

Top 10 research priorities for early-stage colorectal cancer: a Canadian patient-oriented priority-setting partnership

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Abstract

Background: Colorectal cancer, one of the most commonly diagnosed cancers, is now being detected earlier and treatments are improving, which means that patients are living longer. Partnering with Canadian clinicians, patients and researchers, we aimed to determine research priorities for those living with early-stage colorectal cancer in Canada.

Methods: We followed the well-established priority-setting partnership outlined by the James Lind Alliance to identify and prioritize unanswered questions about early-stage (i.e., stages I–III) colorectal cancer. The study was conducted from September 2018 to September 2020. We surveyed patients, caregivers and clinicians from across Canada between June 2019 and December 2019. We categorized the responses using thematic analysis to generate a list of unique questions. We conducted an interim prioritization survey from April 2020 to July 2020, with patients, caregivers and clinicians, to determine a shorter list of questions, which was then reviewed at a final meeting (involving patients, caregivers and clinicians) in September 2020. At that meeting, we used a consensus-based process to determine the top 10 priorities.

Results: For the initial survey, 370 responses were submitted by 185 individuals; of the 98 individuals who provided demographic information, 44 (45%) were patients, 16 (16%) were caregivers, 7 (7%) were members of an advocacy group, 26 (27%) were health care professionals and 5 (5%) were categorized as “other.” The responses were refined to create a list of 66 unique unanswered questions. Twenty-five respondents answered the interim prioritization survey: 13 patients (52%), 2 caregivers (8%), 3 advocacy group members (12%) and 7 health care professionals (28%). This led to a list of the top 30 questions. The final consensus meeting involved 20 individuals (10 patients [50%], 3 caregivers [15%] and 7 health care professionals [35%]), who agreed to the top 10 research priorities. The priorities covered a range of topics, including screening, treatment, recurrence, management of adverse effects and decision-making.

Interpretation: We determined the top research priorities for early-stage colorectal cancer using a collaborative partnership of stakeholders from across Canada. The priorities covered a broad range of topics that could be addressed by future research, including improved screening practices, the role of personalized medicine, the management of adverse effects of treatment, decision-making and prevention of recurrence.

Plain language summary: Colorectal cancer is one of the most commonly diagnosed cancers. We partnered with clinicians, patients and researchers from across Canada to determine the future research priorities for early-stage colorectal cancer. We followed a well-established process to partner with patients, as outlined by the James Lind Alliance. We surveyed patients, caregivers and clinicians to elicit their questions. We used this input to generate a list of potential research questions. We conducted a second survey to create a shorter list of highest-priority questions, which was reviewed at a final meeting. We used a consensus process to determine the top 10 priorities. The topic with greatest priority was prevention of recurrence of colorectal cancer. We encourage funding agencies and research teams to pursue the research questions generated through this collaborative national priority-setting process.

Colorectal cancer is the third most commonly diagnosed cancer in Canada, with early-stage disease (i.e., stages I–III) representing about 80% of diagnoses.¹ Earlier detection and improved treatments mean that patients are living longer after a diagnosis.² Research has shown that, despite potentially being cured of their disease, survivors of colorectal cancer may experience negative long-term effects on their physical and mental health^{3,4} and their quality of life,⁵ and they may have difficulty navigating the health care system.⁵ Although some research exists,^{3–9} an anticipated increase

in the incidence of colorectal cancer and a growing population of survivors¹ mean that more research on survivorship is needed to address the many gaps in knowledge that remain.

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Tackling the vast topic of colorectal cancer survivorship is difficult, given the lack of clarity about research priorities. To date, these priorities have generally focused on new drug treatments or have been determined by researchers with minimal patient engagement.¹⁰ The unique perspectives of patients and those caring for them (caregivers and clinicians) are rarely sought when determining research priorities.¹¹ Given that patients are the ones living with the disease, their perspectives about the problems they encounter and the problems that should be priorities for future research are important.^{11,12} Engaging patients in all stages of the research process, including prioritization, is recommended to achieve more patient-oriented research,¹³ to help with efficient use of research funds¹⁴ and to help with translation of research into practice.¹⁵ Our objective was to determine the research priorities for those living with and beyond diagnosis of early-stage colorectal cancer, using a collaborative partnership involving clinicians, patients and researchers from across Canada.

Methods

Study design and setting

We used the James Lind Alliance (JLA) methodology to conduct our priority-setting partnership.¹⁶ The JLA was established in 2004 as a nonprofit initiative to enable patient, caregiver and clinician involvement in setting priorities for future research.¹⁶ The JLA methodology is an established and rigorous process based on principles underlying priority-setting partnerships. More than 70 studies involving such partnerships have been conducted for a variety of benign and malignant conditions. The goal of a JLA priority-setting partnership is to identify and prioritize evidence uncertainties (“questions about healthcare that cannot be answered by existing research”).¹⁶

We followed the methodology outlined by the JLA¹⁶ but did not hire an external JLA consultant. Instead, we included a local JLA methods expert (N.N.) as a co-investigator on our study team. Together with our steering committee, we defined the objective of our priority-setting partnership as follows: to determine the research priorities for those living with and beyond a diagnosis of early-stage colorectal cancer.

The study had 4 phases: initial survey, assessment of uncertainty, interim priority-ranking survey and final priority-setting meeting. Details of the methodology are outlined in our protocol, which can be obtained upon request to the corresponding author.

Steering committee

We formed a steering committee for our priority-setting partnership in September 2018. The steering committee included national representation through 5 colorectal cancer clinicians (C.C., M.V., S.S., K.R., W.Y.C.), 4 patients with lived experience of colorectal cancer (B.S., G.L., L.D., D.H.), 1 representative from Colorectal Cancer Canada (a nonprofit advocacy group [B.S.]) and 3 researchers with methodologic or content expertise (C.C., N.N., W.Y.C.); some members had dual roles. Our steering committee met monthly from

September 2018 to August 2020. The same 10-member steering committee was involved throughout to guide all aspects of the project, including deciding on the scope, developing the study protocol, codeveloping the initial survey, coding the survey results, planning the final meeting and performing knowledge dissemination activities.

Participants

For both the initial and interim prioritization surveys, people could participate in the survey if they were 18 years of age or older, were residents of Canada and were in 1 of the following categories: people diagnosed with early-stage colorectal cancer; carers of people with early-stage colorectal cancer; doctors, nurses or allied health professionals (e.g., radiation technologists, social workers, psychologists) with clinical experience in early-stage colorectal cancer; or members of organizations that support patients with colorectal cancer and their caregivers (e.g., not-for-profit groups). We excluded those with stage IV colorectal cancer and their caregivers. Those who participated in the initial survey were eligible to participate in subsequent phases of the study, including the final priority-setting meeting.

Process

Initial survey

The steering committee codeveloped the initial open-ended survey to gather potential research questions from patients, caregivers and health care providers. The format of the survey and questions were based on prior JLA surveys,^{16–18} our clinical expertise and input from patient partners. Our goal was to gather a broad range of questions related to the experience of living with and beyond early-stage colorectal cancer (the initial survey is presented in Appendix 1, available at www.cmajopen.ca/content/10/1/E278/suppl/DC1). We pilot tested the survey with 9 people (3 patients, 2 caregivers, 2 clinicians and 2 patient committee members).

We used convenience and snowball sampling and a variety of recruitment methods, including email through professional and advocacy organizations, posters and social media (recruitment materials are presented in Appendix 2, available at www.cmajopen.ca/content/10/1/E278/suppl/DC1). Some professional organizations agreed to send reminders about the survey after the initial email, whereas others did not.

The survey was accessible through the dedicated study website or by a direct link. We collected information using the survey platform Qualtrics from June 2019 to December 2019. The Qualtrics platform limits survey responses to 1 per IP address. The survey was available in English.

The lead author (C.C.) reviewed the survey responses to remove any suggested research questions deemed out of scope. The same author, who is an experienced qualitative researcher, subsequently coded the responses into broad categories using thematic analysis.¹⁹ From these broad categories, the lead author generated a list of “indicative research questions,”¹⁶ which was then reviewed by committee members working in pairs (1 clinical member and 1 patient member) to refine the questions further and combine any categories.

We used a spreadsheet (Microsoft Excel) to organize the data, with each iterative step of the analysis recorded separately. All members of the steering committee provided feedback on the themes, wording of the questions and duplication of questions during a 2-hour in-person meeting in Calgary in February 2020.

Assessment of uncertainty

The lead author (C.C.), in partnership with members of the clinical steering committee (M.V., S.S., K.R., W.Y.C.), reviewed the literature to ensure the questions had not already been fully answered with high-level evidence. The lead author (C.C.) assessed each of the indicative questions by searching the Cochrane Database of Systematic Reviews. She also reviewed clinical practice guidelines (including reference lists within the guidelines) from Alberta Health Services Cancer Care, the American Society of Clinical Oncology, the National Comprehensive Cancer Network (US) and the British Columbia Cancer Agency. The searches were limited to guidelines published in English between 2010 and 2020.

If evidence was identified, we reviewed the content to determine whether the corresponding indicative question had been answered. The process of review took place at our 2-hour in-person meeting in Calgary in February 2020; whether a question was answered (yes or no/incompletely answered) was agreed to by consensus among the clinical team members (C.C., S.S., K.R., W.Y.C.).

Interim priority ranking

We carried out an interim prioritization of the questions generated in the previous step to shorten the list of questions. This prioritization of questions occurred through a second online survey using the same website and survey platform (Appendix 3, available at www.cmajopen.ca/content/10/1/E278/suppl/DC1), from April 2020 to July 2020. The second online survey was developed by the steering committee members and our JLA local expert (N.N.); it was not piloted tested before distribution.

Participants were provided with the long list of questions and asked to rank their top 10 from most important (scored as 1) to least important (scored as 10). Potential participants included members of the steering committee, people who participated in the first survey and consented to being recontacted, and anyone who met the inclusion criteria described above (using email contact lists for distribution, as described in Appendix 2). The aim of this stage was to determine the top 30 priorities.

Final priority-setting meeting

A consensus meeting was held on Sept. 23, 2020, to rank the questions on the short list and to agree on the top 10 priorities. Participants included members of the steering committee, people who participated in the first or second survey and consented to being recontacted, and anyone who met the inclusion criteria described above (using email contact lists for distribution, as described in Appendix 2). We used convenience and snowball sampling and a variety of

recruitment methods, including direct email through professional associations.

We used small-group and whole-group discussions, led by an experienced JLA moderator, and placed an emphasis on equity and inclusivity.¹⁶ We hired the external JLA moderator to ensure transparency, accountability and fairness.

The consensus meeting followed an adapted nominal group technique that has been well established.¹⁶ Briefly, the participants were first divided into 3 small groups with equal distribution of patients, caregivers and clinicians. Each group was given a copy of the top 30 questions. The facilitator for each group (N.N., E.D. and the external moderator, respectively) used an online whiteboard to display the questions and move them to different priority areas (top, middle or bottom) as the discussion progressed.

During a second small-group session, the same 3 groups were guided by their respective facilitators (N.N., E.D., external moderator) to prioritize the questions to reach a top 10 list. The logistic support person (C.F.) compiled an aggregate ranking, using the individual small-group rankings; the group facilitators reviewed the aggregate ranking, which was then presented to all participants in a large-group format. Participants were assigned to different small groups, each with a different facilitator, to discuss and rank the questions a final time. The revised ranking was again aggregated using the same process. The moderator led the large group in a discussion of the second aggregate ranking, and participants agreed upon any revisions to the top 10 research priorities by consensus.

The consensus meeting was changed to a virtual format because of travel restrictions associated with the COVID-19 pandemic. We followed examples where adaptations to in-person meetings have been published²⁰ and also sought informal consultation through the JLA. The process we followed to tailor the final meeting to a virtual format has been described elsewhere.²¹ All participants at the final meeting were given a gift card allowing them to purchase a meal for the day. At the end of the meeting, we conducted a survey to assess participant satisfaction.

Patient engagement

Following the principles of the JLA¹⁶ and the Strategy for Patient-Oriented Research patient framework,^{13,22} we collaborated²³ with patient partners throughout the research process. Our steering committee included 4 patients with lived experience of either colon or rectal cancer (B.S., G.L., L.D., D.H.). The steering committee members were from across Canada and met monthly via teleconference for the entire study period (September 2018–September 2020). Our patient committee members were given equitable voice during both protocol and survey development, recruitment of survey participants, data analysis and planning for the final meeting. Our final consensus meeting included additional patient and family caregivers, who were consulted²³ on the final top 10 research priorities. All members of the steering committee were invited to provide feedback on the final manuscript and to engage in knowledge dissemination through their local networks.

Statistical analysis

Descriptive statistics were used to summarize the characteristics of the survey respondents for each of the surveys.

Ethics approval

This study received approval through our institutional ethics board (HREBA-CC-18-0351).

Results

Initial survey

The progress of the study, including generation of results, is represented in Figure 1. A total of 370 questions were submitted by 185 individuals. Of these individuals, 98 provided complete demographic information (Table 1): 45% ($n = 44$) of these respondents were patients, 16% ($n = 16$) were caregivers, 27% ($n = 26$) were health care providers, 7% ($n = 7$) were from colorectal cancer advocacy organizations, and 5% ($n = 5$) identified as other.

The 370 questions submitted were often written as personal stories or statements. These narratives were initially organized into the following broad categories: diagnosis (48 [13%]), treatment (35 [9%]), treatment complications or adverse effects (53 [14%]), monitoring for recurrence

(44 [12%]), rehabilitation (44 [12%]), quality of life (24 [6%]), lifestyle factors (31 [8%]), support for patients (29 [8%]), support for caregivers (13 [4%]), prevention (23 [6%]) and miscellaneous (26 [7%]) (Table 2). Thirty-three questions were removed because they were considered out of scope (e.g., there was no question, or the question was not related to colorectal cancer).

Assessment of uncertainty

No questions were removed after our review of the literature to ascertain whether a question had already been answered on the basis of high-level evidence.

Interim priority ranking

A list of 66 unique questions was put forth for the interim prioritization process. Twenty-five people participated in the interim prioritization survey (Table 1), during which a list of 30 questions (Box 1) was generated to be taken to the final consensus meeting.

Final priority-setting meeting

The participants at the final virtual consensus meeting were 7 colorectal cancer clinicians, 10 patients with colorectal cancer (2 of whom were also members of the advocacy organization

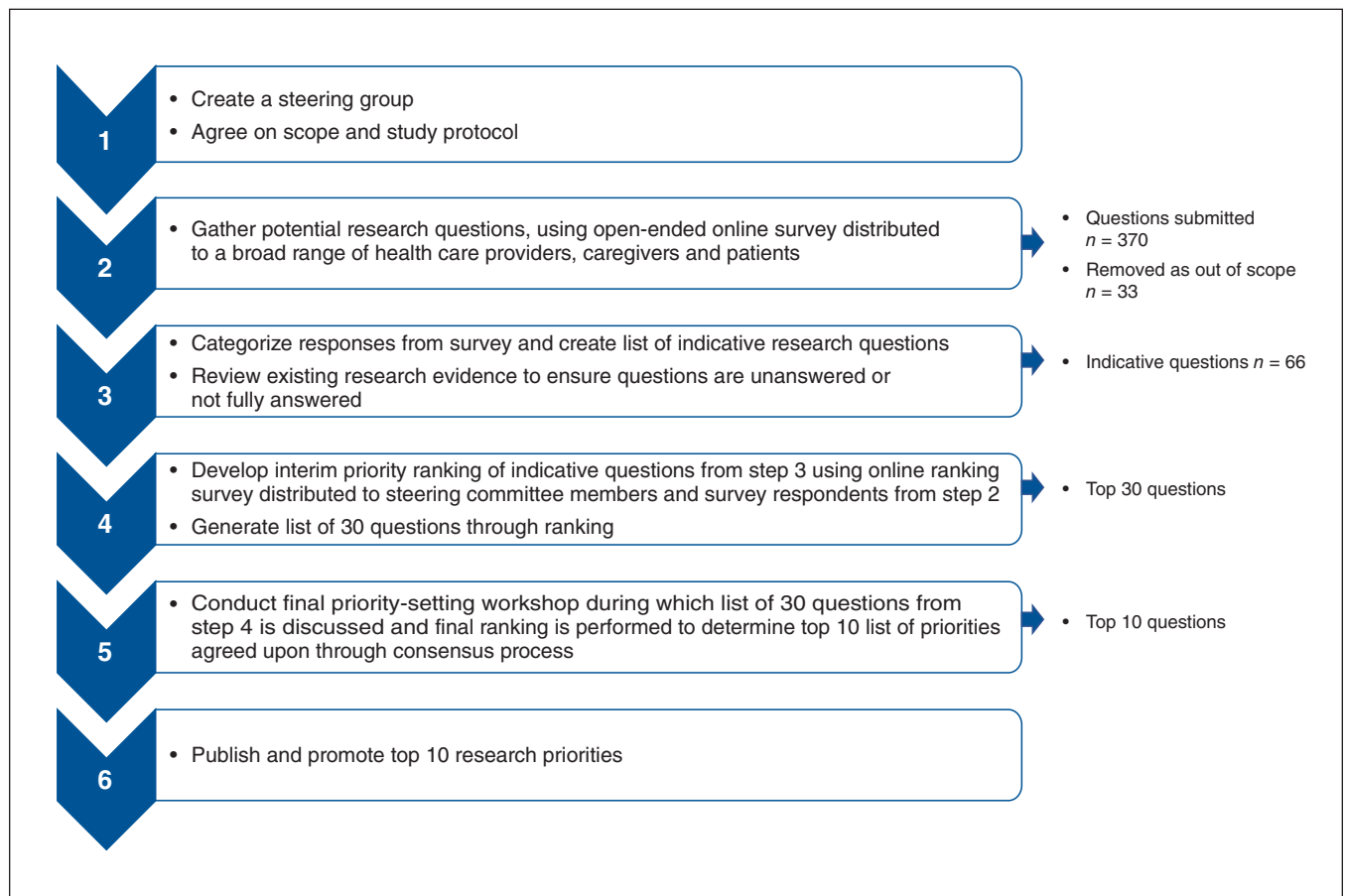


Figure 1: Steps in priority-setting partnership for early-stage colorectal cancer. Adapted, with permission, from James Lind Alliance: How does a JLA PSP work? (<https://www.jla.nihr.ac.uk/about-the-james-lind-alliance/downloads/JLA-PSP-process-final.pdf>).

Table 1 (part 1 of 2): Characteristics of participants

Characteristic	Phase of study; no. (%) of participants		
	Initial survey <i>n</i> = 185*	Interim prioritization <i>n</i> = 25	Final meeting <i>n</i> = 20
Type of participant			
Patient	44 (45)	13 (52)	10 (50)
Caregiver	16 (16)	2 (8)	3 (15)
Advocacy group member	7 (7)	3 (12)	2§
Other	5 (5)	0	
Health professional			
Nurse	12 (46)	2 (29)	2 (29)
Surgeon	1 (4)	0	0
Medical oncologist	6 (23)	3 (43)	5 (71)
Radiation oncologist	1 (4)	0	0
Pharmacist	1 (4)	0	0
Other	5 (19)	2 (29)	0
Age, yr			
18–29	4 (4)	1 (4)	0
30–39	7 (7)	0	4 (20)
40–49	19 (19)	3 (12)	6 (30)
50–59	29 (30)	9 (36)	8 (40)
60–69	27 (28)	9 (36)	1 (5)
70–79	11 (11)	0	1 (5)
≥ 80	1 (1)	2 (8)	0
Prefer not to say	0	1 (4)	0
Sex			
Male	39 (40)	9 (36)	8 (40)
Female	59 (60)	16 (64)	12 (60)
Ethnicity			
White	93 (95)	23 (92)	17 (85)
South Asian	2 (2)	1 (4)	3 (15)
Mixed	1 (1)		0
Prefer not to say	2 (2)	1 (4)	0
Colorectal cancer stage			
I	<i>n</i> = 44 9 (20)	<i>n</i> = 13 0	<i>n</i> = 10 0
II	8 (18)	4 (31)	3 (30)
III	27 (61)	8 (62)	6 (60)
IV	0	1 (8)	1 (10)
Time since diagnosis, yr			
1–5	26 (59)	7 (54)	3 (30)
5–10	12 (27)	4 (31)	5 (50)
> 10	6 (14)	2 (15)	2 (20)
Place of residence			
British Columbia	<i>n</i> = 98 6 (6)	<i>n</i> = 25 0	<i>n</i> = 20 1 (5)
Alberta	46 (47)	16 (64)	10 (50)
Saskatchewan	3 (3)	0	0

Table 1 (part 2 of 2): Characteristics of participants

Characteristic	Phase of study; no. (%) of participants		
	Initial survey <i>n</i> = 185*	Interim prioritization <i>n</i> = 25	Final meeting <i>n</i> = 20
Manitoba	11 (11)	0	0
Ontario	21 (21)	4 (16)	5 (25)
Quebec	5 (5)	5 (20)	3 (15)
Atlantic†	6 (6)	0	1 (5)
Rural‡	10 (11)	5 (20)	3 (15)
Urban‡	61 (62)	20 (80)	17 (85)
Rurality data missing	27 (28)	0	0

*Only 98 participants provided demographic information.
†The Atlantic region consists of Prince Edward Island, Nova Scotia, Newfoundland and Labrador, and New Brunswick.
‡Rural was defined as not urban. Urban was defined as core population density of 1000 people per square mile and population density of surrounding area of 500 people per square mile (1 mi² = 2.6 km²).
§Advocacy group members at the final meeting were also patients with colorectal cancer.

Colorectal Cancer Canada) and 3 caregivers. The moderator, 2 small-group facilitators, 1 logistical support person and 1 student observer, who did not participate in any of the discussions, were also in attendance. Five of the participants (clinicians, patients, caregivers) had not been involved in either of the previous phases of the study. The characteristics of the participants are presented in Table 1.

Small-group discussions led to an initial aggregated rank order of the original 30 questions. A second round of small-group discussions and a large-group discussion led to a final prioritized list of the top 10 research priorities (Box 1) agreed upon by consensus. The top research priority was prevention of recurrence.

Most participants were very satisfied with their overall experience in the virtual meeting (Appendix 4, available at www.cmajopen.ca/content/10/1/E278/suppl/DC1).

Interpretation

Future research has the potential to improve the lives of those affected by colorectal cancer.^{12,24} Using the well-established process of the JLA, we collaborated with patients, their caregivers and health care providers from across Canada to jointly determine the top 10 future research priorities for early-stage colorectal cancer. The priorities covered a range of topics, including improved screening practices, the role of personalized medicine, management of adverse effects of treatment, decision-making and prevention of recurrence. The broad range of topics indicates that there are still many knowledge gaps in colorectal cancer survivorship that could be addressed by future research.

The top research priority was prevention of recurrence. Recurrence occurs in more than 40% of patients with stage II or III colorectal cancer,²⁵ and fear of recurrence is reported

Table 2: Categories of research questions, with examples of raw data and initial indicative question from initial survey

Category	Raw data	Initial indicative question
Diagnosis	“We typically test for colorectal cancer in men at age 50. Can we change this to 45 to catch this cancer at an even earlier stage?” “Colonoscopy should be started at age 40 not 50, I had cancer at 45.”	What is the feasibility and necessity of beginning screening at an early age, given the rise in CRC in those under age 50?
Treatment	“What about holistic methods of treating cancer?” “Why is change of diet not included in treatment?”	What is the evidence for complementary and alternative treatments?
Treatment complications or adverse effects	“How can peripheral neuropathy be better treated?” “Is there better ways to treat neuropathy? Hands are an important part in everyday life, to disregard the devastating events chemo can play with the use of our hands is very upsetting to me personally.”	What can be done to treat peripheral neuropathy in the short and long term?
Monitoring for recurrence	“How is the impact concerning different lifestyles to prevent recurrence?” “What can I do other than scheduled colonoscopies?”	What are the most effective ways to prevent recurrence?
Rehabilitation	“What about chronic bowels symptoms? What are the best ways to improve bowel problems?”	What are the best methods for providing rehabilitation to improve chronic bowel symptoms?
Quality of life	“Finances are running out, because of the neuropathy I am no longer able to work. I am looking for therapy to help with the pain management but nothing is covered.” “The chemo caused it and should be covered.”	What is the long-term financial toxicity of a CRC diagnosis, and how can patients and their families be better supported financially?
Lifestyle factors	“How do I sort through all the information about healthy diet?” “There is a lot of dis-information on the internet about what helps and by how much.”	What is the best diet to follow, and how can this information be systematically provided to patients and their families?
Support for patients	“Are there internet sources of support for patients?” “How can patients learn about all the supports that are available?”	What is the best way to provide information/ education about supports available to CRC patients and their families?
Support for caregivers	“Are there courses that caregivers take to teach them basic skills in caring for the patient (I am thinking very specifically of assisting patients with things like removing colostomy bag, etc.)?” “Where can they (caregivers) go for support?”	How can education and access to support for caregivers be improved?
Prevention	“Why isn't there more education on this (prevention) and why aren't there more campaigns about prevention and risk factors?”	How can people be better informed about the risk factors for colon cancer?
Miscellaneous	“My concerns are more related to knowledge translation, policy and practice guidelines. Why did I have to learn about cancer fatigue video from McMaster from my friends instead of my doctor?”	What are the policy and practice guidelines that are needed to improve the patient experience during the diagnosis phase?

Note: CRC = colorectal cancer.

by up to 60% of survivors.^{26,27} Although evidence exists outlining best practices for monitoring for recurrence,²⁸ there is a lack of comprehensive understanding about the most effective tertiary prevention strategies (e.g., modifiable risk factors, chemoprevention).²⁹ Further research to determine the most effective methods of preventing recurrence could improve patients' quality of life by reducing fear of recurrence and would allow survivors of colorectal cancer to maintain their health.²⁹

Two of the top 10 priorities focused on screening. Screening for colorectal cancer represents an effective method of early detection.³⁰ When diagnosed in early stages, this form of cancer is treatable, with high rates of survival.³⁰ However, screening rates remain low, with just over half of participants in the 2012 Canadian Community Health Survey reporting being up to date with current screening.³¹ In addition, with rising incidence of colorectal cancer among those younger than 50 years of age,³² some countries are now recommending

that screening should start before the age of 50.³³ Effective policies, practices and initiatives to improve screening rates, and the determination of the efficacy of screening individuals under 50 years of age, represent a key component of managing colorectal cancer in the future.

Screening tests for colorectal cancer currently include the fecal immunochemical test, the fecal occult blood test and colonoscopy; the choice of test depends on regional clinical practice guidelines and the patient's personal history of or risk for cancer.³⁰ Although the fecal immunochemical test is effective and noninvasive, it has poor rates of detecting stage I cancer³⁴ and is not recommended to replace colonoscopy in at-risk populations.³⁵ In addition, limited access to colonoscopy and risks associated with the procedure mean that it is not well suited for primary screening.³⁰ Ideally, future research into novel screening tests for colorectal cancer could result in more sensitive, more specific and less invasive procedures.

Box 1: Top 30 research priorities for CRC from interim priority ranking and top 10 research priorities from the final priority-setting meeting*

1. **What are the most effective ways to prevent recurrence?**
2. **What additional policy, practice and educational initiatives are needed to improve screening rates, and how does this apply to screening for those who are under the age of 50?**
3. **How can long-term changes to bowel function (including having an ostomy) be best managed, what is the role of rehabilitation in managing changes to bowel function, and are there new ways of managing this side effect that are being investigated?**
4. **What is the role of personalized medicine, including immunotherapy, to tailor treatments based on patient and tumour characteristics? Would personalized medicine improve efficacy while decreasing side effects of CRC treatment?**
5. **Are we able to find a test that is more sensitive or specific when used for screening for CRC?**
6. **What is the cumulative financial toxicity of a CRC diagnosis, and how can patients and their families be better supported to manage this?**
7. **How can patients be better informed about clinical trials and other research, and how can access to clinical trials and new treatments be improved?**
8. **Can we predict who will get peripheral neuropathy (e.g., numbness and tingling in fingers and toes), and what is the best way to prevent peripheral neuropathy?**
9. **What is the evidence for complementary and alternative medicine in a) the treatment of cancer and b) the prevention and/or management of short-term and long-term side effects from treatments?**
10. **What is the best method to ensure that patients are fully informed and supported to make decisions during a) the diagnostic phase (e.g., diagnosis, prognosis, follow-up tests) and b) treatment phase? Are there any methods that can aid explanation and retention of information?**
11. What is the best way to monitor patients for side effects during treatment, especially those who are vulnerable such as those living in rural and remote areas, are older or have multiple other health problems (e.g., heart disease, diabetes, etc.)?
12. How can CRC patients and their families be better informed about the role of family history and the need for screening of family members to ensure earlier diagnosis of CRC?
13. What is the best way to educate patients about the risks of recurrence and ways to reduce recurrence?
14. How can health care professionals (e.g., physicians, nurse navigators, nurse practitioners, social workers, psychosocial, etc.) be best utilized to provide the required care for patients and families throughout the cancer trajectory? What policy and practice guidelines need to be implemented to improve access to these different types of health care professionals?
15. What are the different treatment options, and how can we best inform patients to make shared decisions in their treatment?
16. What is the best way to provide support specific to CRC at diagnosis, during treatment and post-treatment to patients and their families?
17. What additional policy, practice and educational initiatives are needed to ensure a) health care providers are better informed and equipped to diagnose CRC earlier in those who are symptomatic? b) delays in diagnosis are avoided to ensure earlier detection and treatment?
18. Are new methods for detecting recurrence being developed so that it can be caught earlier?
19. What is the best way to provide information after cancer treatment about prognosis, monitoring for recurrence and follow-up care?
20. How can we improve efficiency in our health care system to improve access to the right information and the right care at the right time for CRC patients and their families?
21. What are the best methods for treating peripheral neuropathy in the short and long term?
22. What is the best diet to follow, and how can this information be systematically provided to patients and their families?
23. Is total neoadjuvant treatment (TNT) approach a more effective way to treat rectal cancer than the previous standard, and could it eliminate need for surgery in some patients?
24. What is the best model of follow-up care, and how can this be standardized across Canada to ensure continuity of care and early detection of recurrence?
25. What are the most effective ways of informing the general public of the signs and symptoms of CRC?
26. What is the role of the gut microbiome in preventing CRC?
27. What is the best way to prevent and manage short-term and long-term cognitive changes (brain fog)?
28. How can the long-term mental health impacts (fear of recurrence, anxiety, depression) be better managed?
29. How can patients and families be better informed about what to expect, what resources exist and how to access the resources they need in post-treatment recovery?
30. How can patients living long term with an ostomy or LARS (lower anterior resection syndrome) be better supported?

Note: CRC = colorectal cancer.

*The items shown in bold represent the top 10 research priorities as ranked in the final priority-setting meeting.

Five of the top 10 priorities focused on either new treatments for colorectal cancer or the management of short- and long-term adverse effects associated with current treatments. Personalized medicine (or precision medicine) refers to medical treatments tailored to individuals, often through a unique understanding of their genes and proteins.³⁶ Personalized medicine in cancer is a rapidly expanding area of research because of the expectation that it will provide more effective treatments with fewer adverse effects.³⁶ Currently, more than 100 molecules have been reported as biomarkers for colorectal cancer, which have potential for diagnosis or treatment.³⁶ Further research is needed to clarify the effectiveness, feasibility, accessibility and cost-benefit ratios of implementing personalized medicine into colorectal cancer care.

While the future of colorectal cancer treatment using personalized medicine holds promise in decreasing treatment-related sequelae, patients struggle in the short term to manage the many adverse effects of treatment (e.g., peripheral neuropathy, changes to bowel function, social isolation, return-to-work issues and financial instability).²⁸ For example, up to 31% of patients treated with oxaliplatin chemotherapy had peripheral neuropathy 5 years after treatment.³⁷ In addition, up to 80% of survivors of colorectal cancer experience some degree of bowel changes (e.g., incontinence, frequency, urgency, emptying difficulties), with up to 40% experiencing severe symptoms.³⁸ These adverse effects can have substantial impact on functional ability, return to work and overall quality of life.^{28,38} High-quality evidence is lacking on the efficacy of interventions to manage the adverse effects specific to colorectal cancer. Future research could guide the development of tailored, comprehensive supportive care (e.g., rehabilitation, psychosocial support) and integrative oncology strategies to ensure patients and their families are best equipped to optimize their health and well-being.

Information and decision-making were also in the top 10 priorities. Specifically, research priorities focused on how best to inform patients and families throughout the colorectal cancer trajectory to promote informed decision-making and how to ensure that information about new treatments, clinical trials and other research studies is accessible. Patients who are fully informed make better decisions, which leads to improved health outcomes.³⁹ However, providing effective education remains a barrier to informed decision-making, especially in terms of communicating retainable information.⁴⁰ Some evidence supports tools such as decision aids;³⁹ however, further research could help to clarify best practices for providing information and ultimately optimizing informed decision-making.

Since completion of this study, our findings have been used in a recent grant competition within Alberta Health Services, wherein research teams were asked to submit studies that would address the priorities that we identified. In addition, 2 authors (C.C., W.Y.C.) have submitted 3 grant applications that are directly related to the top 10 research priorities. Future end-of-study knowledge translation activities will include targeted presentations to patients, clinicians, researchers and health care administrators.

Limitations

Our study had several limitations. Although we invited participation from across Canada and included a variety of stakeholder groups, our sample was small, and most participants were Albertans. As such, the survey participants may not be representative of the broader colorectal cancer community. In addition, almost half of the participants did not provide complete demographic information. This may have been related to our decision, as a committee, to leave the demographic questions to the end of the survey; we felt it was more important to collect opinions about research priorities. From the demographic information provided, we could confirm representation from caregivers, clinicians, patients and other stakeholders. We do not know whether the missing demographic information represents bias.

We did not ask participants who completed the second survey if they had participated in the first phase of the study (i.e., the first survey). We used a variety of recruitment methods to reach as many health care professionals as possible, but some groups (e.g., family physicians, gastroenterologists, surgeons) were underrepresented, which might have biased the final list of research questions. Our sample included mostly white respondents, meaning that the research priorities of those with different racial or ethnic backgrounds may not be represented. We attempted to reach a diverse patient population by using multiple recruitment strategies (e.g., social media, poster advertisements, advocacy groups, physical presence in clinical settings, patient support groups). However, our recruitment materials and surveys were in English only, and our priority-setting meeting was conducted in English. We are reassured that many of the broader themes and questions generated in our study were similar to JLA studies in other cancer populations^{17,18,41-43} and to a 2018 study identifying critical research gaps in colorectal cancer.⁴⁴ Researchers using similar priority-setting approaches in the future should consider incorporating equity, diversity and inclusion principles and resources.

We deviated from the JLA process by conducting our final consensus meeting virtually. Although in-person meetings are typically preferred to ensure engagement of all participants, we were able to achieve a high level of engagement and satisfaction while meeting study timelines, reducing the burden of travel costs and time, and ensuring the safety of participants.

Lessons learned from patient engagement

We followed established guidelines for working with patient partners, as outlined by the JLA¹⁶ and the Strategy for Patient-Oriented Research,²² and included committee members with experience in patient engagement. These resources were essential to ensure a meaningful and partnered approach. As researchers and clinicians, we learned from patients and caregivers about their experience of illness and navigating the health care system, and their unique perspectives on how to shape future research to best meet their needs.

To build an environment with equal input from all committee members, we took time to explore knowledge gaps with our patient partners and to explain the research process; we also

encouraged them to provide regular feedback. We found that our patient partners provided many new ideas about how to engage with the broader colorectal cancer community across Canada. They emphasized the importance of ongoing follow-up after our final meeting to stay engaged with the work and to participate in the knowledge dissemination process.

Engaging with survivors of colorectal cancer and caregivers to seek their participation in both surveys was challenging. Although some survivors are members of advocacy organizations, the majority of survivors are not, which made it difficult to develop initial and ongoing connections with all colorectal cancer survivors. We also found the inability to meet in person for our final session meant that specific premeeting activities and virtual meeting skills (described elsewhere²¹) were required, to ensure that everyone felt engaged in the virtual format.

Conclusion

Future research has the potential to further improve the lives of those affected by colorectal cancer. To provide the greatest benefit to patients and families, their direct input is necessary in the development of research questions. We determined the top 10 research priorities for early-stage colorectal cancer using a collaborative partnership of patients, their caregivers and health care professionals from across Canada. The 10 priorities do not include all the research topics that could improve the lives of patients with this type of cancer and their families; however, our patient and clinician partners determined that these 10 questions have substantial value.

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