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Risk communication in cataract surgery

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ABSTRACT

Purpose Risk communication is an integral aspect of shared decision-making and evidence-based patient choice. There is currently no recommended way of communicating risks and benefits of cataract surgery to patients. This study aims to investigate whether the way this information is presented influences patients' perception of how risky surgery will be.

Methods and analysis Two-arm parallel randomised study and patients referred for cataract surgery were assigned to receive information framed either positively (99% chance of no adverse effects) or negatively (1% chance of adverse effects). Subsequently, patients rated their perceived risk of experiencing surgical side effects on a 1–6 scale.

Results This study included 100 patients, 50 in each study group. Median (IQR) risk perception was 2 (1–2) in the positive framing group and 3 (1–3) in the negative framing group (p<0.0001). Risk framing was the only factor that was significant in risk perception, with no differences found by other patient clinical or demographic characteristics.

Conclusion Patients who received positive framing reported lower risk scores for cataract surgery than patients who received negative framing. Patient factors were not identified as significant determinants in patients' perceived risk. Larger longitudinal studies are warranted to further investigate.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Framing effects are known to influence patients' health decisions, with positive framing promoting prevention and negative framing encouraging detection. However, there is a gap in understanding its effect in the context of cataract surgery.

WHAT THIS STUDY ADDS

⇒ Positive framing reduces surgical risk perception in cataract surgery, thereby highlighting the significance of framing and communication delivery in this field.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ A shift towards framing-conscious communication strategies could improve patient understanding and decision-making in clinical settings, which could lead to better-informed patient decisions and enhanced patient care.

INTRODUCTION

Cataract surgery is one of the most common surgeries performed in Canada and worldwide[1] and it is becoming more prevalent as people in the world live longer. If left untreated, cataracts are known to have a detrimental effect on a patient's quality of life, by lowering their independence in performing daily activities, decreasing their personal safety and increasing their likelihood of vision loss.[2–4] Although permanent loss of vision from cataract surgery is rare, there are some risks of potentially sight-threatening complications. According to the literature, the overall rate of severe complications in the 1-year postoperative period following cataract surgery is 0.5%. These severe complications include infectious endophthalmitis (0.16%), retinal detachment (0.26%) and suprachoroidal haemorrhage (0.06%).[5]

Risk communication is an integral aspect of shared decision-making and evidence-based patient choice. In the context of making medical decisions, it has been shown that patients often overestimate their likelihood of experiencing the benefits and underestimate their likelihood of experiencing the risks.[6] Previous studies have demonstrated that the perceived benefits (or magnitude of risk) of a procedure may be inflated if presented using relative risk than when using an absolute risk.[7 8] Additionally, it has been proposed that the way information is framed may also play a role in decision-making. For example, a study by Bigman *et al* presented the effect of a human papilloma virus (HPV) prophylactic vaccines as 70% effective (positive frame) to some participants and as 30% ineffective (negative frame) to the rest.[9] Findings showed that participants who received the positive frame perceived the HPV vaccine as effective and were more willing to receive it than those in the negative framed group. Similarly, another study showed that when presented with information regarding safety of a hypothetical vaccine, a positive framed information was associated with more positive attitudes towards vaccination (eg, 90% chance of no side effects vs 10% chance of side effects).[10] On the other hand, it has been shown how negative framing is more effective in advising people to engage screening activities, such as breast cancer self-examination.[11 12]

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Whether the information about the outcomes of different actions is presented as either a loss or a gain can also have varying effects.[8] For instance, in the context of surgery, one could emphasise the risks and disadvantages of not getting surgery (loss framing) or the benefits and advantages of getting surgery (gain framing). Prior studies have demonstrated that loss-framed messages are expected to be more effective than gain-framed in persuading individuals to perform a health behaviour that is perceived to be risky.[8] Retamero and Galesic reconciled these findings, by suggesting that gain frames can more effectively promote disease prevention behaviours, whereas loss frames can more effectively encourage disease detection behaviours.[13] Other factors that may also alter patients' risk perceptions include presenting information using numbers versus graphics, the order of presenting risks and benefits and presenting information using percentages vs numbers.[7 14]

Although there have been studies reporting on the capacity and quality of cataract surgery in Canada, there is little information about the determinants of cataract surgery uptake in our population.[15] When considering uptake of cataract surgery, the way surgical risks and benefits are communicated must be considered because patients' perception of surgical risks can have a substantial impact on their decision to undergo surgery. Some patients may overestimate the risks of cataract surgery, which can be a barrier to receiving surgery in a timely manner, and other patients may underestimate the risks, which can cause them to have surgery prematurely.[6] A shared decision model requires patient education and clear risk–benefit communication.[16–18] Family physicians, primary eye care providers and ophthalmologists all play an important role in educating patients about the risks and benefits of cataract surgery. Currently, there is no standardised or recommended way of communicating the potential benefits and risks of cataract surgery to patients, and it is usually up to each health provider's discretion.[19] This study aims to investigate whether the type of framing (positive or negative) matters when communicating risks and educating patients about cataract surgery. Recognising the impact of communication delivery on patient perception could inform clinical practice and guide patient education strategies to better ensure that patients are well-informed and empowered prior to making their decision.[20]

MATERIALS AND METHODS

Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

Study design and sample

This was a two-arm parallel randomised experimental design conducted at a single eye care centre with approval from the institutional ethics committee. English-speaking patients over 40 years old, with no cognitive impairment who were referred for cataract surgery and had not yet made their decision to undergo the procedure, were considered for this study. Prior to enrolment in the study, patients that fulfilled inclusion criteria were contacted and fully informed of the study protocol, and the appropriate informed consent was obtained. Enrolment was done in a hybrid model, some patients were recruited and consented via telephone prior to each patient's initial cataract consultation appointment, whereas others were approached while waiting for their ophthalmology appointment.

Data collection and intervention

Patients who consented and agreed to participate were randomly allocated to either the positive framing or negative framing group, patients were not told in which group they were randomised to. Randomisation was done using an online randomiser.[21] Following randomisation, participants were administered a concise questionnaire encompassing several key sociodemographic variables, visual acuity (VA), prior knowledge and exposure to cataract surgery, and general attitudes towards surgery. Following this, a member of our research team communicated the risks of cataract surgery based on which group the patient was randomised to using either positive framing (99% chance of no severe complications) or negative framing (1% chance of severe complications). The framing percentages were carefully chosen to mirror the low incidence rates of severe complications postcataract surgery as reported in the 'Cataract in the Adult Eye Preferred Practice Pattern',[5] ensuring that our communication reflected realistic clinical scenarios (see main questionnaires in Appendix A). Patients then expressed their perceived risk for experiencing surgery side effects using a 6-point Likert-type scale ranging from 1 (not likely at all) to 6 (very likely). Similar to a simple dichotomous scale where a patient would choose one of the two options, using a 6 point-scale ensured patients favour one option over the other since there is no mid-point, while also allowing us to determine the strength of the choice preference.[22]

Statistical analysis

To ensure our analyses demonstrate adequate power (≥0.80) to statistically assess differences in our study outcomes, the perceived likelihood of risk, a score of 0.5 away from the neutral midpoint 3.5 (on a scale from 1 to 6) with a type I error of 0.05, we used the statistical software nQuery for our initial sample size calculation.[23] This calculation required a minimum of 150 patients (75 in each group), informed by assumptions derived from a previous study, which examined differences across six groups.[22] While this study only included two groups for framing, all other parameters such as expected effect size (0.457), SD (1), alpha level (0.05) and power (0.80) were maintained as per the guiding framework of the prior study. However, given the novelty of this type of research in the field, we acknowledge there was uncertainty of

Table 1 Baseline characteristics

Group	A (Positive framing)	B (Negative framing)	Total	P value
N	50	50	100	
Mean age (years)	70.2±9.5	70.8±8.9	70.5±9.2	0.738
Female n (%)	34 (68)	29 (58)	63 (63)	0.543
Mean waiting time (days)	74±79	81±68	77±73	0.271
Ethnicity n (%)				0.572
White	23 (46)	22 (44)	45 (45)	
South Asian	17 (34)	12 (24)	29 (29)	
Arab/West Asian	2 (4)	1 (2)	3 (3)	
Black	2 (4)	1 (2)	3 (3)	
Hispanic/Latin America	2 (4)	3 (6)	5 (5)	
East Asian	1 (2)	3 (6)	4 (4)	
Other	2 (4)	1 (2)	3 (3)	
N/A	1 (2)	7 (14)	8 (8)	
Education n (%)				0.010
Less than high school	1 (2)	1 (2)	2 (2)	
High school	12 (24)	18 (36)	30 (30)	
Postsecondary	20 (40)	24 (48)	44 (44)	
Postgraduate	15 (30)	6 (12)	21 (21)	
N/A	2 (4)	1 (2)	3 (3)	
Household income n (%)				0.252
<$40 000	14 (28)	17 (34)	31 (31)	
$40 000–$60 000	16 (32)	8 (16)	24 (24)	
$60 000–$90 000	9 (18)	12 (24)	21 (21)	
$90 000–$130 000	1 (2)	5 (10)	6 (6)	
$130 000–$160 000	1 (2)	2 (4)	3 (3)	
$160 000–$200 000	0 (0)	0 (0)	0 (0)	
$200 000 or more	1 (2)	0 (0)	1 (1)	
N/A	8 (16)	6 (12)	14 (14)	
Visual satisfaction n (%)				0.706
Very dissatisfied	17 (34)	21 (42)	38 (38)	
Fairly dissatisfied	12 (24)	11 (22)	23 (23)	
Fairly satisfied	17 (34)	16 (32)	33 (33)	
Very satisfied	4 (8)	2 (4)	6 (6)	
Recruitment n (%)				0.524
In person	15 (30)	18 (36)	33 (33)	
By phone	35 (70)	32 (64)	67 (67)	
Visual acuity n (%)				0.519
20/50 or better	24 (48)	23 (46)	47 (47)	
20/60–20/150	18 (36)	23 (46)	41 (41)	
20/200 or worse	8 (16)	4 (8)	12 (12)	

these assumptions. Our interim analysis, conducted at 50 patients, 25 in each group, used nQuery again for re-estimation. The parameters used for this calculation were as follows: effect size of 0.66, SD of 0.79, alpha level of 0.05, power of 80%. This re-estimation indicated that a total sample size of 44 patients, 22 in each group would be sufficient to achieve the desired power. However, aiming to ensure robustness, and the possibility of an inflated type I error rate due to the interim analysis, but avoiding over-recruitment, we proceeded with a target sample

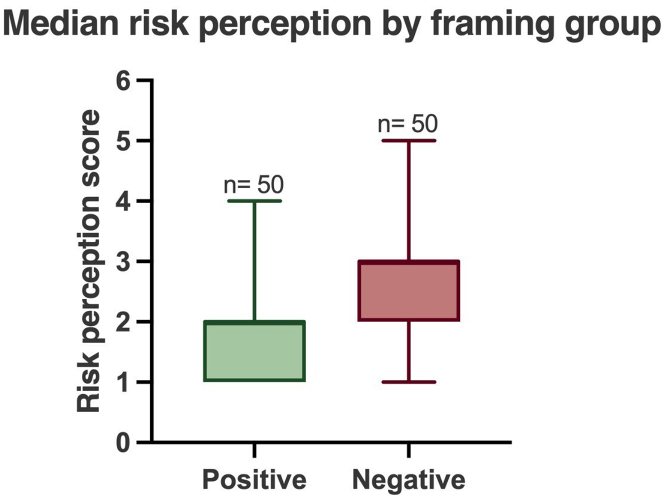

Figure 1 Risk perception score per study group. Box plot of median risk perception scores for two framing groups in the study. The 'Positive' group is shown in green and the 'Negative' group in red. Each box displays the IQR of risk perception scores with the median value represented by the horizontal line within the box. The number of participants in each group is denoted by 'n' above the boxes. Whiskers extend to the furthest points that are not considered outliers, indicating the variability outside the upper and lower quartiles.

size of 100 patients to allow for a more robust estimate, while maintaining the ethical conduct of the research. On completion of recruitment and data collection, we performed a post hoc power calculation, confirming the power of our study was 99.6%. This decision, while exceeding the minimum suggested by interim findings, was made to enhance the strength of our study's conclusions and was preplanned as part of our adaptive design strategy.

The normality of variables was evaluated using a Shapiro-Wilk test before proceeding to the analyses. Statistical analyses were conducted for non-normally distributed variables. Then, we examined whether there were any significant differences in randomisation across conditions based on the demographic variables and prestimulus questions. We calculated median (IQR) risk perception score for the positive and negative framing groups, and posteriorly, difference in risk scores between groups was analysed using Mann-Whitney U test. Considering that we adopted a hybrid approach, we decided to analyse for difference in risk perceptions scores based on the method of approach, either in person on the day of the appointment or via telephone ahead of the appointment. Subsequently, regression analysis was used to identify any predictors of risk scores among continuous variables such as age, waiting time and VA. Finally, we explored potential drivers of risk perception, including categorical variables like gender, education, visual satisfaction and prior cataract knowledge. For comparisons involving these categorical variables, the Mann-Whitney test was employed for two categories, whereas the Kruskal-Wallis test was applied when comparisons involved more than two groups. P values <0.05 were considered statistically significant. In the case of a positive result in these comparisons, Dunn's multiple comparison test was performed to adjust and compare p values.

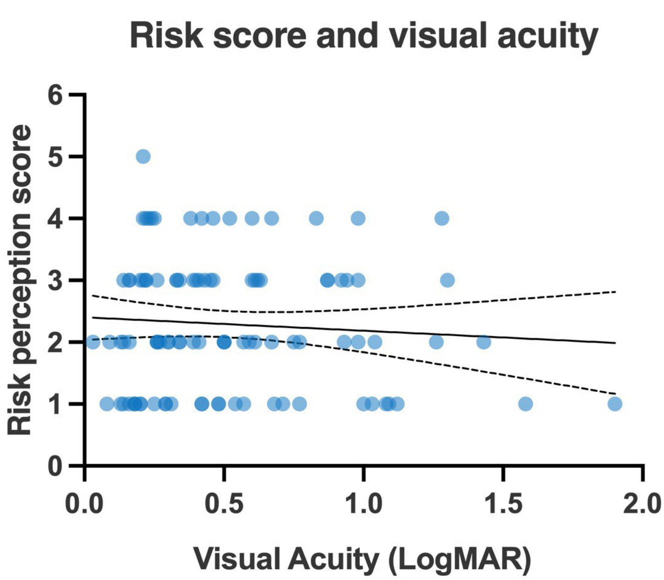

Figure 2 Risk perception score by visual acuity. Scatter plot illustrating the relationship between risk perception score and visual acuity measured in LogMAR. Each dot represents an individual patient's risk perception score with corresponding visual acuity. The dashed lines depict a trend line with upper and lower confidence intervals.

RESULTS

This study included a total of 100 patients, with an equal distribution of 50 participants in each of the two study groups, positive framing and negative framing. Sixty-seven per cent of patients were recruited and interviewed via telephone ahead of their appointment, while the remaining 33% were conducted in person when patients were in the waiting room before seeing the ophthalmologist. The distribution of interview modality was balanced between the two study groups, with 35 patients (70%) in the positive framing group interviewed by phone and 15 patients (30%) in person, while in the negative framing group, 32 patients (64%) were interviewed by phone and 18 patients (36%) in person (p=0.524). Most participants in both the positive and negative framing groups were women, accounting for 68% and 58%, respectively. The mean age of participants was 70±10 years 70 in the positive framing group and 71±9 years in the negative framing group. The overall average waiting time for first consult was 77±73 days. There were no significant differences in the baseline characteristics between the groups. Baseline characteristics and main demographic data of the study patients are summarised in table 1.

Median (IQR) was 2 (1–2) for the positive framing group and 3 (1–3) for the negative framing group, statistically significant difference in risk perception scores between the groups was found (p<0.0001) (figure 1).

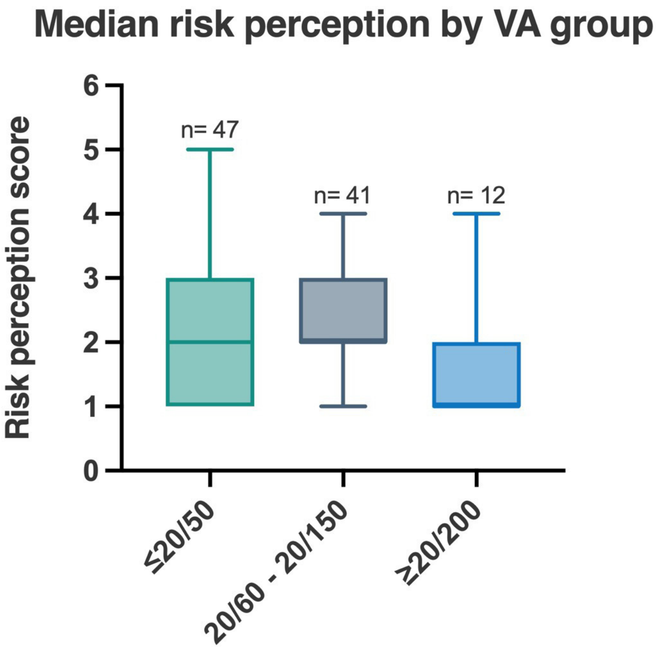

Figure 3 Risk perception score by visual acuity group. Box plot representation of median risk perception by visual acuity group. The groups are divided into three categories based on visual acuity measurements: ≤20/50, 20/60–20/150 and≥20/200. Sample sizes for each category are indicated. The central line in each box shows the median risk perception score, while the box itself covers the first to third quartile range. Whiskers show the range of the rest of the data excluding outliers.

We found no significant difference in risk perception scores between those approached in person on the day of the appointment and those contacted via telephone prior to the appointment (p=0.66), median (IQR) was 2 (1–3) for both groups. Moreover, regression analysis of risk scores with age indicated that for every 10-year increase in age, risk perception score increases by 0.07, however this relationship is not statistically significant (beta coefficient=0.007; 95% CI −0.016 to 0.03; p value=0.6). Similarly, a non-significant correlation was found between risk perception and waiting time, showing that with a increment of 30 days in waiting time, the observed effect on the risk score is an increase of 0.04 (beta coefficient=0.001308 per day; 95% CI −0.001598 to 0.004215; p-value=0.37).

Regression of VA at time of referral showed a negative correlation between the variables, in a Snellen chart, a three-line improvement in VA is associated with a decrease of 0.07 in risk perception score. However, it is important to note that this relationship was not found to be statistically significant (beta coefficient=−0.2180 per logMAR unit; 95% CI −0.7960 to 0.3600; p value=0.4560). Risk scores compared across different VA groups (20/50 or better, 20/60–20/150 and 20/200 or worse) also showed no significant differences between the groups (p=0.30) (figures 2 and 3).

In additional analyses, when looking at influence on surgical risk perception of other demographical factors such as gender, level of education and prior cataract surgery knowledge non-significant differences in risk scores were found. Additionally, when looking at a clinical baseline characteristic such patient visual satisfaction, there was also no significant difference in risk scores. Results for these analyses are summarised in table 2.

DISCUSSION

Risk communication is a fundamental aspect in shared decision-making and patient-centred care. Clear communication is paramount, as it can guide patients' understanding and expectations of medical interventions, and in the context of surgery, potentially reducing the likelihood of overestimation or underestimation of risks.[6] Framing effects, originated from Tversky and Kahneman's Prospect Theory (1979), play a pivotal role in risk communication, profoundly impacting patients' perceptions and health decisions.[24] Positive or gain-framed messages, as initially shown by Rothman and Salovey, are more efficacious in promoting preventive behaviours, whereas negative or loss-framed messages are persuasive for detection behaviours.[25] Since these original theories, subsequent studies have then been done further replicating this concept in varied medical specialties,[8–13 26 27] highlighting the influence of framing in successful patient-physician communication.[28] Our study builds on this existing literature by specifically investigating the impact of positive-framed and negative-framed surgical risks information in risk perception among patients considering cataract surgery.

Our study revealed a significant difference in risk perception scores between patients that received a positive versus those who received a negative framing. Specifically, participants receiving positive communication of risks perceived cataract surgery as less risky than those who received information with a negative framing. These findings align with findings from previous studies on the influential role of framing in shaping patients' understanding, where positive framed information leads to a more positive attitude towards the intervention.[10]

On the other hand, the way the information was presented to the patients, either in person or by telephone, did not significantly influence the risk perception scores. Furthermore, no significant correlations were found between the demographic variables analysed and risk perception, which reinforces the predominant influence of framing.

Our findings indicate the necessity of re-evaluating communication strategies in clinical scenarios, especially in surgical settings where risk perception can affect patient decisions.[29] Prompting health providers need to adopt balanced and clear risk communication strategies in the absence of standardised guidelines.[19]

From a policy standpoint, strategies to educate primary eye care providers to consider the impact of communication delivery in patient perception, aiming to improve the way health providers convey information about potential benefits and risks, are of potential benefit.

Table 2 Comparative analysis of risk perception scores across other characteristics

Variable	N	Median (IQR)	Test type	P value
Gender			Mann Whitney U test	0.519
Female	37	2 (1–3)		
Male	63	2 (1–3)		
Education			Kruskal-Wallis test	0.104
Less than high school	2	1 (1–1)		
High school	30	2 (2–3)		
Postsecondary	44	2 (2–3)		
Postgraduate	21	2 (1–2)		
N/A	3	2 (2–3)		
Knowledge			Kruskal-Wallis test	0.303
Very limited	66	2 (1–3)		
Some	27	2 (1–3)		
Extensive	7	2 (1–2)		
Visual satisfaction			Kruskal-Wallis test	0.077
Very dissatisfied	38	2 (1–3)		
Fairly dissatisfied	23	3 (2–3)		
Fairly satisfied	33	2 (1–3)		
Very satisfied	6	1 (1–2)		

Our study supports the shift to a more comprehensive and coherent approach to patient education, one that is patient-centred and aims for informed and empowered patients.

The limitations of this study are that we focused on immediate perception of risk measured through a self-reported scale, and not looking into the long-term impact on behaviour or decision-making. Second, we included only English-speaking participants, narrowing the generalisability of our findings to populations with varied language proficiencies, cultural backgrounds and cognitive states. We acknowledge that the framing of risk was presented in a binary manner (99% positive vs 1% negative), which does not encompass the diverse ways risk can be communicated in a clinical setting, potentially introducing a framing effect bias. Regarding our analyses, while the univariate regressions performed in our study, aimed to assess potential association with risk perception, the method may not have fully accounted for all influential factors. Therefore, it is important to acknowledge that other variables considered in this study could be more comprehensively addressed with multivariable analysis in future studies to offer a deeper understanding of their impact. Furthermore, the impact of cognitive load and individual psychological factors such as optimism bias on risk perception was not assessed. The assumption that all participants uniformly understand and interpret risk percentages could also affect the validity of our findings.

Despite these limitations, this study presents several notable strengths including a powered sample size and a diverse participant pool from the Greater Toronto Area, which increases generalisability. Furthermore, to our knowledge, this is the first study that explored the impact of risk framing specifically in the context of cataract surgery, filling a significant gap in the existing literature on cataract care.

Next steps in research should prioritise exploring the direct impacts of differently framed information on patients' actual decisions and behaviours to offer insights into how perceptions translate into actions in real medical settings. In addition, a larger sample size, that includes participants from diverse linguistic and cognitive backgrounds, would help refine our understanding of risk perception across different populations or cultures. Furthermore, given that we did not identify significant sociodemographic drivers of risk perception scores, the need for a more comprehensive exploration of other individual factors such as, cultural influences, personality traits and individual experiences, is emphasised, as these could play a role in shaping perception of risk and benefits as well. By building on our findings, further research could contribute to the refinement of communication practices, ultimately improving patient understanding and contributing to enhanced patient-centred care.

In conclusion, our study showed that the framing of risks has a significant effect on patients' perception, highlighting the impact of communication delivery in surgical discussions. This work adds to the existing literature on risk communication, by providing new insights specifically into the framing effect within the context of cataract surgery. It is clear from our findings that there is a pressing need to refine and enhance dialogue strategies to optimise clear and effective risk–benefit communication.

Contributors Study concept and design were conceived by MBS, IIKA and DLM. Study data were collected and acquired by DLM. All authors were involved in the interpretation of study data. DLM was responsible for writing the first draft of the manuscript. All authors were responsible for revising the first draft of the manuscript into the final manuscript. All authors approved the final draft and are accountable for its finalised content. MBS accepts full responsibility as the guarantor of this work.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by Research Ethics Board Trillium Health Partners ID-1050. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; internally peer-reviewed.

Data availability statement Data are available upon reasonable request.

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