%, West 87%, $p = 0.07$). Surgeons with colorectal or surgical oncology fellowship training were more likely to give a correct response than non–fellowship trained surgeons (99% v. 86%, respectively, $p = 0.004$). Given the second clinical scenario involving a healthy 55-year-old patient with rectal cancer 5 cm above the anorectal ring and T2N0 on preoperative imaging, 87% of surgeons selected an appropriate response (Table 3). There was a significant variation in the proportion of appropriate responses according to both practice region (Atlantic 62%, Central 76%, West 65%, $p = 0.007$) and completion of specialty training (fellowship-trained surgeons 83%, non–fellowship trained surgeons 69%, $p < 0.001$).

Surgeons were asked how many lymph nodes are recommended for staging rectal cancer, and 55% answered correctly (≥ 12 nodes). The median response was 12 nodes and responses ranged from 1 to 25 nodes. The proportion of correct responses was significantly different according to practice region and fellowship training (Table 4). Only 45% of surgeons indicated that an adequate distal resection margin for an upper rectal cancer was at least 5 cm. The mean response was 3.55 cm and responses ranged from 1 cm to 15 cm. There was no difference in responses according to geographic region; however, surgeons with colorectal or surgical oncology fellowship training were more likely to give a correct response (Table 4). Surgeons were asked about adjuvant therapy for rectal cancer, and 69% of respondents knew which TNM-stage tumours require adjuvant therapy. There was no difference in

Table 2. Treatment recommendations of Canadian general surgeons for a healthy 55-year-old woman with normal continence and a midrectal cancer with T3N1 preoperative staging

Treatment	Overall responses, %	Responses by practice region, %			Responses according to surgeon training, %	
		Atlantic	Central	West	Fellowship*	Other
Neoadjuvant therapy and low anterior resection†	78	66	81	77	97	74
Low anterior resection ± adjuvant therapy based on pathology†	1	5	1	2	1	2
Referral to a specialized treatment centre†	9	11	9	8	2	11
APR and neoadjuvant or adjuvant therapy	12	18	9	13	0	13

APR = abdominoperineal resection.
*Colorectal/surgical oncology fellowship.
†Indicates a correct response.

responses according to geographic region; however, surgeons with colorectal or surgical oncology fellowship training were more likely to respond correctly (Table 4).

Overall, only 17% of surgeons answered all of the questions correctly, and surgeons with colorectal/surgical oncology training were more likely to provide correct responses to all of the questions than other surgeons (34% v. 14%, respectively, $p < 0.001$). The proportion of surgeons who responded correctly to all of the questions was 11% in the Atlantic region, 20% in the Central region and 15% in the Western region; however, these differences were not significant. On multivariate analysis, completion of colorectal/surgical oncology fellowship training and fewer years in practice were associated with providing a correct response to all of the questions (Table 5).

Discussion

The results of this study demonstrate that rectal cancer care in Canada is provided in a variety of clinical settings and that most surgeons who treat patients with rectal cancer work in community hospitals and do not have subspecialty training. While the majority of surgeons who treat rectal cancer provided correct responses for the clinical scenarios and survey questions, surgeons with subspecialty training were more likely to respond correctly than non–subspecialty trained surgeons. There was some regional variation in care, with fewer surgeons in Atlantic Canada providing correct responses. However, this may simply reflect the lower proportion of colorectal surgeons/surgical oncologists practising in that region.

Previous research has reported improved outcomes among patients with rectal cancer who are treated by surgeons with subspecialty training, including increased use of sphincter-preserving surgery,[12–15] decreased local recurrence,[12,16] decreased anastomotic leak,[16,17] decreased postoperative mortality[16] and improved disease-specific survival.[16,18] It has been suggested that this variation in outcomes may reflect differences in surgical technique. While the importance of total mesorectal excision (TME) in the management of rectal cancer is well established,[1] surgeons contribute more than just technical expertise to the treatment of these patients. For example, receipt of neoadjuvant/adjuvant therapies is associated with improved survival in patients with stage II and III rectal cancer,[19] and surgeons play a central role in deciding which patients are referred for such treatment. The present study suggests that there are differences in knowledge and practice patterns between colorectal surgeons/surgical oncologists and

Table 3. Treatment recommendations of Canadian general surgeons for a healthy 55-year-old woman with normal continence and a mid-rectal cancer that is 3 cm in diameter, encompasses 20% of the lumen, staged as T2N0 on preoperative imaging

Treatment	Overall responses, %	Responses by practice region, %			Responses according to surgeon training, %	
		Atlantic	Central	West	Fellowship*	Other
Neoadjuvant therapy and low anterior resection†	14	13	15	24	12	18
Low anterior resection ± adjuvant therapy based on pathology†	64	58	68	56	82	60
Referral to a specialized treatment centre†	9	6	9	9	2	10
APR and neoadjuvant or adjuvant therapy	7	8	4	8	1	7
Transanal excision	6	15	4	3	3	5

APR = abdominoperineal resection.
*Colorectal or surgical oncology fellowship.
†Correct response.

Table 4. Knowledge of Canadian general surgeons regarding lymph node harvest, distal resection margin for upper rectal cancer and indications for adjuvant therapy in patients with rectal cancer.

Factor	Responses by practice region, %			Responses according to surgeon training, %	
	Atlantic	Central	West	Fellowship*	Others
Surgeons who indicated that ≥ 12 lymph nodes are recommended for staging rectal cancer†‡	36	61	48	71	51
Surgeons who indicated that an adequate distal resection margin for upper rectal cancer is ≥ 5 cm‡	37	46	46	67	41
Surgeons who would refer patients with stage II/III rectal cancer for adjuvant therapy‡	62	70	70	79	67

*Colorectal/surgical oncology fellowship.
†Significant difference across practice regions ($p < 0.01$).
‡Significant difference according to fellowship training ($p < 0.01$).

non–subspecialty trained surgeons. These differences may explain, to some extent, the previously reported variation in patient outcomes according to surgeon training.

While subspecialty-trained surgeons were more likely to respond correctly to the survey questions, the present study suggests that there is room for knowledge improvement among all surgeons who treat patients with rectal cancer. There was considerable variation in the responses regarding distal margin for upper rectal cancer and appropriate selection of patients for adjuvant therapy. Decisions based on inaccurate knowledge in these areas of rectal cancer care could clearly have a negative impact on patient outcomes. It is particularly concerning that only 55% of surgeons responded correctly to the question regarding lymph node harvest given that, for more than a decade, practice guidelines from several North American organizations have consistently recommended the assessment of at least 12 lymph nodes.[9,10,20] Furthermore, lymph node harvest after colorectal cancer resection has been the focus of many papers, reviews and editorials in recent years. This raises questions about how surgeons acquire and maintain knowledge.

Formal surgical training plays a central role in surgeon education. In the present study fellowship-trained surgeons and recent graduates were more likely to respond correctly to all of the survey questions than other surgeons. However, continuing professional development (CPD) after completion of training is necessary to maintain existing knowledge and to acquire new knowledge and learn technologies and techniques that were not part of residency or fellowship curricula. Continuing education may occur in several formats but has traditionally involved attending didactic sessions at conferences, courses or rounds. Such activities can improve professional practice and health care outcomes; however, the effects are typically small and do not impact complex behaviours.[21] Interactive CPD activities involving hands-on practice or case discussions in addition to didactic sessions may be a more effective way to alter physician behaviour and improve patient outcomes.[21] However, most of this research has come from nonsurgical disciplines, and it is unclear how various CPD formats may impact or improve specific aspects of surgeon knowledge.

Table 5. Multivariate analysis of factors associated with providing correct responses to all of the items in the mail survey of practice patterns and knowledge of rectal cancer care

Factor	OR (95% CI)
Colorectal/surgical oncology fellowship	
Yes	3.5 (1.99–6.14)
No	1.0
Region	
Atlantic	0.57 (0.26–1.22)
West	0.59 (0.35–0.98)
Central	1.0
Practice setting	
Academic	1.03 (0.59–1.79)
Other	1.0
Years in practice	0.94 (0.92–0.96)

CI = confidence interval; OR = odds ratio.

Most of the existing CPD literature related to rectal cancer care, including 2 Canadian studies,[22,23] has examined training surgeons in the technique of TME. Phang[22] developed a province-wide strategy to improve rectal cancer care in British Columbia using didactic sessions, videos and hands-on cadaveric dissection. Approximately 80% of surgeons performing rectal cancer surgery in the province participated in the program, resulting in increased use of TME and neoadjuvant radiation and decreased local recurrence in patients with stage III disease.[24,25] Surgeon knowledge of the course content was assessed using a written test. There was a significant improvement in surgeon knowledge after completion of the course, and this was maintained when reassessed a year later.[26] These data suggest that well-designed, comprehensive courses attended by interested surgeons can lead to improvements in surgeon knowledge and clinical outcomes.

However, at present, participation in such educational events is voluntary. Although the Royal College of Physicians and Surgeons of Canada requires all general surgeons to participate in CPD annually, there are no stipulations that the content of the CPD activities must relate to specific areas of a surgeon's clinical practice. Surgeons simply need to accumulate adequate CPD hours in order to maintain certification. Ideally, CPD should involve a 4-step process: 1) physician assessment to identify areas in need of improvement, 2) participation in learning activities, 3) application of new knowledge/skills into practice and 4) assessment of patient outcomes.[27] Previous research has suggested that providing general surgeons with a simple framework to complete these steps can have a favourable impact on clinical practice.[28] However, widespread implementation and regulation of such a program presents significant challenges given the broad scope of diseases treated by general surgeons and the lack of infrastructure to assess both physician knowledge and patient outcomes.

Limitations

There are several limitations associated with the present study that should be considered. A low response rate may limit the conclusions that can be drawn from survey research. However, our survey had an overall response rate of 61%, which exceeds the generally acceptable threshold for this type of research. We did not have any information for the nonresponders in this study, therefore we were not able to assess response bias. If respondents reported what they perceived to be the correct responses as opposed to their actual clinical practice, then reporting bias may be a concern. However, a previous study has suggested that physician practice patterns measured using a

clinical vignette are similar to actual clinical practice.[29] The correct responses to the survey were based on consensus decisions of the colorectal surgeons and surgical oncologists at our institution. Although the questions were designed to have clearly correct responses, there may be controversy surrounding some of the topics that were addressed, and alternative answers to the questions may have been considered reasonable by some surgeons. The grouping of provinces for geographic analysis was made arbitrarily by the study investigators and was not based on any recognized variation of practice patterns. Finally, the survey responses have not been linked to patient care or outcomes. However, previous research using an identical measure of surgeon knowledge and treatment decision practice patterns demonstrated improved outcomes for patients if they were treated by surgeons with extensive knowledge of rectal cancer care.[6]

Conclusion

Although there were differences in practice patterns and knowledge of rectal cancer care between surgeons with colorectal/surgical oncology training and non–subspecialty trained surgeons, our study suggests that there are important deficiencies in knowledge among both groups of surgeons. Initiatives are needed to ensure that all surgeons who treat patients with rectal cancer, regardless of training, maintain a thorough and accurate knowledge of rectal cancer treatment issues.

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Contributors: All authors designed the study. D. Richardson and G. Porter acquired and analyzed the data, which P. Johnson also analyzed. All authors wrote and reviewed the article and approved the final version for publication.

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