

# Survey and Interview Findings of an Environmental Scan of Perioperative Geriatric Models of Care in Canada\*



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## ABSTRACT

### Background

Best practice recommendations support the implementation of perioperative geriatric care models that tailor to the specific needs of older adults undergoing surgery. The objective of this study was to describe the current proactive perioperative geriatric programs and pathways in Canadian hospitals.

### Methods

A survey of geriatricians, surgeons, and anesthesiologists practicing in Canada combined with phone interviews of a subset of participants were used to determine characteristics of perioperative geriatric pathways or programs including eligibility, team composition, and intervention elements.

### Results

Analysis of 132 survey respondents and 24 interviews showed 47% (40 out of 85) of hospitals described had elements of a perioperative geriatrics program and 20% had two or more elements. Eleven themes emerged including: how perioperative geriatric care programs built geriatric competencies in other health-care providers; geriatric assessment identified risks not captured in standard perioperative risk assessment; perceived value for patients and the health-care team; delirium prevention was addressed; most programs were reactive; most programs were informal; virtual care may be used to meet demand; successful implementation required system buy-in with collaboration across subspecialties; mechanisms to drive improvement were accountability and data evaluation; few clinicians with geriatric expertise; and other priorities limited program implementation.

## Conclusions

There were few hospitals in Canada with perioperative geriatric care models and even fewer with elements spanning the entire perioperative pathway. Strengths, weaknesses, opportunities, and threats to inform the implementation and sustainability of perioperative geriatric care in the Canadian context were identified in this national environmental scan.

**Key words:** perioperative, geriatrics, survey

## INTRODUCTION

The rate of aging worldwide is increasing.<sup>(1)</sup> Canada will soon become a “super-aged” society, with more than 20% of its population over the age of 65 by 2024.<sup>(2)</sup> The average patient undergoing elective and emergency surgery has become older and more likely to live with frailty over time.<sup>(3)</sup> However, older patients living with frailty experience more adverse post-operative outcomes, with odds ratios ranging from 1.5 to 4.8 compared with younger patients.<sup>(4,5)</sup> Multiple factors underlie this age-related risk. Patient-level factors include physiological changes of aging, multi-morbidity, and frailty and other geriatric syndromes.<sup>(5–8)</sup> System factors also contribute, as traditional reactive models of surgical care may not be tailored to deliver for older adults.<sup>(9)</sup> Very few ‘whole-pathway’ approaches to older age-friendly surgical care, that is, multicomponent and multidisciplinary intervention with integration across community and social care that starts preoperatively and continues through to proactive discharge planning with follow-up services, have been implemented.<sup>(10,11)</sup>

Comprehensive geriatric assessment (CGA) is the cornerstone of geriatric medicine that is a multidimensional interdisciplinary diagnostic process focused on determining a frail older person's medical, psychological, and functional capability in order to develop a coordinated and integrated plan for treatment and long-term follow-up.<sup>(12)</sup> A systematic review of randomized trials comparing CGA to standard care found that older people undergoing surgery who received a CGA had a lower risk of mortality and were more likely to return to their preoperative residence (RR 0.71, 95% CI 0.55 to 0.92).<sup>(13)</sup> Perioperative geriatric care models in orthopaedics, vascular surgery, urology, trauma, general surgery, cancer surgery, and spine surgery have demonstrated improved clinical outcomes, including reductions in delirium, postoperative complications, length of stay, mortality, and discharge to higher level of care.<sup>(14–19)</sup> Based on this increasing body of evidence, the American College of Surgeons has published standards for geriatric surgery which address institutional investment (securing administrative and leadership support to establish geriatric surgical care as a priority), clinical practice (shared decision making, geriatric specific assessment, interdisciplinary collaboration), and programmatic infrastructure (standardized protocols across the perioperative pathway integrated into institutional operations).<sup>(20)</sup>

The current landscape of geriatric models of perioperative care is well-described in the United Kingdom (UK) and Australasia; both regions describe an appetite for geriatric surgical care, but identify barriers including funding and workforce shortage challenges.<sup>(21,22)</sup> Conversely, there is no comprehensive data on how perioperative geriatric care is delivered in Canada. The objective of this study was to conduct a systematic national environmental scan of the presence of structured perioperative geriatric programs and pathways in hospitals across Canada. We aimed to describe current proactive perioperative geriatric programs and pathways in Canadian hospitals; eligibility criteria, components, and providers of these perioperative geriatric programs and pathways; and to provide guidance on operationalizing perioperative geriatric care in Canada. Four principles differentiate 'proactive' from reactive models: "1) systematic case finding, 2) early involvement, 3) focus on evidence-based strategies to prevent geriatric syndromes including delirium, falls, functional decline, incontinence, and 4) direct implementation of recommendations."<sup>(23)</sup> To the best of our knowledge, this is first-ever data on the state of proactive perioperative geriatric models/pathways.

## METHODS

### Study Design

This study was a cross-sectional electronic survey followed by one-on-one semi-structured phone interviews for a subset of participants to provide further qualitative data regarding existing programs and pathways. This study is reported using the Checklist for Reporting Results of Internet E-Surveys (CHERRIES)<sup>(24)</sup> (Appendix A1).

### Study Population and Recruitment

Geriatricians, anesthesiologists, and general surgeons practicing in Canada who are on the email distribution lists from the Canadian Geriatrics Society, Canadian Anesthesiologists' Society, and/or Canadian Association of General Surgery were identified. Additional physician emails were identified through public domain directories. Two reminder emails were sent at two weeks after the initial recruitment email and then at 30 days after the first reminder.<sup>(25)</sup> The survey link was also distributed via Twitter. We used snowball recruitment whereby survey respondents were encouraged to forward the survey to colleagues. Study participants were also asked to participate in a one-on-one semi-structured phone interview for more detailed qualitative data acquisition. The option to enter a draw for a gift card was used to incentivize study participation.

### Survey Development

Development of individual questionnaire items was guided by standard methods of survey research,<sup>(26)</sup> review of best practice guidelines on perioperative geriatrics from the American College of Surgeons and American Geriatrics Society,<sup>(20)</sup> as well as similar national surveys of perioperative geriatric care models conducted in the UK and Australasia.<sup>(21,22)</sup> The final survey comprised of 24 questions exploring the existence of established pathways or programs for proactive perioperative geriatric care. If such a pathway or program existed, further information was gathered regarding hospital and province of location, type of surgery, patient eligibility criteria, program elements (an element was defined as any preoperative, intraoperative or postoperative intervention option listed in questions 11, 12, 17, 21), assessment and management stratified by stage of perioperative course (preoperative, intraoperative, postoperative), and team composition. The survey used a combination of up to 20 multiple choice and four open-ended questions. The content of the survey was peer-reviewed by geriatricians and surgeons for face validity and clarity (n = 3). Feedback from testing was used iteratively to construct the final questionnaire. Test-retest reliability was conducted by administering the final questionnaire twice at two weeks apart to three participants fulfilling the inclusion criteria, consisting of one geriatrician and two surgeons. Out of all the questions, one rater had three questions with differing responses, another rater had all the same responses, and the third rater had two questions with differing responses.

### Survey Administration

The final self-administered questionnaire (Appendix A2) was administered using Google Forms (Google Inc., Mountain View, CA) between September and December 2019. Information on study participation was presented prior to the questionnaire and consent was implied by completing the questionnaire.

### Semi-Structured Phone Interviews

A follow-up invitation was sent to those survey respondents who indicated an interest in participating in a 15-minute phone interview. A reminder email was sent two weeks after the

follow-up invitation. A series of pre-planned questions were used to conduct a semi-structured interview (Appendix A3). Phone interviews were conducted, recorded, and transcribed by one of two study authors (BC and MM). If the participant reported to be working at a hospital with a structured perioperative geriatrics pathway or program, four questions exploring the pathway or program's benefit to patients, benefit to the health-care team, areas for improvement, and details including postoperative team composition were discussed. If the participant did not work in a hospital with a pathway or program, two questions exploring potential expected benefits of establishing a pathway or program and resources needed to create a pathway or program at their hospital were discussed. Further questions were asked throughout the interview for clarification and additional details.

### Data Analysis

Multiple choice responses were reported as frequencies and proportions. In scenarios of discrepancies between respondents from the same hospital, the more inclusive response was accepted, with the recognition that one or more of the respondents from the same hospital may not have been aware of all the initiatives/protocols in place at their institution. Free text responses and verbal responses from the phone interview were transcribed and analyzed using an inductive approach to identify themes. Qualitative data were coded by key features and collated into themes using an inductive approach by two study authors (MM and CW) independently, such that themes were generated from the data rather than using a pre-existing theoretical framework, until saturation of themes was attained. Theme saturation was determined as the point at which no new themes were emerging from the interviews and agreed by both coders, setting a minimum of 17 interviews as informed by the literature.<sup>(27)</sup> Pair debriefing to check for congruence with the original data was used to minimize the influence of researcher subjectivity. Disagreements were resolved with consultation with a third study author (BC).

Themes were categorized using a SWOT (strengths, weaknesses, opportunities, threats) framework by two authors (MM and CW) independently. The SWOT framework was chosen as it helps to inform decision-making for service delivery based on internal (strengths and weaknesses) and external (opportunities and threats) factors gathered from surveys.<sup>(28)</sup> Applying the SWOT analysis traditionally used in competition and business strategy to the present study, strengths were defined as “internally-relating facets of perioperative geriatric programs/pathways lending them an advantage over other interventions,” weaknesses were defined as “internally-relating characteristics of perioperative geriatric programs/pathways which lead them to have a relative disadvantage against other alternatives,” opportunities were defined as “externally-related realities within the greater environment that can be leveraged to enable and/or promote the implementation/sustainment of perioperative geriatric programs/pathways,” and threats were defined as “externally-related realities within the greater environment which might pose as barriers to and/or hinder the

implementation or sustainment of perioperative geriatrics programs/pathways”.<sup>(29)</sup> Differences in categorization of themes were resolved through discussion. The framework was used in this study to understand, analyze, and inform strategy related to perioperative geriatric models of care.

### Ethics

The study protocol was approved by the University of Toronto Health Sciences Research Ethics Board (Protocol #: 00038096).

## RESULTS

### Survey Results

There were 132 survey respondents, comprising 104 (79%) geriatricians, 14 (11%) general surgeons, 9 (7%) anaesthesiologists, and 5 (4%) ‘other’. The respondents were from 85 hospitals (15 hospitals with <200 beds) with representation from all provinces (Appendix A4). Eighty-one (61%) survey respondents reported working in an academic hospital and 70 (53%) reported working in a hospital with a geriatric-specific surgical program or care pathway. Forty of 85 (47%) hospitals had elements of a perioperative geriatric program, though 17 (20%) had two or more elements. Of the 40 hospitals with a perioperative geriatrics program or pathway, half were academic hospitals. Fifteen, five, and 30 programs targeted the pre-operative, intraoperative, and postoperative stages, respectively. Orthopedic surgery was the most common surgical service targeted (Table 1).

TABLE 1.  
Types of surgical services with geriatric surgical programs or pathways, by perioperative stage, in the 85 hospitals associated with survey participants

<i>Surgical Discipline</i>	<i>Number of Hospitals (out of total n = 85), (%)</i>
<i>Preoperative Stage (15 hospitals)</i>	
Orthopedics	9 (10.6%)
General Surgery	9 (7.1%)
Urology	6 (7.1%)
Cardiac Surgery	5 (5.9%)
<i>Intraoperative Stage (5 hospitals)</i>	
Orthopedics	4 (4.7%)
Cardiac Surgery	1 (1.2%)
General Surgery	1 (1.2%)
Trauma	1 (1.2%)
Urology	1 (1.2%)
Vascular Surgery	1 (1.2%)
<i>Postoperative Stage (30 hospitals)</i>	
Orthopedics	27 (31.8%)
General Surgery	13 (15.3%)
Trauma	8 (9.4%)
Urology	7 (8.2%)

Of the 15 hospitals with a preoperative geriatric surgical program or pathway, age was the most commonly used eligibility criteria. All but one of the hospital programs with a preoperative geriatrics pathway included a geriatrician (93%) in the care delivery. Almost all of the preoperative geriatrics programs had delirium counselling (93%) and medication review (93%) as part of preoperative optimization, and used the comprehensive geriatric assessment (87%) to inform risk assessment. See Table 2 for other characteristics of preoperative geriatrics programs.

Five hospitals were described as having an intraoperative component to geriatric surgical care. Components of these intraoperative geriatric care pathways included peripheral nerve blocks, geriatric-specific management (e.g., dose-adjustments and/or drug choices), geriatric-specific IV fluid protocols, and sedation depth monitoring protocols in two, two, one, and one, programs, respectively.

Thirty hospitals were described as having a postoperative geriatrics care pathway or program, with age being the

most common eligibility criteria. Common elements included the use of geriatric-specific order sets in 19 (63%), geriatric-surgery co-management models in 16 (54%), and geriatrics consultation in 15 (50%). See Table 3 for other characteristics of postoperative geriatrics programs.

There were six non-geriatrician respondents, for all of whom there was a geriatrician respondent from the same hospital. The non-free text answers provided by anesthesiologists and surgeons were captured by the themes from the corresponding geriatrician respondent from the same hospital. The themes in the non-free text answers were captured within the interviews.

**Phone Interview Results**

Of the 132 survey respondents, 24 agreed to the phone interview of which 22 (92%) were geriatricians and 2 (8%) were general surgeons, with representation from all provinces except Newfoundland and Labrador, and Saskatchewan (Appendix A4). The 24 interviewees worked at 24 different hospitals, 15 (63%) of which were academic hospitals. Fourteen (59%) of the interviewees reported working at a hospital that had a geriatric-specific program or care pathway for surgical patients. Saturation of themes was achieved before the last interview. Eleven themes were identified and categorized into the SWOT analysis framework as follows (see Figure 1): four strengths, two weaknesses, three opportunities and two threats.

Strengths of perioperative geriatric care programs include building geriatric competencies in other health-care providers; geriatric assessment identifies risks that are not captured in standard perioperative risk assessment; there is perceived value for patients and the health-care team; and delirium prevention is addressed. Weaknesses identified included the reactive rather than proactive nature of programs and the lack of formal program recognition. Opportunities included the identification of elements of successful implementation (system buy-in, integration, coordination across space and

TABLE 2.  
Characteristics of pre-operative geriatrics programs/pathways among the 15 Canadian hospitals with pre-operative geriatrics programs/pathways

<i>Urgency of Surgery</i> N (%) <sup>a</sup>	
Urgent/Emergent	4 (26.7%)
Elective	2 (13.3%)
Both	8 (53.3%)
<i>Program Eligibility Criteria</i> N (%)	
Age	10 (66.7%)
Procedure	7 (46.7%)
Frailty	6 (40%)
Other	4 (26.7%)
<i>Pre-operative Optimization Elements</i> N (%)	
Delirium counseling	14 (93.3%)
Med review	14 (93.3%)
Geriatrics referral	11 (73%)
Nutrition supplement	9 (60%)
<i>Type of Geriatric Risk Assessment</i> N (%)	
CGA	13 (86.7%)
Cognitive screen	10 (66.7%)
Frailty screen	9 (60%)
Functional screen	9 (60%)
<i>Program Team Composition</i> N (%)	
Geriatrician	14 (93.3%)
Geriatrics nurse	12 (80%)
Surgeon	4 (26.7%)

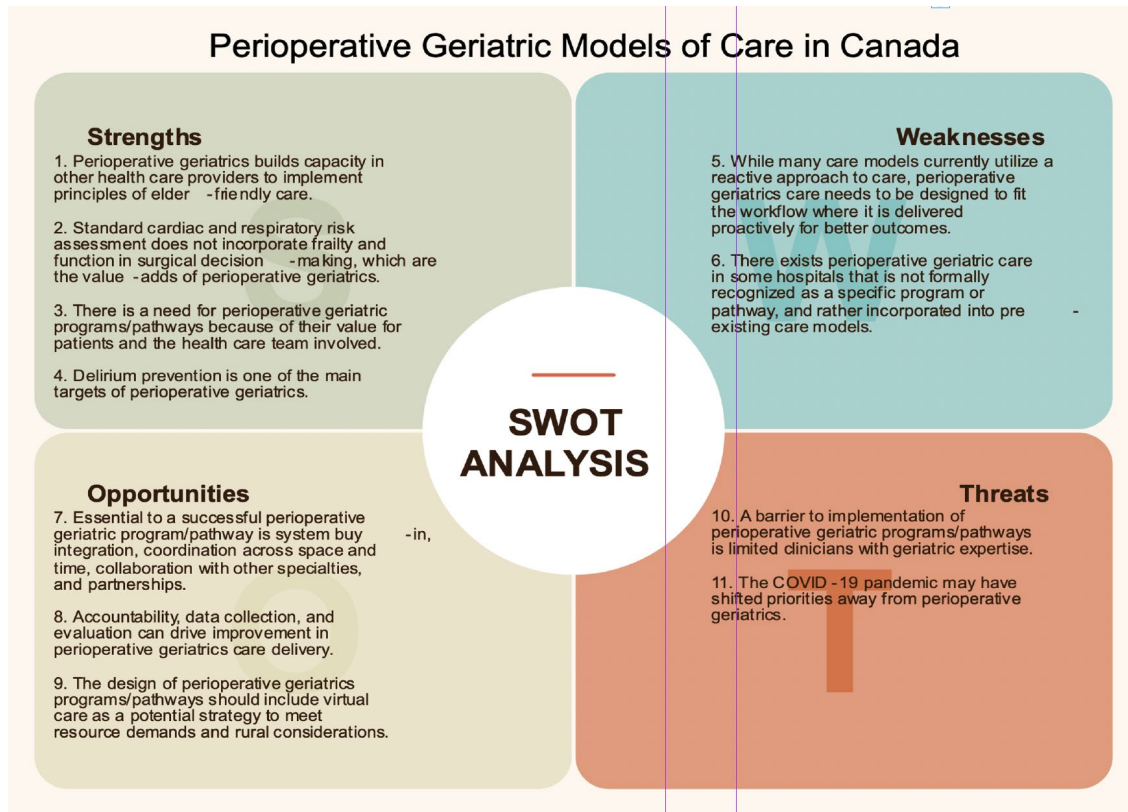
<sup>a</sup>missing data.

CGA = comprehensive geriatric assessment.

TABLE 3.  
Characteristics of post-operative geriatrics programs/pathways among the 30 Canadian hospitals with post-operative geriatrics programs/pathways

<i>Program Eligibility Criteria</i> N (%) <sup>a</sup>	
Age	10 (33.3%)
Procedure	7 (23.3%)
Frailty	6 (20%)
Other	4 (13.3%)
Procedure	7 (23.3%)
<i>Postoperative Elements</i> N (%)	
Order set	19 (63.3%)
Co-management model	16 (53.3%)
Automatic geriatrics referral	15 (50%)
Geriatrics ward	5 (16.7%)

<sup>a</sup>missing data.



From: Canva (Sydney, Australia: [https://www.canva.com/design/DAFIGos86-IJbiVr0VJprL2fgQdjUSWA/view?utm\\_content=DAFIGos86-I&utm\\_campaign=designshare&utm\\_medium=link2&utm\\_source=sharebutton](https://www.canva.com/design/DAFIGos86-IJbiVr0VJprL2fgQdjUSWA/view?utm_content=DAFIGos86-I&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton))

FIGURE 1. Perioperative geriatric models of care in Canada

time, collaboration with other specialties, and partnerships), mechanisms to drive improvement (accountability, data collection, and evaluation), and leveraging virtual care to meet demand. Threats to the implementation of perioperative geriatric programs include limited clinicians with geriatric expertise—including geriatricians, but also physicians with additional training in geriatrics and/or advanced practice nurses with specialization in geriatrics—and other priorities such as the COVID-19 pandemic response.

See Table 4 for details with supportive participant quotes. Thematic analysis of the two surgeon participants overlapped with the themes identified from the geriatrician participants' interview data.

## DISCUSSION

In a national environmental scan of perioperative geriatric services in Canada, based on quantitative and qualitative methods, we found that implementation of whole pathway approaches to perioperative care for older adults<sup>(10)</sup> remains low relative to the UK and Australasia. Similar to other jurisdictions, existing perioperative geriatric care models tend to focus on orthopedic surgery and processes are structured reactively, despite impressions that proactive care may be optimal. As evidence and guidelines support perioperative models of comprehensive geriatric care, future efforts are required

to develop, implement, and evaluate proactive perioperative geriatric care in Canada.

While surveys of perioperative geriatric models have been conducted in the UK and Australasia, to our knowledge no such data exist in the Canadian context. Therefore, our data provide novel insights in Canada. While we found orthopaedics to be the most common surgical discipline to incorporate geriatric pathways, the uptake in Canada appears to be comparatively lower than other countries<sup>(10)</sup> such as in Australia, where 92% of older adults with hip fracture receive a geriatric review. Canada also lags behind the National Health Service (NHS) health-care trusts in the UK where 53% of trusts provided geriatric medicine services for older surgical patients.<sup>(21)</sup> Our data are consistent with existing Canadian data using physician billing claims that demonstrate that fewer than 10% of hip fracture patients, and fewer than 3% of older elective surgery patients, receive care from a geriatrician.<sup>(30,31)</sup> A further challenge in Canada is the widening geriatrician-supply gap; using the benchmark ratio of 1.25 specialists/10,000 population over 65, there was already a shortfall of 471.7 geriatricians in 2019.<sup>(32)</sup> Similar to the UK, most models in Canada are reactive rather than proactive,<sup>(21)</sup> which is contrary to best practice recommendations that suggest geriatric-led multidisciplinary care should be initiated before surgery.<sup>(11,20)</sup>

The themes identified in this study are similar to other qualitative studies in this space. System barriers limiting

clinicians with geriatric expertise and the opportunity for collaboration are themes reflected in the present Canadian study and in Australasia.<sup>(33)</sup> A similar study from the UK also evaluated their system as being reactive and cited a lack of evidence.<sup>(34)</sup> The need for proactive approaches to perioperative

geriatrics and for data collection are recognized across all aforementioned jurisdictions.<sup>(33,34)</sup>

While harnessing strengths and addressing weaknesses intrinsic to perioperative geriatrics, next steps would be to leverage opportunities to implement/sustain proactive

TABLE 4.  
SWOT analysis of themes from phone interviews on perioperative geriatric models of care in Canada with representative quotations (n = 24)

<i>Strengths</i>	<p>Perioperative geriatrics builds geriatric competencies in other health care providers to implement principles of elder-friendly care.</p> <p><i>“the competency of the team is much better ... so they’ve learned through us and they have gotten so good now to identify geriatric syndromes and how to manage the medications in the post-operative period”</i> [participant ID 15]</p> <p><i>“you know there’s that cross kind of talk and that cross capacity building”</i> [participant ID 14]</p> <p>Standard cardiac and respiratory risk assessment does not incorporate frailty and function in surgical decision-making, which are the value-adds of perioperative geriatrics.</p> <p><i>“And when we see the patients, we complement the internal medicine evaluation, which is essentially based for them on you know heart, lungs and kidneys, but we really do the geriatric evaluation to push through the cognitive, nutritional, mobility and all the risk factors for geriatric syndromes in the post-operative period.”</i> [participant ID 15]</p> <p><i>“So that judgement piece that could be really hard for surgical teams on their own and isn’t really addressed when you do usual pre-op, like GIM or anesthesia pre-op. They judge risk of surgery but they don’t always judge the aspect of functional or cognitive risk. I think those are the really big pieces.”</i> [participant ID 11]</p> <p>There is a need for perioperative geriatric programs/pathways because of their value for patients and the health care team involved.</p> <p><i>“in terms of what is the likelihood of functional improvement and what is the likelihood of functional impairment, delirium, needing prolonged hospitalization or ending up in a higher level of care, that has been much more clearly communicated with patients who have come in. Even the ones that have proceeded with surgery have said that they have felt much more confident knowing what’s going to happen compared to before or what they were feeling just coming out of the surgeon’s office.”</i> [participant ID 3]</p> <p><i>“as evidence suggest, a structured pre-op care can improve post-op outcomes in older adults, so I think there is absolutely a need for implementing the program”</i> [participant ID 10]</p> <p>Delirium prevention is one of the main targets of perioperative geriatrics.</p> <p><i>“I also think it’s helpful in that we talk about common post-op complications, delirium being a very common one – what that is, how to prevent it and do some post-op planning around delirium prevention as well as support post-operatively, whether that’s with home care or family involvement”</i> [participant ID 6]</p> <p><i>“I think that we would have less delirium if we had a structured perioperative program, if we had opioid sparing, order sets, if we had a consultation geriatrics team embedded within the pathway. I think all of that would provide benefit to our patients.”</i> [participant ID 23]</p>
<i>Weaknesses</i>	<p>While many care models currently utilize a reactive approach to care, perioperative geriatrics care needs to be designed to fit the workflow where it is delivered proactively for better outcomes.</p> <p><i>“from my perspective the pre-op geriatrics program is of critical importance for all of us who work in the hospital, recognizing and seeing how hard it is to deal with these things after the fact. I think very frequently how much I wished to see a person ahead of time only to discuss the outcomes and to have a plan.”</i> [participant ID 1]</p> <p><i>“We have less patients who end up kind of falling apart and then three weeks later, we’re getting consulted because the patient’s broken down [and] they don’t know what to do. We find that we are still getting some of those consults on the general surgery and other services where we’re not engaged proactively, but that’s why I think our general surgery colleagues now are very interested in us being able to get involved...”</i> [participant ID 9]</p> <p>There exists perioperative geriatric care in some hospitals that is not formally recognized as a specific program or pathway, and rather incorporated into pre-existing care models.</p> <p><i>“we do a lot of consults on surgical services, but it’s not like a mandatory or structured consult service”</i> [participant ID 7]</p> <p><i>“there is a request for consultation that goes in to the existing consultation team, as part of the you know the same pool of consultations that are received for other purposes as well. And there is a small team”</i> [participant ID 19]</p>

TABLE 4. Continued

<i>Opportunities</i>	<p>Essential to a successful perioperative geriatric program/pathway is system buy-in, integration, coordination across space and time, collaboration with other specialties, and partnerships.</p> <p><i>“you need to have a lot of environmental, contextual support pieces in place in order to be successful. So, for example, engagement from stakeholders, the willingness of the organization and the services that are going to be affected, their willingness to change and embrace improvement processes. So, much of what a geriatrics pathway would be recommending needs to be implemented by other people, by the unit staff that are actually looking after the patients and the MRPs. And so, in order for them to do that, they have to be completely bought into the concept of a geriatrics pathway.”</i> [participant ID 19]</p> <p><i>“Often times you need champions on the surgical side and on our [geriatric] side.”</i> [participant ID 24]</p>
	<p>Accountability, data collection, and evaluation can drive improvement in perioperative geriatrics care delivery.</p> <p><i>“Sure, we did measure both critical outcomes and patient-reported experiences and outcomes, so we saw improvements in clinical outcomes including morbidity and length of stay and we, through our patient-reported measures, were able to demonstrate high levels of patient satisfaction with the program.”</i> [participant ID 5]</p> <p><i>“there needs to be also accountability in order for this to be successful. If the practice change isn’t happening, who’s responsible? Who is going to be driving that practice change, in terms of management directors and programmatic leadership? And then, there also needs to be monitoring and evaluation because you could put a whole lot of effort into the process and if it’s not making a difference, if you don’t have some data to inform quality improvement, it’s a lot of work without making a lot of change.”</i> [participant ID 19]</p>
	<p>The design of perioperative geriatrics programs/pathways should include virtual care as a potential strategy to meet resource demands and rural considerations.</p> <p><i>“so how do you do a distributed model with knowing that geriatrics resources are very limited ... I absolutely think that’s [telehealth] part of the solution”</i> [participant ID 2]</p>
<i>Threats</i>	<p>A barrier to implementation of perioperative geriatric programs/pathways is limited clinicians with geriatric expertise.</p> <p><i>“unless you have a geriatrician to lead it or maybe even a geriatric nurse practitioner who is very motivated and can lead the program, it’s difficult to think about such programs.”</i> [participant ID 10]</p> <p><i>“I think it would predominantly come down to geriatrics resources. I think that it probably wouldn’t be that difficult to convince folks that it was a good idea and the right approach, but we’re pretty limited in terms of our capacity at the moment.”</i> [participant ID 16]</p> <p>The COVID-19 pandemic may have shifted priorities away from perioperative geriatrics.</p> <p><i>“COVID has put in a wrench in a lot of programs, including this one, because COVID has impacted our ability to do rehabilitation and also, it’s impacted the pre- surgical schedule.”</i> [participant ID 8]</p> <p><i>“I think, right now, it’s hard to... being able to focus on a lot of these things, just coming out of the pandemic, when everyone was kind of in survival mode”</i> [participant ID 17]</p>

perioperative geriatric programs/pathways in Canada, in addition to mitigating threats that may pose a barrier to overall implementation success. The SWOT analysis can be applied by looking to the British Geriatrics Society’s whole pathway approach and the American College of Surgeons’ Geriatric Surgery Verification Program Standards.<sup>(20,35)</sup> Successful proactive ‘whole pathway’ perioperative geriatrics models are already implemented elsewhere, including the NHS Proactive Care of Older People undergoing Surgery (POPS) service.<sup>(35,36)</sup> POPS involves a team of geriatricians, clinical nurse specialists, and allied health and incorporates preoperative CGA and optimization, and postoperative monitoring for early detection and treatment of complications, including delirium. As perspectives from Canada align with those from other jurisdictions, adoption of international solutions including POPS may be tweaked to fit the Canadian context, leveraging opportunities for multispecialty collaboration, data collection, and adaptations based on resource and geographic

constraints. This highlights the need for system leaders, health advocates, and policymakers to recognize the added value of perioperative geriatrics, potentially paving the way for a national guideline.

Limitations of this study include the large number of geriatrician respondents in both the survey and phone interviews. Surgeons and anesthesiologists who participated in the study were more likely to be interested in perioperative geriatrics. Surgeon recruitment only focused on the general surgical specialty, though perioperative geriatric care seemed most common in orthopaedics. The study only focused on proactive, and not reactive, consultation. The study was conducted only in the English language and may have under-represented the experience of Francophone jurisdictions. The environmental scan represented only the physician perspective and did not capture health system managers or patient data. Lastly, the findings may be subject to reporting bias with likely over-representation from respondents interested in or involved in

perioperative geriatric care, and the extent of the response bias is uncertain given the ambiguous sampling frame.

## CONCLUSION

This study defined the current landscape of perioperative geriatrics care in Canada and identified the strengths, weaknesses, opportunities, and threats to inform the elements necessary for the implementation and sustainability of perioperative geriatric care in the Canadian context. The findings are similar to those found in other international surveys of models of perioperative geriatrics care including resource allocation gap, competing clinical priorities, role of data in driving change, importance of stakeholder engagement, need for evolving from reactive to proactive care delivery, joint development by different specialties, and the integral role of the geriatrician. <sup>(10)</sup> The adoption and spread of perioperative geriatric care models can be addressed using implementation science. Next steps include the establishment of multispecialty perioperative groups to engage policy makers and managers to develop surgical systems that embrace whole pathway care for the older person undergoing surgery, including a national guideline. <sup>(32)</sup>

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## CONFLICT OF INTEREST DISCLOSURES

We have read and understood the *Canadian Geriatrics Journal's* policy on conflicts of interest disclosure and declare there are none.

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**APPENDIX A1. Checklist for Reporting Results of Internet E-Surveys (CHERRIES)<sup>(24)</sup>**

<i>Item Category</i>	<i>Checklist Item</i>	<i>Explanation</i>
Design	Describe survey design	Geriatricians, general surgeons and anesthesiologists practising in Canada.
IRB (Institutional Review Board) approval and informed consent process	IRB approval	Approval was obtained from the University of Toronto Research Ethics Board (#38096)
	Informed consent	Informed consent was obtained by providing the letter of information on the first page of the online survey and notifying participants that completion of the survey would mean that consent was provided.
	Data protection	Data was collected via Google forms and file is password protected.
Development and pre-testing	Development and testing	The questionnaire was created using a standard guide for survey research, <sup>(21)</sup> review of best practice guidelines on perioperative geriatrics from the American College of Surgeons and American Geriatrics Society, <sup>(20)</sup> as well as similar national surveys of perioperative geriatric care models conducted in the United Kingdom and Australasia. <sup>(21,22)</sup> Sensibility testing was performed by reviewers from geriatrics, anesthesiology, and surgery for content validity. The survey was iteratively constructed and pilot-tested two weeks apart for test-retest reliability.
Recruitment process and description of the sample having access to the questionnaire	Open survey versus closed survey	This was an open survey available for each visitor of the webpage.
	Contact mode	Eligible participants were contacted via email and social media (Twitter).
	Advertising the survey	Online – via emails and social media (Twitter)
Survey administration	Web/Email	Website
	Context	Google Forms (Google Inc, Mountain View CA) – the survey was not embedded as part of another website
	Mandatory/voluntary	Voluntary survey
	Incentives	The option to enter a draw for a \$100 gift card was used to incentivize study participation
	Time/Date	September to December 2019
	Randomization of items or questionnaires	Items were not randomized
	Adaptive questioning	Adaptive questioning using conditional display based on responses to previous items was used to reduce the number of questions
	Number of Items	1–6 items per page
	Number of screens (pages)	10
	Completeness check	Questions regarding demographics and the extensive of a perioperative pathway or program were made mandatory. Questions regarding each stage of the perioperative course (preoperative, intraoperative, postoperative) each had a “don’t know” option.
Review step	Yes, participants had a back button to review prior answers.	
Response rates	Unique site visitor	Google Forms documented each submitted survey response.
	View rate (Ratio of unique survey visitors/unique site visitors)	This was not collected.
	Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	This was not collected.
	Completion rate (Ratio of users who finished the survey/users who agreed to participate)	This was not collected.

**APPENDIX A1. Continued**

<i>Item Category</i>	<i>Checklist Item</i>	<i>Explanation</i>
Preventing multiple entries from the same individual	Cookies used	This was not collected.
	IP check	This was not collected.
	Log file analysis	This was not collected.
	Registration	If the participants were logged into their Google account, duplicate entries were prevented. However, there was no method to prevent duplicate entries for those who were not logged into their Google account.
Analysis	Handling of incomplete questionnaires	Only completed questionnaires were analyzed.
	Questionnaires submitted with an atypical timestamp	Only questionnaires submitted between September to December 2019 were analyzed. This was determined prior to recruitment.
	Statistical correction	No weighting of items or propensity scores used.

**APPENDIX A2. Self-administered online survey**

For this survey, the perioperative period will be divided into three distinct phases of a surgical procedure:

1. Preoperative phase (time from decision to pursue surgery to the beginning of the surgical procedure);
2. Intraoperative phase (time from the beginning of the surgical procedure to transfer to the post-anesthesia care unit);
3. Postoperative phase (time from end of care in the post-anesthesia care unit to discharge from hospital).

**General Questions**

1. (G1) What is your specialty of expertise?
  - Geriatric Medicine
  - Anesthesiology
  - General Surgery
  - Orthopedic Surgery
  - Other (*prompt free text field*)
2. (G2) In which province do you practice?  
*Province names presented as dropdown options.*
3. (G3) What is the name of the main hospital where you practice?  
*Free text field.*
4. (G4) What city/town is your hospital located in?  
*Free text field.*
5. (G5) In what type of hospital do you mainly practice? Definition: An academic hospital is fully affiliated with a university sharing the academic mission of conducting research, teaching and providing clinical care.
  - Fully academically affiliated
  - Community
6. (G6) Does your hospital have any geriatric-specific programs or pathways of care for surgical patients such as: geriatric-specific order sets, geriatrics-surgery co-management model, automatic referrals for geriatrics consultation, specially designed elder-friendly ward, etc?
  - Yes
  - No
  - Don't know

*If yes, then prompts Question 7.*

*If no, then proceed to Final Questions (#22-23) portion of the survey.*

*If don't know, then proceed to Final Questions (#22-23) portion of the survey.*

**PRE-operative Geriatrics Pathway/Program**

Preoperative phase (time from decision to pursue surgery to the beginning of the surgical procedure)

7. (S1) In your hospital, does a PRE-operative geriatrics program/pathway exist?
  - Yes
  - No
  - Don't know

*If yes, then prompts PRE-operative Questions #8-14.*

*If no, then prompts Question #15.*

*If don't know, then prompts Question #15.*

**PRE-operative Geriatrics Pathway/Program Questions**

Preoperative phase: time from decision to pursue surgery to the beginning of the surgical procedure

8. (Pr1) Your hospital’s PRE-operative geriatrics/pathway program includes which types of surgery? Select all that apply. (If the PRE-operative geriatrics pathway/program only applies to a subgroup of patients within a type of surgery, provide more details under “other”).
  - Cardiac Surgery
  - General Surgery
  - Neurosurgery
  - Orthopaedic Surgery
  - Otolaryngology
  - Plastic Surgery
  - Trauma Service
  - Urology
  - Vascular Surgery
  - Don’t know
  - Other (*prompt free text field*)
  
9. (Pr2) Your hospital’s PRE-operative geriatrics/pathway program is delivered to what urgency of surgery?
  - Elective surgical patients only
  - Urgent/emergent surgical patients only
  - Both
  - Don’t know
  
10. (Pr3) Eligibility for your hospital’s PRE-operative geriatrics/pathway program is based on which of the following characteristics? Select all that apply. If not applicable, leave blank.

	<i>Age</i>	<i>Procedure Type</i>	<i>Frailty Measure</i>	<i>Other</i>
Cardiac Surgery				
General Surgery				
Neurosurgery				
Orthopaedic Surgery				
Otolaryngology				
Plastic Surgery				
Trauma Service				
Urology				
Vascular Surgery				

If responded “other” in previous question, provide additional comments here. (*free text field*)

11. (Pr4) What type of geriatric-specific optimization interventions are offered in your hospital’s PRE-operative geriatrics pathway/program? Select all that apply.
  - Delirium counseling
  - Medication review
  - Nutritional supplements
  - Prehabilitation program (e.g., physiotherapy program prior to surgery)
  - Geriatric-specific preoperative order set
  - Interdisciplinary case review
  - Automatic referral for geriatrics consultation
  - Don’t know
  - Other (*prompt free text field*)

12. (Pr5) In your hospital's PRE-operative geriatrics pathway/program, how is geriatric risk determined? Select all that apply.
- A frailty screening tool
  - A functional measure (e.g. ADLs, IADLs, Timed-Up-and-Go)
  - A cognitive screening tool (e.g. Mini-Cog, Mini Mental State Examination)
  - Comprehensive Geriatric Assessment (CGA)
  - None
  - Don't know
  - Other (*prompt free text field*)
13. (Pr6) In your hospital's PRE-operative geriatrics pathway/program, which of the following domains are routinely assessed? Select all that apply.
- Cognitive impairment
  - Decision-Making Capacity
  - Depression
  - Delirium risk
  - Alcohol/substance misuse
  - Cardiac evaluation
  - Pulmonary evaluation
  - Functional status
  - Frailty
  - Nutritional status
  - Medication management
  - Don't know
  - Other (*prompt free text field*)
14. (Pr7) Which health care providers are involved in the geriatric risk assessment and/or geriatric-specific optimization interventions in your hospital's PRE-operative geriatrics pathway/program? Select all that apply.
- Geriatrician
  - Anesthesiologist
  - Surgeon
  - Nurse
  - Physiotherapist
  - Occupational therapist
  - Dietician
  - Social worker
  - Case manager
  - Don't know
  - Other (*prompt free text field*)

### **INTRA-operative Geriatrics Pathway/Program**

Intraoperative phase: time from the beginning of the surgical procedure to the transfer to the post-anesthesia care unit

15. (S2) In your hospital, does an INTRA-operative geriatrics program/pathway exist?
- Yes
  - No
  - Don't know

*If yes, then prompts INTRA-operative Question #16.*

*If no, then prompts Question #18.*

*If don't know, then prompts Question #18.*

### **INTRA-operative Geriatrics Pathway/Program Questions**

Intraoperative phase: time from the beginning of the surgical procedure to the transfer to the post-anesthesia care unit

16. (I1) Your hospital's INTRA-operative geriatrics/pathway program includes which types of surgery? Select all that apply. (If the INTRA-operative geriatrics pathway/program only applies to a subgroup of patients within a type of surgery, provide more details under "other").
- Cardiac Surgery
  - General Surgery
  - Neurosurgery
  - Orthopaedic Surgery
  - Otolaryngology
  - Plastic Surgery
  - Trauma Service
  - Urology
  - Vascular Surgery
  - Don't know
  - Other (*free text*)
17. (I2) Your hospital's INTRA-operative geriatrics pathway/program includes which of the following elements? Select all that apply.
- Peripheral nerve blocks
  - Geriatric-specific intravenous fluid administration (e.g. decrease in fluid administration)
  - Geriatric-specific management (e.g. dose or drug choice adjustments)
  - Additional monitoring for depth of sedation (e.g. bispectral index)
  - Additional blood work
  - Don't know
  - Other (*prompt free text field*)

### **POST-operative Geriatrics Pathway/Program**

Postoperative phase: time from end of care in the post-anesthesia care unit to discharge from hospital

18. (S3) In your hospital, does a POST-operative geriatrics program/pathway exist?
- Yes
  - No
  - Don't know

*If yes, then prompts POST-operative questions #19-21.*

*If no, then prompts Final Questions #22-23.*

*If don't know, then prompts Final Questions #22-23.*

### **POST-operative Geriatrics Pathway/Program Questions**

Postoperative phase: time from end of care in the post-anesthesia care unit to discharge from hospital

19. (Po1) Your hospital's POST-operative geriatrics pathway/program includes which types of surgery? Choose all that apply. (If the POST-operative geriatrics pathway/program only applies to a subgroup of patients within a type of surgery, provide more details under "other".)
- Cardiac Surgery
  - General Surgery
  - Neurosurgery
  - Orthopaedic Surgery
  - Otolaryngology
  - Plastic Surgery
  - Trauma Service
  - Urology
  - Vascular Surgery
  - Don't know
  - Other (*prompt free text field*)

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20. (Po2) Eligibility for your hospital’s POST-operative geriatrics pathway/program is based on which of the following characteristics? Select all that apply. If not applicable leave blank.

	<i>Age</i>	<i>Procedure Type</i>	<i>Frailty Measure</i>	<i>Other</i>
Cardiac Surgery				
General Surgery				
Neurosurgery				
Orthopaedic Surgery				
Otolaryngology				
Plastic Surgery				
Trauma Service				
Urology				
Vascular Surgery				

If responded “other” in previous question, provide additional comments here. *(free text field)*

21. (Po3) Your hospital’s POST-operative geriatrics pathway/program includes which of the following elements? Select all that apply. If not applicable leave blank.

22.

	<i>Geriatric-specific order sets</i>	<i>Specially designed elder-friendly ward</i>	<i>Geriatric-surgery co-management model</i>	<i>Automatic referral for geriatrics consultation</i>	<i>Other</i>
Cardiac Surgery					
General Surgery					
Neurosurgery					
Orthopaedic Surgery					
Otolaryngology					
Plastic Surgery					
Trauma Service					
Urology					
Vascular Surgery					

If responded “other” in previous question, provide additional comments here. *(free text field)*

**Final Questions**

23. (F1) Is there anything else you would like to tell us about your perioperative geriatrics program/pathway or geriatric resources available at your hospital for surgical patients?

*Free text field.*

24. (F2) We are also conducting an optional phone interview to learn more about existing structured perioperative geriatrics program/pathways. If you would like to participate, please provide your email.

- Not interested.
- Interested

*If not interested, prompt Submit Form page.*

*If interested, prompt email collection page (Question #23).*

25. Provide your name and email if you are interested in participating in an additional phone interview.

Name: *(free text)*

Email: *(free text)*

**Submit Form page:**

Thank you for filling out this survey. If you would like to enter for a chance to win a gift card, please provide your contact information at the following link. *(Link here)*



### APPENDIX A3. Semi-structured phone interview questions

Hello, this is *[interviewer's name here]*, one of the research investigators involved in the study, "A Canadian Environmental Scan of Perioperative Geriatric Models of Care". Since you have opted to participate in a phone interview at the end of the survey and have signed the consent form, we are calling you to conduct the interview at this time.

We would like to remind you that all of the questions are completely optional to answer and you may choose to skip questions, end the interview and/or withdraw from the study at any time. Please let me know if you have any questions or concerns before we begin.

*If the participant has consented to the phone interview being recorded:* Please note that this interview is being recorded for transcribing purposes only.

Q1) Do you work at a hospital with a structured perioperative geriatrics program or pathway?

*If participant answers "yes" to Q1:*

- Q2) What benefits do you believe your hospital's geriatrics pathway or program provide for patients?
- Q3) What benefits do you believe your hospital's geriatrics pathway or program provide for the health care team involved in the pathway or program?
- Q4) What improvements can be made to your hospital's geriatrics pathway or program?
- Q5) We asked basic questions about your hospitals' perioperative geriatrics pathway or program, are there any other details that you wanted to tell us about?

*If participant answers "no" to Q1:*

- Q6) Do you believe your hospital would benefit from a structured perioperative geriatrics program or pathway? Why or why not?
- Q7) What are the resources needed to create a structured perioperative geriatrics program or pathway at your hospital?

**APPENDIX A4. Demographic and hospital data from survey and interviewees of perioperative geriatrics programs in Canadian hospitals**

<i>Survey Respondent Demographics</i> <i>N (out of a total n = 132), (%)</i>		<i>Interviewee demographics</i> <i>N (out of a total of n = 24), (%)</i>	
<i>Province</i>		<i>Province</i>	
Alberta	18 (13.6%)	Alberta	4 (16.7%)
British Columbia	16 (12.1%)	British Columbia	3 (12.5%)
Manitoba	3 (2.3%)	Manitoba	3 (12.5%)
New Brunswick	6 (4.5%)	New Brunswick	1 (4.2%)
Newfoundland and Labrador	2 (1.5%)	Nova Scotia	1 (4.2%)
Nova Scotia	7 (5.3%)	Ontario	9 (37.5%)
Ontario	61 (46.2%)	Prince Edward Island	1 (4.2%)
PEI	1 (0.8%)	Quebec	2 (8.3%)
Quebec	17 (12.9%)		
Saskatchewan	1 (0.8%)		
<i>Survey respondents' individual hospital demographics</i> <i>N (out of a total n = 85), (%)</i>			
<i>Province</i>			
Alberta	8 (9.4%)		
British Columbia	12 (14.1%)		
Manitoba	3 (3.5%)		
New Brunswick	3 (3.5%)		
Newfoundland and Labrador	2 (2.4%)		
Nova Scotia	3 (3.5%)		
Ontario	40 (47.1%)		
PEI	1 (1.2%)		
Quebec	12 (14.1%)		
Saskatchewan	1 (1.2%)		