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Breast cancer screening based on personalized risk assessment: Experience and satisfaction of primary care providers with receiving risk communication documents for patients enrolled in the PERSPECTIVE I&I project

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Abstract

Objective: We aim to document primary care providers' (PCPs) experience and satisfaction with receiving risk communication documents on their patient's breast cancer (BC) risk assessment and proposed screening action plan.

Methods and Analysis: A survey was sent to all 763 PCPs designated by participants in PERSPECTIVE I&I research project, about one to four months after the receipt of risk communication documents. Descriptive analyses were used to report on participants' responses. Responses to two open-ended questions were subjected to content analysis.

Results: A total of 168 PCPs answered the survey, from which 72.6% reported being women and 74.4% having more than 15 years of practice. Relatively few (38.1%) were familiar with the risk-based BC screening approach prior to receiving their patient risk category. A vast majority (85.7%) agreed with the screening approach and would recommend it to their patients if implemented at the population level. PCPs reported understanding the information given to them (92.3%) and agreed with the proposed BC screening action plan (88.7%). Some PCPs suggested to simplify the materials, to stay mindful of the fact that the approach could increase their workload, and to invest efforts in the planning of professional training.

Conclusion: PCPs displayed positive attitudes about a risk-based BC screening approach and were satisfied with the information provided. They also highlighted that if the approach were to be implemented at the population level, it would be important to address issues such as professional training, impact on workload. Future qualitative studies may help further characterize PCPs' perspectives.

Keywords: Risk-based breast cancer screening, risk assessment, primary care providers, polygenic risk score.

Strengths and limitations of this study:

- This study is among the first to report on the experience and satisfaction of PCPs receiving patients' personalized BC risk assessment and proposed action plans in order to adapt screening for their individual patients in a real-life scenario. This makes it possible to collect real-life PCPs feedback compared to feedback based on hypothetical scenarios.
- The main limitation of this study is related to its relatively low response rate, which resulted in a limited sample size. Such a sample cannot be deemed to represent the PCPs population at large.
- Our small sample size also prevented us from conducting more complex multivariable analyses.

Introduction

According to the World Health Organization, more than 2.3 million women were diagnosed with breast cancer (BC) in 2020, leading to more than 600,000 deaths [1]. In Canada, BC is the second most commonly diagnosed cancer and more than 28,600 women were diagnosed with this disease in 2022 [2]. Fortunately, the death rate of from BC has steadily declined since its peak in 1986 [3 4 5]. Such a decline in mortality can be attributed to improved treatments and more efficient screening programs [6 3].

While the current age-based BC screening programs have been successful in reducing mortality, there are still areas for improvement [7]. This includes reducing BC overdiagnosis [8], which can have several consequences such as unnecessary medical exams, treatments, and psychological impacts on patients [9]. Moreover, age-based screening recommendations ignore several BC risk factors, such as genetic susceptibility, lifestyle habits, or reproductive history [10]. Evidence suggests that a more personalized risk-based approach could be a cost-effective way to improve BC screening programs [11 12 13 14 15]. This personalized approach involves targeting women at the highest risk for developing BC. [15]. First, such risk stratification is expected to allow for reducing BC mortality through early detection of tumors in high-risk patients, thereby significantly increasing the chances of effective therapeutic management, cure, and long-term survival [15]. Moreover, by focusing screening efforts on specific populations, this personalized approach would lead to a more rational and cost-effective allocation of limited healthcare resources, representing a significant benefit in terms of cost optimization and spending efficiency within the healthcare system [13 15].

Although a personalized risk-based approach appears promising, its implementation does represent a challenge [14 16]. Part of this challenge concerns the coordination of health services through adequate preparation of, and efficient communication with, primary care providers (PCPs) [14]. Several studies indicated that PCPs seem to have positive attitudes towards the implementation of risk-based assessment for BC [17 18 19 20]. The use of genomic technologies for multifactorial risk assessment in other types of cancer also seems to be generally well received by various PCPs [21 22 23]. However, they tend to report a lack of training in conducting BC risk assessment [24]. Other barriers to implementing a risk-based screening approach were identified, such as an increased workload, a lack of financial and human resources, and a lack of coordination between public and private PCPs [25]. Primary healthcare professionals, such as nurse practitioners and family

physicians, are in a prime position to facilitate the implementation of BC screening approaches tailored to each patient's individual risk level [20]. Their role is essential on several instances [20 26 27 28]. First, they are expected to clearly explain to their patients the advantages and disadvantages of different screening methods based on personal risk assessments. Second, to able to effectively interpret and communicate each patient's calculated risk level using specific prediction tools. Finally, to advise their patients on the most appropriate screening and prevention strategies based on their individual risk profile. In definitive, PCPs in this context are expected to have the crucial responsibility of educating, raising awareness, and guiding their patients towards the screening options best suited to their personal risk of BC [20].

Most previous studies collected PCPs' opinions and attitudes on hypothetical implementation scenarios [17 18 21 23 29]. To our knowledge, very few evaluated the experience and satisfaction of PCPs on the actual receipt of a patient's personalized BC risk category in real-life practice. This important feedback is needed to guide future implementation efforts [30].

Our study aimed therefore to document the experience and satisfaction of PCPs relative to the receipt of information on their patients' personalized BC risk category and proposed screening action plan in their real-life practice in the context of the PERSPECTIVE Integration and Implementation study [16 31].

Materials and Methods

Setting

The present study is part of a major Canadian research project entitled PERSPECTIVE: I&I (Personalized Risk Assessment for Prevention and Early Detection of Breast Cancer: Integration and Implementation), which aims to improve breast cancer risk assessment and determine optimal approaches for implementing risk-based screening and prevention within the Canadian health system [32 16]. This project included a pre-implementation research activity recruiting more than 3,750 women from Quebec and Ontario, Canada's two most populous provinces [31]. Participating women underwent a comprehensive BC risk assessment using the Breast and Ovarian Analysis of Disease Incidence and Carrier Estimation Algorithm (BOADICEA) model implemented in the CanRisk prediction tool. This tool estimates participants' 10-year BC risk using the polygenic risk score (PRS) and multiple risk factors, namely age at menarche, age at menopause, number of

children, age at first live birth, use of oral contraception, use of hormone replacement therapy, body mass index, height and alcohol use [33] [34] [35,36]. By identifying and combining common, low-penetrance genetic variants, PRS is considered as useful tool for estimating the genetic risk of developing disease at both individual and population levels [37] [36] [38] [39]. The information from the risk assessment was then used to inform patients about their risk category and of possible screening action plan. In Quebec province only, the risk communication documents were sent to both the women and their designated family physician or primary care nurse practitioner. This includes a risk letter that reported on women's 10-year estimated risk, stratified into three risk categories using age-dependent risk thresholds. The remaining lifetime risks (from age 30 to 80 years) for these three categories—referred to as "average," "higher than average," and "high"—are based on percentages of less than 15%, 15%–24%, and more than 25%, respectively [16]. It also included the proposed screening action plan based on that risk category. Finally, it also includes a 2-page information booklet on the study, risk assessment, the importance of discussing their risk level with their patient, and a follow-up decision tree detailing the proposed action plan based on risk category [16,32]. All the documents are available in the Supplementary files.

Design and participants

All family physicians and primary care nurse practitioners designated by each of the 1,642 women participating in PERSPECTIVE I&I in the province of Quebec were sent an invitation letter and the survey. They were mailed about one to four months after the letter informing women of their risk category and the corresponding screening action plan were sent out. To increase participation, two additional reminders were sent by fax one to six months after the initial mailing. The recruitment phase took place from July 2021 to July 2022. Participants were consented by completing the questionnaire. In addition, we specified the terms of confidentiality and participation in the first paragraph of the survey, while also providing a telephone number and e-mail address for any questions concerning the study. The Ethics Review Boards of the *CHU de Québec-Université Laval* Research Center (Quebec City University Hospital) approved this study (MP-20-2020-4670).

Survey instrument development

The survey was based on previous work [15,22,23,40-42] and developed in French by a multidisciplinary team of clinicians and scientists with expertise in epidemiology, social science, and medicine. This 9-item questionnaire was pilot-tested with a dozen of clinicians and scientists not involved in the study. In the survey introduction, PCPs were reminded that, as part of the PERSPECTIVE I&I research project, they have received a letter reporting risk category for at least one of their patient's BC risk assessments. After this introduction, PCPs were invited to provide their experience and satisfaction through seven close-ended multiple-choice questions related to the following aspects:

- Familiarity with the risk-based BC screening approach, clarity of the letter used to inform women on their risk category, usefulness of the information booklet in understanding the result letter, attitudes and readiness regarding the proposed screening action plan, and perceived needs for more training (1 question with 8 statements);
- Use and appreciation of the PERSPECTIVE I&I project website, which provides further information about the risk-based BC screening approach (1 question with 4 statements);
- Attitudes towards implementing a risk-based approach at the population level and its perceived benefits (2 questions);
- Socio-demographic information such as profession, gender, and years of practice (3 questions).

The survey also had two open-ended questions on possible ways to improve the risk-based BC screening approach and the material provided and on additional resources that would be needed to support their practice (2 questions).

Statistical analysis

Descriptive analyses were used to report participants' responses to the seven closed-ended questions. We used Fisher's exact test with the SAS software, Version 9.4 (Copyright © 2016 by SAS Institute Inc., Cary, NC, USA) for our bivariate analyses. Specifically, we tested whether participants' attitudes towards the risk-based BC screening approach differed across years of practice and across gender. Years of practice were classified as follows: less than 5 years, 5-10 years, 11-15 years, 16-20 years, 21 years and over.

A content analysis was performed on the two open-ended questions. Responses were coded by AO and JL to group them into larger themes using an Excel spreadsheet. ASB also independently coded the data.

AO, JL, and ASB then deliberated over their respective coding to come up with intercoder agreement to assure the reliability of the identified themes[43]. An inductive approach was favored for the coding and analysis of our qualitative data where codes were selected without prior theoretical framework. It should be noted that the answers to our open-ended questions were generally short. To remain faithful to the perspectives of our participants, the themes identified are also presented in general terms.

Results

Out of the 763 PCPs contacted, 168 (22%) participated in our study. Most of them (i.e., 72.4%) had only one patient participating in the PERSPECTIVE I&I project, while 27.6% had two patients or more. Among participants, 72.6% were female and 74.4% had more than 15 years of practice (Table 1).

Quantitative results

Only 38.1% of our participants knew about screening based on personalized BC risk assessment. Despite this, 86.9% of participants believed it is appropriate to carry out BC risk assessment prior to screening. The vast majority also found the proposed action plan appropriate (85.7%) and were ready to follow it (88.7%). Moreover, 92.3% reported understanding the information provided in the risk letter and 89.3% of them agreed that the information booklet enabled them to understand the description of their patient's risk category. Finally, the perception of participants was mixed about the need for more training; 44.1% of them agreed that they need more training while 34.5% neither agreed nor disagreed with this statement (Figure 1).

When asked about their appreciation of the study's online resource, 158 (94%) participants reported that they did not visit the website mentioned in the risk communication documents. As for the 10 (6%) participants who did visit it, all agreed that the website answered their questions, that the information was clearly presented and easily accessible, and that they would recommend the website to their colleagues if they wish to learn more about risk-stratified BC screening approach.

When we asked participants how likely they would encourage their patients to participate in a risk-based BC screening program, 87.5% of them responded that they were likely or very likely to encourage their patients to take part in such a program (Figure 2). There was no evidence from our bivariate analysis that

years of practice or gender influence the likelihood of encouraging patients to participate in a risk-based BC screening program (data not shown).

When presented with various statements about the benefits of personalized risk-stratified approach for BC screening, 82.1% of the participants agreed that it could screen high risk women and 69% of them responded that it could both reduce unnecessary mammograms in the future and screen women of less than 50 years of age. A little more than 40% agreed that it could reduce the number of false positive mammograms and that it could lead to cost savings for society. Only a third (34.5%) of our participants believed that the approach could reduce the number of BC deaths (Figure 3).

Qualitative results

A total of 42 participants provided an answer to the open-ended question on whether there are aspects to be modified in the risk-based BC screening approach and in the material provided. A few participants deemed the approach ineffective, superfluous, or irrelevant. The main concern was related to the potential increase in PCPs' workload. Addressing the follow-up of high-risk patients was also judged important as well as putting efforts in the promotion of the risk-based BC screening approach in the population. Concerning the documents received, some would have appreciated a shorter, simplified, version of the documents while others felt that it would be necessary to clarify which information should be provided to patients. Lastly, some participants stated that there were no aspects to change to the risk-based approach or to the risk communication documents received.

A total of 21 participants responded to the open-ended question on additional resources that would help their practice within a risk-based BC screening approach. Participants mentioned the need to develop resources for PCPs such as a mobile application. They were concerned about improving access to information about genetic and mentioned the importance of developing information tools for patients. The need for additional training and case discussions was also raised. Finally, participants suggested transferring the follow-up role to nurses.

Discussion

Summary of results and perspective of the literature

According to our results, risk-based approach to guide BC screening is receiving a strong support from PCPs with a vast majority considering the approach appropriate and being likely or very likely to recommend the approach if it were to be implemented at a population level. This positive appraisal of the risk-based BC screening approach echoed the results reported in previous [17 18 19 20].

However, one of the main concerns was related to the potential impact on workload. This concern is also reported in other studies and is deemed as an important barrier to implementation [44 17 45]. Future risk-based BC screening initiatives will need to invest on the development and implementation of an efficient operational integration of this approach [46]. As our participants suggested, this could involve a greater role for nurses in assessing and communicating breast cancer risk category to patients. Several implementation scenarios such as self-management by women themselves are possible for the risk-based BC screening approach and should be considered and pilot-tested [40].

The need for more professional training was mentioned in both our qualitative and quantitative results. As with workload, the need for training is a recurring aspect in previous studies looking at the implementation of risk-based screening [18 24]. This highlights the necessity of leading concerted multi-level strategies to offer adequate training in personalized risk assessment and stratification that includes genomics and precision medicine approaches [22]. In the context of the PERSPECTIVE I&I project, a website was available and mentioned in the documents for PCPs wishing to have additional information about the approach. It was concerning to know that only 6% of our participants consulted the website despite admitting their need for more training. This lack of use of the website might be explained by two aspects. First, participants found the information in the documents clear and sufficient to understand the BC risk assessment and screening action plan. Second, it is consistent with PCPs expressed concerns with increased workload. In light of these results, risk-based BC screening initiatives should ensure that risk assessment letters describing the risk category be concise, clear and in an easy-to-read format. This also highlighted the importance of involving all relevant stakeholders, particularly PCPs, when designing communication tools. If implementation efforts do provide a website or online resources, the latter should not replace the information booklet provided along with the risk category letter. The website should offer complementary and detailed information for those wishing to learn more about personalized risk assessment and risk-stratified BC screening approach. As mentioned by

PCPs, given the limited resources in healthcare systems, the most important objective is to ensure the simplicity and clarity of the information provided rather than quantity.

Strength and Limitations

To our knowledge, our study is among the first to report on the experience and satisfaction of PCPs receiving patients' personalized BC risk assessment and proposed action plans in order to adapt screening for their individual patients. This makes it possible to collect real-life PCPs feedback compared to feedback based on hypothetical scenarios. The addition of qualitative open-ended questions added context to our quantitative results, by allowing our participants to give suggestions and answers that our research team had simply not anticipated when constructing the questionnaire, particularly regarding the fear of an increase in their workload or the way in which information was presented in the letter and information leaflets. In this sense, the answers to our open-ended questions are a way of enriching the information gathered in the other questions by providing new answers or more in-depth explanations of the PCPs' perspective on implementation of the approach [47]. However, further qualitative studies would be necessary to gain an even more contextualized and in-depth understanding of the issue. Finally, our results are timely given that several major research projects are underway to study the implementation of risk-based BC screening approaches [14 48 16 49].

The main limitation of this study is related to its relatively low response rate, which resulted in a limited sample size. Such a sample cannot be deemed to represent the PCPs population at large. It also prevented us from conducting more complex multivariable statistical analyses. In addition, our sample is not representative of PCPs in the province of Quebec. Notably we have an over-representation of PCPs identifying themselves as women and of PCPs with more than 21 years' experience, potentially affecting the generalizability of our findings.

Nonetheless, our sample size is within the range of previous similar work [23,29,50-52] and our findings are poised to offer a glimpse into the experience and satisfaction of family physicians and nurse practitioners upon receiving their patient's BC risk-category and action plan for BC screening. Finally, it is worth reminding that the survey was launched in the middle of the third wave of the COVID-19 pandemic, during which health care professionals were overwhelmed and strained by the massive influx of patients.

Implications for clinical practice and future research

Overall, our results show that PCPs are in favour of the integration of the risk-based BC screening approach when provided with real-life information about risk category and screening action plan. With the reduction of costs associated with genome sequencing and the rapid advancement of technologies [53], it is becoming increasingly feasible for healthcare systems to allocate resources in calculating patients' genomic risk to include in risk assessment tools in order to offer to patients a risk stratified approach for screening tailored to their risk category. This study contributes to the growing body of scientific evidence evaluating the potential of implementing personalized risk assessment to offer a risk-based BC screening approach. Specifically, our findings highlight the importance of considering PCPs' perspectives when planning to implement this BC screening approach. In addition, future studies with a qualitative design would probably provide a unique opportunity to further explore PCPs views about the approach and put our findings into a wider context.

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Supplementary materials

Supplementary file 1: Tables and Figures

Supplementary file 2: Questionnaire (in French)

Supplementary file 3: Risk letters and proposed screening action plans based on that risk category (in French)

Supplementary file 4: CROSS-Checklist

Footnotes

Contributors: All authors have contributed to the development of this research. HN and JS participated in the conceptualization of the research. AO, JL and PF wrote the first draft of this manuscript. All authors critically reviewed and commented on drafts of this manuscripts and approved the first version submitted. AO, AB, PF and HN revised the manuscript following the reviewers' comments, before the final version submitted.

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Availability of data and materials: Data are available upon a reasonable request to the corresponding author.

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Supplementary file 1: Tables and Figures

Table 1. Participants' characteristics (n=168)

Sociodemographic variables	Frequency n (%)
Profession	
Physician	163 (97.0)
Primary Care Nurse Practitioner	5 (3.0)
Prefer not to answer	0 (0.0)
Gender	
Women	122 (72.6)
Men	46 (27.4)
Other	0 (0.0)
Years of practice	
< 5 years	14 (8.3)
5-10 years	20 (11.9)
11-15 years	8 (4.8)
16-20 years	20 (11.9)
> 21 years	105 (62.5)
Prefer not to answer	1 (0.6)

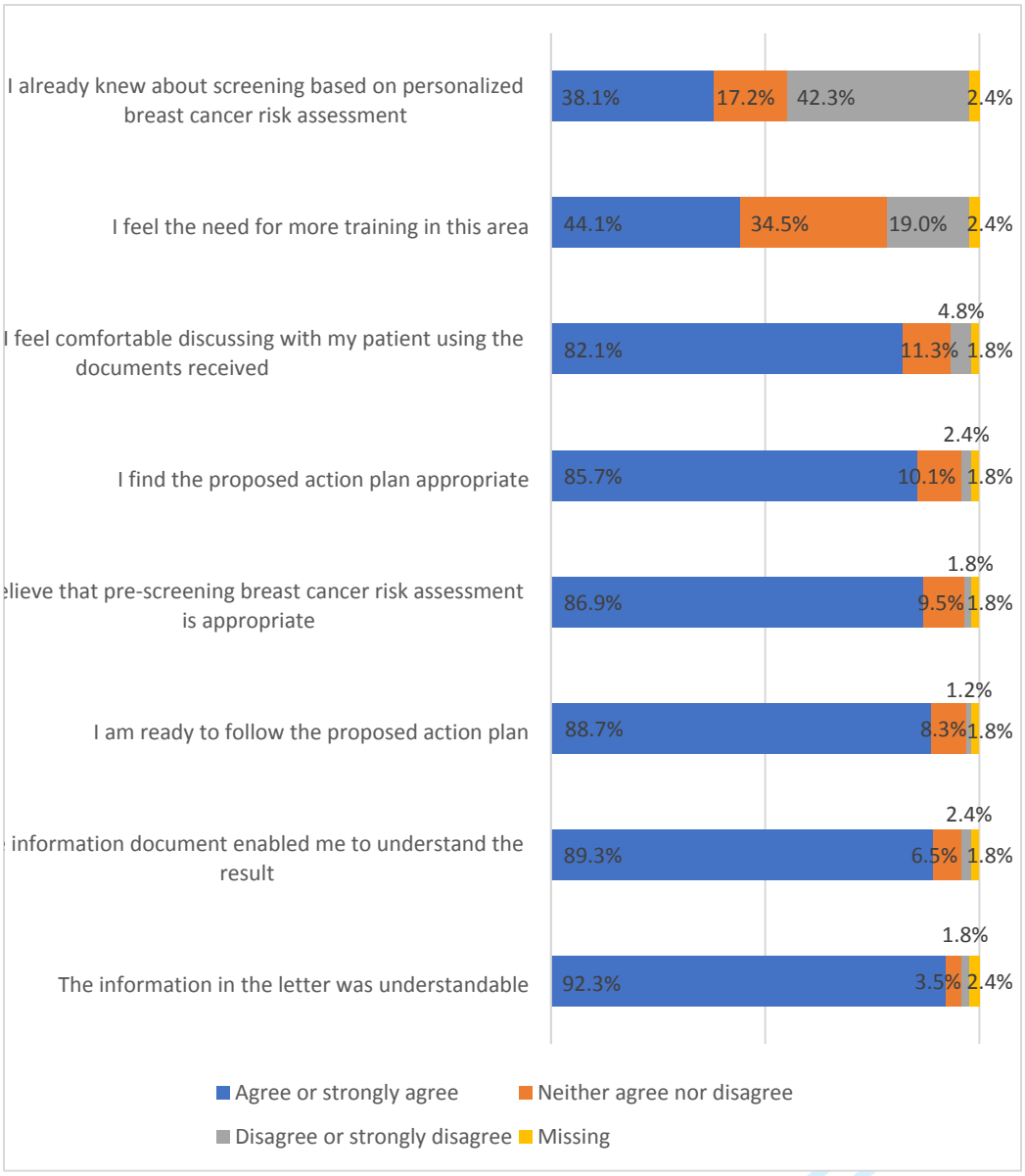

Figure 1. Participants' experience and satisfaction with the risk letter and the risk-based breast cancer screening approach.

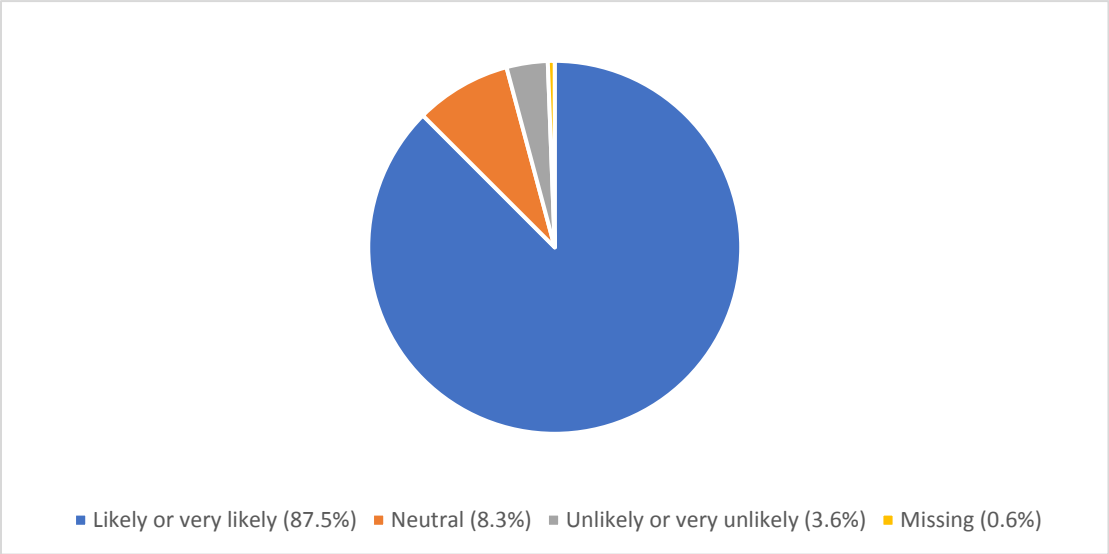

Figure 2. Participants' likeliness to encourage patients to participate in programs that offer personalized risk assessment for breast cancer screening if it were to be offered at population level.

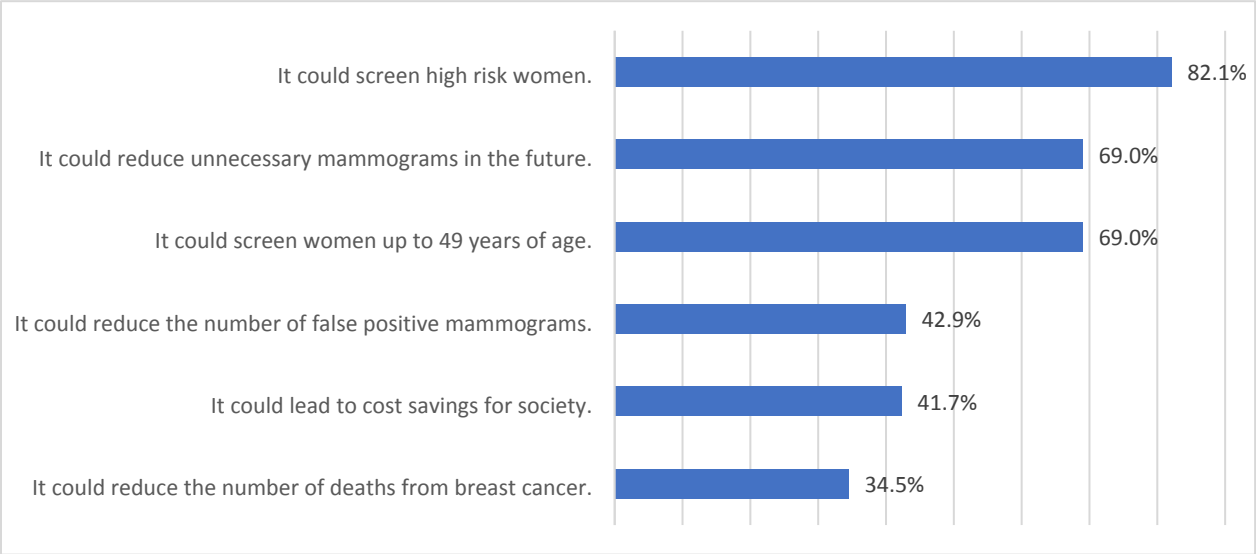

Figure 3. Benefits of personalized risk assessment for breast cancer screening according to participants.

Questionnaire de retour d'expérience concernant l'étude PERSPECTIVE I&I

Vous avez reçu récemment un ou plusieurs résultats de l'évaluation personnalisée du risque de cancer du sein de votre patiente ou vos patientes réalisée dans le cadre du projet de recherche PERSPECTIVE. Afin de nous permettre de tenir compte de vos avis et préférences dans l'amélioration de nos processus, nous vous invitons à répondre à ce court sondage qui prendra environ 10 minutes.

Vos réponses seront rendues anonymes : nous ne collecterons pas votre nom ni aucune information permettant de vous identifier en lien avec vos réponses aux questions.

Soyez à l'aise de formuler vos remarques à l'égard de l'étude.

Vous pouvez en tout temps refuser de répondre à une question.

Si vous avez des questions sur le questionnaire, contactez-nous par téléphone au 418 682-7391 (sans frais 1 888 682-7391) ou par courriel à l'adresse info@etudeperspective.ca.

Q1 : Suite à votre lecture des documents reçus (lettre et document d'information), veuillez SVP indiquer votre niveau d'accord avec les énoncés suivants :

	Très en accord	En accord	Ni en accord ni en désaccord	En désaccord	Très en désaccord
Les informations dans la lettre étaient compréhensibles	○	○	○	○	○
Le document d'information m'a permis de bien comprendre le résultat	○	○	○	○	○
Je connaissais déjà le dépistage basé sur l'évaluation personnalisée du risque de cancer du sein	○	○	○	○	○
Je juge que l'évaluation du risque de cancer du sein avant dépistage est pertinente	○	○	○	○	○
Je trouve le plan d'action proposé approprié	○	○	○	○	○
Je suis prêt à suivre le plan d'action proposé	○	○	○	○	○

Je me sens à l'aise de discuter avec ma patiente à l'aide des documents reçus	○	○	○	○	○
Je ressens le besoin d'avoir davantage de formation dans ce domaine	○	○	○	○	○

Q2 : Avez-vous consulté le site internet mentionné dans la lettre?

○ Oui
○ Non

Q2a Si oui, pour quelles raisons ? (Cochez tout ce qui s'applique)

☐ J'avais des interrogations suite à la lecture des documents
☐ Je voulais valider ma compréhension suite à la lecture des documents
☐ Je voulais en savoir plus sur l'évaluation personnalisée du risque de cancer du sein
☐ Autre

Veuillez préciser

_____

Q2b Si oui, suite à votre consultation du site Internet, veuillez SVP indiquer votre niveau d'accord avec les énoncés suivants :

	Très en accord	En accord	Ni en accord ni en désaccord	En désaccord	Très en désaccord
Le site Internet a répondu à mes interrogations	○	○	○	○	○
Les informations sur le site Internet étaient présentées clairement	○	○	○	○	○
J'ai trouvé les informations que je cherchais sur le site Internet	○	○	○	○	○
Je recommanderais le site Internet à mes collègues pour qu'ils s'informent sur l'évaluation personnalisée du risque de cancer du sein	○	○	○	○	○

Q3 : Si l'évaluation personnalisée du risque pour le dépistage du cancer du sein était proposée au niveau populationnel, quelle est la probabilité que vous encouragiez vos patientes à participer à un tel programme?

- ○ Très probable
- ○ Probable
- ○ Neutre
- ○ Improbable
- ○ Très improbable
- ○ Ne sais pas

Q3a : Si vous avez répondu > ou >, quelles sont les raisons qui expliquent votre choix?

- ☐ Cette approche demande trop de temps de consultation
- ☐ Je juge cette approche superflue par rapport au PQDCS
- ☐ Ce n'est pas de ma responsabilité
- ☐ Je me questionne sur la validité médicale de cette approche
- ☐ Je ne suis pas assez à l'aise avec cette approche
- ☐ Je vais utiliser cette approche lorsque d'autres le feront
- ☐ Autre

Veuillez préciser _____

Q4 : Cochez SVP le ou les énoncés avec lesquels vous êtes en accord concernant l'utilisation de l'évaluation du risque personnalisée pour le dépistage du cancer du sein.

- ☐ Cela pourrait réduire des mammographies inutiles dans le futur
- ☐ Cela pourrait permettre de dépister des femmes de 49 ans et moins
- ☐ Cela pourrait permettre de dépister des femmes ayant un risque élevé
- ☐ Cela pourrait permettre de réduire le nombre de mammographies faussement positives
- ☐ Cela pourrait permettre de diminuer le nombre de décès liés au cancer du sein
- ☐ Cela pourrait mener à des économies à la société

Q5 : Êtes-vous :

- ○ Médecin
- ○ Infirmière praticienne spécialisée en 1er ligne
- ○ Préfère ne pas répondre

Q6 : Quel est votre sexe?	◯ Femme ◯ Homme ◯ Autre ◯ Préfère ne pas répondre
Q7 : Depuis combien de temps pratiquez-vous votre profession?	◯ Moins de 5 ans ◯ De 5 à 10 ans ◯ De 11 à 15 ans ◯ De 16 à 20 ans ◯ 21 ans et plus ◯ Préfère ne pas répondre

Questions ouvertes optionnelles

Q8 : Selon vous, y aurait-il des aspects à modifier dans l'approche personnalisée d'évaluation du risque et le matériel fourni? Si oui, lesquels? _____

Q9 : Quelles ressources supplémentaires pourraient vous aider? _____

Checklist for Reporting Of Survey Studies (CROSS)

Section/topic	Item	Item description	Reported on page #
Title and abstract			
Title and abstract	1a	State the word "survey" along with a commonly used term in title or abstract to introduce the study's design.	1-2-3
	1b	Provide an informative summary in the abstract, covering background, objectives, methods, findings/results, interpretation/discussion, and conclusions.	1-2-3
Introduction			
Background	2	Provide a background about the rationale of study, what has been previously done, and why this survey is needed.	4-5
Purpose/aim	3	Identify specific purposes, aims, goals, or objectives of the study.	5
Methods			
Study design	4	Specify the study design in the methods section with a commonly used term (e.g., cross-sectional or longitudinal).	5
Data collection methods	5a	Describe the questionnaire (e.g., number of sections, number of questions, number and names of instruments used).	6-7
	5b	Describe all questionnaire instruments that were used in the survey to measure particular concepts. Report target population, reported validity and reliability information, scoring/classification procedure, and reference links (if any).	6-7
	5c	Provide information on pretesting of the questionnaire, if performed (in the article or in an online supplement). Report the method of pretesting, number of times questionnaire was pre-tested, number and demographics of participants used for pretesting, and the level of similarity of demographics between pre-testing participants and sample population.	6-7
	5d	Questionnaire if possible, should be fully provided (in the article, or as appendices or as an online supplement).	Supp. Files
Sample characteristics	6a	Describe the study population (i.e., background, locations, eligibility criteria for participant inclusion in survey, exclusion criteria).	6
	6b	Describe the sampling techniques used (e.g., single stage or multistage sampling, simple random sampling, stratified sampling, cluster sampling, convenience sampling). Specify the locations of sample participants whenever clustered sampling was applied.	6
	6c	Provide information on sample size, along with details of sample size calculation.	6
	6d	Describe how representative the sample is of the study population (or target population if possible), particularly for population-based surveys.	11
Survey	7a	Provide information on modes of questionnaire administration, including the type and number of contacts, the location where the survey was conducted (e.g., outpatient	6-7

administration		room or by use of online tools, such as SurveyMonkey).	
	7b	Provide information of survey's time frame, such as periods of recruitment, exposure, and follow-up days.	6
	7c	Provide information on the entry process: –>For non-web-based surveys, provide approaches to minimize human error in data entry. –>For web-based surveys, provide approaches to prevent "multiple participation" of participants.	N/A
Study preparation	8	Describe any preparation process before conducting the survey (e.g., interviewers' training process, advertising the survey).	6-7
Ethical considerations	9a	Provide information on ethical approval for the survey if obtained, including informed consent, institutional review board [IRB] approval, Helsinki declaration, and good clinical practice [GCP] declaration (as appropriate).	6
	9b	Provide information about survey anonymity and confidentiality and describe what mechanisms were used to protect unauthorized access.	6
Statistical analysis	10a	Describe statistical methods and analytical approach. Report the statistical software that was used for data analysis.	8
	10b	Report any modification of variables used in the analysis, along with reference (if available).	N/A
	10c	Report details about how missing data was handled. Include rate of missing items, missing data mechanism (i.e., missing completely at random [MCAR], missing at random [MAR] or missing not at random [MNAR]) and methods used to deal with missing data (e.g., multiple imputation).	Supp. file 1
	10d	State how non-response error was addressed.	N/A
	10e	For longitudinal surveys, state how loss to follow-up was addressed.	N/A
	10f	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for non-representativeness of the sample.	N/A
	10g	Describe any sensitivity analysis conducted.	N/A
Results			
Respondent characteristics	11a	Report numbers of individuals at each stage of the study. Consider using a flow diagram, if possible.	8
	11b	Provide reasons for non-participation at each stage, if possible.	N/A
	11c	Report response rate, present the definition of response rate or the formula used to calculate response rate.	8

Descriptive results	11d	Provide information to define how unique visitors are determined. Report number of unique visitors along with relevant proportions (e.g., view proportion, participation proportion, completion proportion).	8
	12	Provide characteristics of study participants, as well as information on potential confounders and assessed outcomes.	8
Main findings	13a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates along with 95% confidence intervals and p-values.	8-9 and Sup. File
	13b	For multivariable analysis, provide information on the model building process, model fit statistics, and model assumptions (as appropriate).	N/A
	13c	Provide details about any sensitivity analysis performed. If there are considerable amount of missing data, report sensitivity analyses comparing the results of complete cases with that of the imputed dataset (if possible).	N/A
Discussion			
Limitations	14	Discuss the limitations of the study, considering sources of potential biases and imprecisions, such as non-representativeness of sample, study design, important uncontrolled confounders.	11
Interpretations	15	Give a cautious overall interpretation of results, based on potential biases and imprecisions and suggest areas for future research.	9-10-11-12
Generalizability	16	Discuss the external validity of the results.	11
Other sections			
Role of funding source	17	State whether any funding organization has had any roles in the survey's design, implementation, and analysis.	18
Conflict of interest	18	Declare any potential conflict of interest.	18
Acknowledgements	19	Provide names of organizations/persons that are acknowledged along with their contribution to the research.	18

BMJ Open

Primary care providers' experience and satisfaction with personalized breast cancer screening risk communication: A descriptive cross-sectional study

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Keywords:	Epidemiology < ONCOLOGY, Breast tumours < ONCOLOGY, PUBLIC HEALTH, Cancer genetics < GENETICS

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Primary care providers' experience and satisfaction with personalized breast cancer screening risk communication: A descriptive cross-sectional study

Word count: Abstract= 324; document = 3204

Total number of figures and tables = 4

Abstract

Objective: To describe primary care providers' (PCPs) experience and satisfaction with receiving risk communication documents on their patient's breast cancer (BC) risk assessment and proposed screening action plan.

Design: Descriptive cross-sectional study.

Setting: A survey was distributed to all 763 primary care providers (PCPs) linked to 1,642 women participating in the PERSPECTIVE I&I research project in Quebec, approximately one to four months after the delivery of the risk communication documents. The recruitment phase took place from July 2021 to July 2022.

Participants: Primary care providers.

Main outcome measures: Descriptive analyses were conducted to report participants' experiences and satisfaction with receiving risk communication. Responses to two open-ended questions were subjected to content analysis.

Results: A total of 168 PCPs answered the survey, from which 73% reported being women and 74% having more than 15 years of practice. Only 38% were familiar with the risk-based BC screening approach prior to receiving their patient risk category. A majority (86%) agreed with the screening approach and would recommend it to their patients if implemented at the population level. A majority of PCPs also reported understanding the information provided (92%) and expressed agreement with the proposed BC screening action plan (89%). Some PCPs recommended simplifying the materials, acknowledging the potential increase in workload, and emphasizing the need for careful planning of professional training efforts.

Conclusion: PCPs expressed positive attitudes toward a risk-based BC screening approach and were generally satisfied with the information provided. This study suggests that, if introduced in Canada in a manner similar to the PERSPECTIVE I&I project, risk-based BC screening would likely be supported by most PCPs. However, they emphasized the importance of addressing concerns such as professional training and the potential impact on workload if the approach were to be implemented at the population level. Future qualitative studies are needed to further explore the training needs of PCPs and to develop strategies for integrating this approach with the high workloads faced by primary care providers.

Keywords: Risk-based breast cancer screening, risk assessment, primary care providers, polygenic risk score.

Strengths and limitations of this study:

- This is the first study to report on the experience and satisfaction of PCPs receiving patients' personalized BC risk assessment and proposed action plans in order to adapt screening for their individual patients in a real-life scenario. By focusing on real-life scenarios, the study captures genuine feedback from PCPs, as opposed to feedback based on hypothetical situations.
- The primary limitation of this study is the potential for selection bias, as participants with a more positive attitude towards risk-based BC screening may have been more likely to participate in our survey, leading to an over-representation of individuals who are more favorable to the approach compared to those who are less supportive.
- Our sample is also not representative of PCPs population in the province of Quebec. We have an over-representation of women family physician and an under-representation of primary care nurses' practitioners.

Introduction

According to the World Health Organization, more than 2.3 million women were diagnosed with breast cancer (BC) in 2020, leading to more than 600,000 deaths [1]. In Canada, BC is the second most commonly diagnosed cancer and more than 28,600 women were diagnosed with this disease in 2022 [2]. Fortunately, the death rate from BC has steadily declined since its peak in 1986 [3 4 5]. Such a decline in mortality can be attributed to improved treatments and more efficient screening programs [6 3].

While current age-based BC screening programs have been associated with a reduction in mortality for certain populations, there are still areas for improvement [7]. This includes reducing BC overdiagnosis [8], which can have several consequences such as unnecessary medical exams, treatments, and psychological impacts on patients [9]. Moreover, age-based screening recommendations ignore several BC risk factors, such as genetic susceptibility, lifestyle habits, or reproductive history [10]. Evidence suggests that a more personalized risk-based approach could be a cost-effective way to improve BC screening programs [11 12 13 14 15]. This personalized approach involves targeting women at the highest risk for developing BC. [15]. First, such risk stratification is expected to allow for reducing BC mortality through early detection of tumors in high-risk patients, thereby significantly increasing the chances of effective therapeutic management, cure, and long-term survival [15]. Moreover, by focusing screening efforts on specific populations, this personalized approach would lead to a more rational and cost-effective allocation of limited healthcare resources, representing a significant benefit in terms of cost optimization and spending efficiency within the healthcare system [13 15].

Although a personalized risk-based approach appears promising, its implementation does represent a challenge [14 16]. Part of this challenge concerns the coordination of health services through adequate preparation of, and efficient communication with, primary care providers (PCPs) [14]. Several studies indicated that PCPs seem to have positive attitudes towards the implementation of risk-based assessment for BC [17 18 19 20]. The use of genomic technologies for multifactorial risk assessment in other types of cancer also seems to be generally well received by various PCPs [21 22 23]. However, they tend to report a lack of training in conducting BC risk assessment [24]. Other barriers to implementing a risk-based screening approach were identified, such as an increased workload, a lack of financial and human resources, and a lack of coordination

between public and private PCPs [25]. Primary healthcare professionals, such as nurse practitioners and family physicians, are in a prime position to facilitate the implementation of BC screening approaches tailored to each patient's individual risk level [20]. Their role is essential on several instances [20 26 27 28]. First, they are expected to clearly explain to their patients the advantages and disadvantages of different screening methods based on personal risk assessments. Second, to be able to effectively interpret and communicate each patient's calculated risk level using specific prediction tools. Finally, to advise their patients on the most appropriate screening and prevention strategies based on their individual risk profile. Ultimately, PCPs in this context are expected to have the crucial responsibility of educating, and guiding their patients towards the screening options best suited to their personal risk of BC [20].

Most previous studies collected PCPs' opinions and attitudes on hypothetical implementation scenarios [17 18 21 23 29]. To our knowledge, no study has evaluated the experience and satisfaction of PCPs on the actual receipt of a patient's personalized BC risk category in real-life practice. This feedback is essential for informing future implementation efforts [30].

The aim of our study was to describe the experience and satisfaction of PCPs regarding the receipt of information about their patients' personalized BC risk category and proposed screening action plan within the context of real-life practice, as part of the PERSPECTIVE Integration and Implementation study [16 31].

Materials and Methods

Setting

The present descriptive cross-sectional study is part of a major Canadian research project entitled PERSPECTIVE: I&I (Personalized Risk Assessment for Prevention and Early Detection of Breast Cancer: Integration and Implementation), which aims to improve breast cancer risk assessment and determine optimal approaches for implementing risk-based screening and prevention within the Canadian health system [32 16]. This project included a pre-implementation research activity recruiting more than 3,750 women from Quebec and Ontario, Canada's two most populous provinces [31]. Participating women underwent a comprehensive BC risk assessment using the Breast and Ovarian Analysis of Disease Incidence and Carrier Estimation Algorithm (BOADICEA) model implemented in the CanRisk prediction tool. This tool estimates

participants' 10-year BC risk using the polygenic risk score (PRS) and multiple risk factors, namely age at menarche, age at menopause, number of children, age at first live birth, use of oral contraception, use of hormone replacement therapy, body mass index, height and alcohol use [33] [34] [35,36]. By identifying and combining common, low-penetrance genetic variants, PRS is considered as useful tool for estimating the genetic risk of developing disease at both individual and population levels [37] [36] [38] [39]. The information from the risk assessment was then used to inform patients about their risk category and possible screening action plan. In Quebec province only, the risk communication documents were sent to both the women and their designated family physician or primary care nurse practitioner. This included a risk letter that reported on women's 10-year estimated risk, stratified into three risk categories using age-dependent risk thresholds. The remaining lifetime risks (from age 30 to 80 years) for these three categories—referred to as "average," "higher than average," and "high"—are based on percentages of less than 15%, 15%–24%, and more than 25%, respectively [16]. It also included the proposed screening action plan based on that risk category. Finally, it also includes a 2-page information booklet on the study, risk assessment, the importance of discussing their risk level with their patient, and a follow-up decision tree detailing the proposed action plan based on risk category [16] [32].

Design and participants

All family physicians and primary care nurse practitioners designated by each of the 1,642 women participating in PERSPECTIVE I&I in the province of Quebec were sent an invitation letter and the survey. They were mailed about one to four months after the letter informing women of their risk category and the corresponding screening action plan were sent out. To increase participation, two additional reminders were sent by fax one to six months after the initial mailing. The recruitment phase took place from July 2021 to July 2022. Participants were consented by completing the questionnaire. In addition, we specified the terms of confidentiality and participation in the first paragraph of the survey, while also providing a telephone number and e-mail address for any questions concerning the study. The Ethics Review Boards of the *CHU de Québec-Université Laval* Research Center (Quebec City University Hospital) approved this study (MP-20-2020-4670).

Survey instrument development

The survey was based on previous work [15,22,23,40-42] and developed in French by a multidisciplinary team of clinicians and scientists with expertise in epidemiology, social science, and medicine. This 9-item questionnaire was pilot-tested with twelve clinicians and scientists not involved in the study. In the survey introduction, PCPs were reminded that, as part of the PERSPECTIVE I&I research project, they have received a letter reporting risk category for at least one of their patient's BC risk assessments. After this introduction, PCPs were invited to share their experience and satisfaction through seven close-ended multiple-choice questions related to the following aspects:

- Familiarity with the risk-based BC screening approach, clarity of the letter used to inform women on their risk category, usefulness of the information booklet in understanding the result letter, attitudes and readiness regarding the proposed screening action plan, and perceived needs for more training (1 question with 8 statements);
- Use and appreciation of the PERSPECTIVE I&I project website, which provides further information about the risk-based BC screening approach (1 question with 4 statements);
- Attitudes towards implementing a risk-based approach at the population level and its perceived benefits (2 questions);
- Socio-demographic information such as profession, gender, and years of practice (3 questions).

The survey also had two open-ended questions on possible ways to improve the risk-based BC screening approach and the material provided and on additional resources that would be needed to support their practice (2 questions). The questionnaire is available in the Supplementary file 2.

Statistical analysis

Descriptive analyses were used to report participants' responses to the seven closed-ended questions. We used Fisher's exact test with the SAS software, Version 9.4 (Copyright © 2016 by SAS Institute Inc., Cary, NC, USA) for our bivariate analyses. Specifically, we examined whether participants' attitudes toward the risk-based BC screening approach varied based on years of practice and gender. Years of practice were classified as follows: less than 5 years, 5-10 years, 11-15 years, 16-20 years, 21 years and over.

A content analysis was performed on the two open-ended questions. Responses were coded by AO and JL to group them into larger themes using an Excel spreadsheet. ASB also independently coded the data.

AO, JL, and ASB then deliberated over their respective coding to come up with intercoder agreement to assure the reliability of the identified themes[43]. An inductive approach was favored for the coding and analysis of our qualitative data where codes were selected without prior theoretical framework. It should be noted that the answers to our open-ended questions were generally short. To remain faithful to the perspectives of our participants, the themes identified are also presented in general terms.

Results

Out of the 763 PCPs contacted, 168 (22%) participated in our study. Most of them (i.e., 72.4%) had only one patient participating in the PERSPECTIVE I&I project, while 27.6% had two patients or more. Among participants, 72.6% were female and 74.4% had more than 15 years of practice (Table 1).

Quantitative results

Only 38.1% of our participants knew about screening based on personalized BC risk assessment. Despite this, 86.9% of participants believed it is appropriate to carry out BC risk assessment prior to screening. The majority also found the proposed action plan appropriate (85.7%) and were ready to follow it (88.7%). Moreover, 92.3% reported understanding the information provided in the risk letter and 89.3% of them agreed that the information booklet enabled them to understand the description of their patient's risk category. Finally, the perception of participants was mixed about the need for more training; 44.1% of them agreed that they need more training while 34.5% neither agreed nor disagreed with this statement (Figure 1).

When asked about their appreciation of the study's online resource, 158 (94%) participants reported that they did not visit the website mentioned in the risk communication documents. As for the 10 (6%) participants who did visit it, all agreed that the website answered their questions, that the information was clearly presented and easily accessible, and that they would recommend the website to their colleagues if they wish to learn more about risk-stratified BC screening approach.

When we asked participants how likely they would encourage their patients to participate in a risk-based BC screening program, 87.5% of them responded that they were likely or very likely to encourage their patients to take part in such a program (Figure 2).

When presented with various statements about the benefits of personalized risk-stratified approach for BC screening, 82.1% of the participants agreed that it could screen high risk women and 69% of them responded that it could both reduce unnecessary mammograms in the future and screen women of less than 50 years of age. A little more than 40% agreed that it could reduce the number of false positive mammograms and that it could lead to cost savings for society. Only a third (34.5%) of our participants believed that the approach could reduce the number of BC deaths (Figure 3).

Qualitative results

A total of 42 participants provided an answer to the open-ended question on whether there are aspects to be modified in the risk-based BC screening approach and in the material provided. A few participants considered the approach to be ineffective, unnecessary, or irrelevant. The main concern was related to the potential increase in PCPs' workload. The importance of addressing the follow-up care for high-risk patients was also emphasized, along with the need to focus on promoting the risk-based BC screening approach within the general population. Concerning the documents received, some would have appreciated a shorter, simplified version while others felt that it would be necessary to clarify which information should be provided to patients. Lastly, some participants stated that there were no aspects to change to the risk-based approach or to the risk communication documents received.

A total of 21 participants responded to the open-ended question on additional resources that would help their practice within a risk-based BC screening approach. Participants mentioned the need to develop resources for PCPs such as a mobile application. They were concerned about improving access to information about genetic and mentioned the importance of developing information tools for patients. The need for additional training and case discussions was also raised. Finally, participants suggested transferring the follow-up role to nurses.

Discussion

Summary of results and perspective of the literature

According to our results, risk-based approach to guide BC screening is receiving a strong support from PCPs with a majority considering the approach appropriate and being likely or very likely to recommend the

approach if it were to be implemented at a population level. This positive appraisal of the risk-based BC screening approach echoed the results reported in previous studies [17 18 19 20].

However, one of the main concerns was related to the potential impact on workload. This concern is also reported in other studies and is deemed as an important barrier to implementation [44 17 45]. Future risk-based BC screening initiatives will need to invest in the development and implementation of an efficient operational integration of this approach [46]. As our participants suggested, this could involve a greater role for nurses in assessing and communicating breast cancer risk category to patients. Several implementation scenarios such as self-management by women themselves are possible for the risk-based BC screening approach and should be considered and pilot-tested [40,47].

The need for more professional training was mentioned in both our qualitative and quantitative results. As with workload, the need for training is a recurring aspect in previous studies looking at the implementation of risk-based screening [18,24]. This indicates the necessity of leading concerted multi-level strategies to offer adequate training in personalized risk assessment and stratification that includes genomics and precision medicine approaches [22]. In the context of the PERSPECTIVE I&I project, a website was available and mentioned in the documents for PCPs wishing to have additional information about the approach. It was concerning to know that only 6% of our participants consulted the website despite admitting their need for more training. Two factors may explain the limited use of the website. First, participants found the information in the documents clear and sufficient to understand the BC risk assessment and screening action plan. Second, this aligns with the concerns expressed by PCPs regarding an increased workload. In light of these results, risk-based BC screening initiatives should ensure that risk assessment letters describing the risk category be concise, clear and in an easy-to-read format. This also indicated the importance of involving all relevant stakeholders, particularly PCPs, when designing communication tools. If implementation efforts include a website or online resources, these should complement, rather than replace, the information booklet provided with the risk category letter. The website should offer complementary and detailed information for those wishing to learn more about personalized risk assessment and risk-stratified BC screening approach. As mentioned by PCPs, given the limited resources in healthcare systems, the most important objective is to ensure the simplicity and clarity of the information provided rather than quantity.

Strength and Limitations

To our knowledge, no study has examined the experience and satisfaction of PCPs in receiving personalized BC risk assessments and proposed action plans to tailor screening for their individual patients. This makes it possible to collect real-life PCPs feedback compared to feedback based on hypothetical scenarios. Furthermore, our results are timely given that several major research projects are underway to study the implementation of risk-based BC screening approaches [14 48 16 49].

The main limitation of this study is that our sample may be biased toward PCPs with more positive attitudes toward risk-based BC screening. As a result, PCPs who were less interested in this approach may have been less likely to participate in the survey, leading to their underrepresentation in our sample. Thus, such a sample cannot be considered representative of the broader population PCPs population. In addition, our sample is not representative of PCPs in the province of Quebec. Notably, there is an over-representation of female family physicians and an overall under-representation of primary care nurse practitioners [50], which may impact the generalizability of our findings. However, it is important to note that the survey was launched during the midst of the third wave of the COVID-19 pandemic, a time when healthcare professionals were under significant stress and facing an increased workload [51 52]. Another limitation is the lack of socio-demographic data for the 78% of primary care providers who did not participate in our survey, which limits the statistical analysis and generalizability of our findings.

The inclusion of qualitative open-ended questions provided valuable context to our quantitative results by allowing participants to offer insights and suggestions that our research team had not anticipated during the development of the questionnaire. Notably, this included concerns about increased workload and the way information was presented in the letter and information leaflets. In this way, the responses to the open-ended questions enriched our findings, offering new perspectives and more detailed explanations of primary care providers' views on implementing the risk-based screening approach [53].

However, open-ended questions alone do not provide a comprehensive understanding of PCPs' attitudes and perspectives. Future qualitative research is needed to gather more contextualized and detailed data on their views, particularly regarding training needs and how to integrate a risk-based BC screening approach while managing high workloads.

Despite these limitations, our findings provide valuable insights into the experiences and satisfaction of family physicians and nurse practitioners when receiving their patients' BC risk categories and screening action plans.

Implications for clinical practice and future research

Overall, our results show that PCPs are in favour of the integration of the risk-based BC screening approach when provided with real-life information about risk category and screening action plan. With the reduction of costs associated with genome sequencing and the rapid advancement of technologies [54], it is becoming increasingly feasible for healthcare systems to allocate resources in calculating patients' genomic risk to include in risk assessment tools in order to offer to patients a risk stratified approach for screening tailored to their risk category. This study contributes to the growing body of scientific evidence evaluating the potential of implementing personalized risk assessment to offer a risk-based BC screening approach. Specifically, our findings indicate the importance of considering PCPs' perspectives when planning to implement this BC screening approach. In addition, future studies with a qualitative design would probably provide a unique opportunity to further explore PCPs views about the approach and put our findings into a wider context.

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Tables

Table 1. Participants' characteristics (n=168)

Sociodemographic variables	Frequency n (%)
Profession	
Physician	163 (97.0)
Primary Care Nurse Practitioner	5 (3.0)
Prefer not to answer	0 (0.0)
Gender	
Women	122 (72.6)
Men	46 (27.4)
Other	0 (0.0)
Years of practice	
< 5 years	14 (8.3)
5-10 years	20 (11.9)
11-15 years	8 (4.8)
16-20 years	20 (11.9)
> 21 years	105 (62.5)
Prefer not to answer	1 (0.6)

Figure legends

Figure 1. Participants' experience and satisfaction with the risk letter and the risk-based breast cancer screening approach.

Figure 2. Participants' likeliness to encourage patients to participate in programs that offer personalized risk assessment for breast cancer screening if it were to be offered at population level.

Figure 3. Benefits of personalized risk assessment for breast cancer screening according to participants.

Supplementary materials

Supplementary file 1: Questionnaire

Supplementary file 2: CROSS-Checklist

Footnotes

Contributors: All authors have contributed to the development of this research. HN and JS participated in the conceptualization of the research. AO, JL and PF wrote the first draft of this manuscript. All authors

critically reviewed and commented on drafts of this manuscripts and approved the first version submitted. AO, AB, PF and HN revised the manuscript following the reviewers' comments, before the final version submitted. HN acted as guarantor.

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Ethics approval and consent to participate: Ethics approval was obtained. Ethics Research Committees of the CHU de Québec-Université Laval (MP-20-2020-4670). Participants were consented by completing the questionnaire.

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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.

Availability of data and materials: Data are available upon a reasonable request to the corresponding author.

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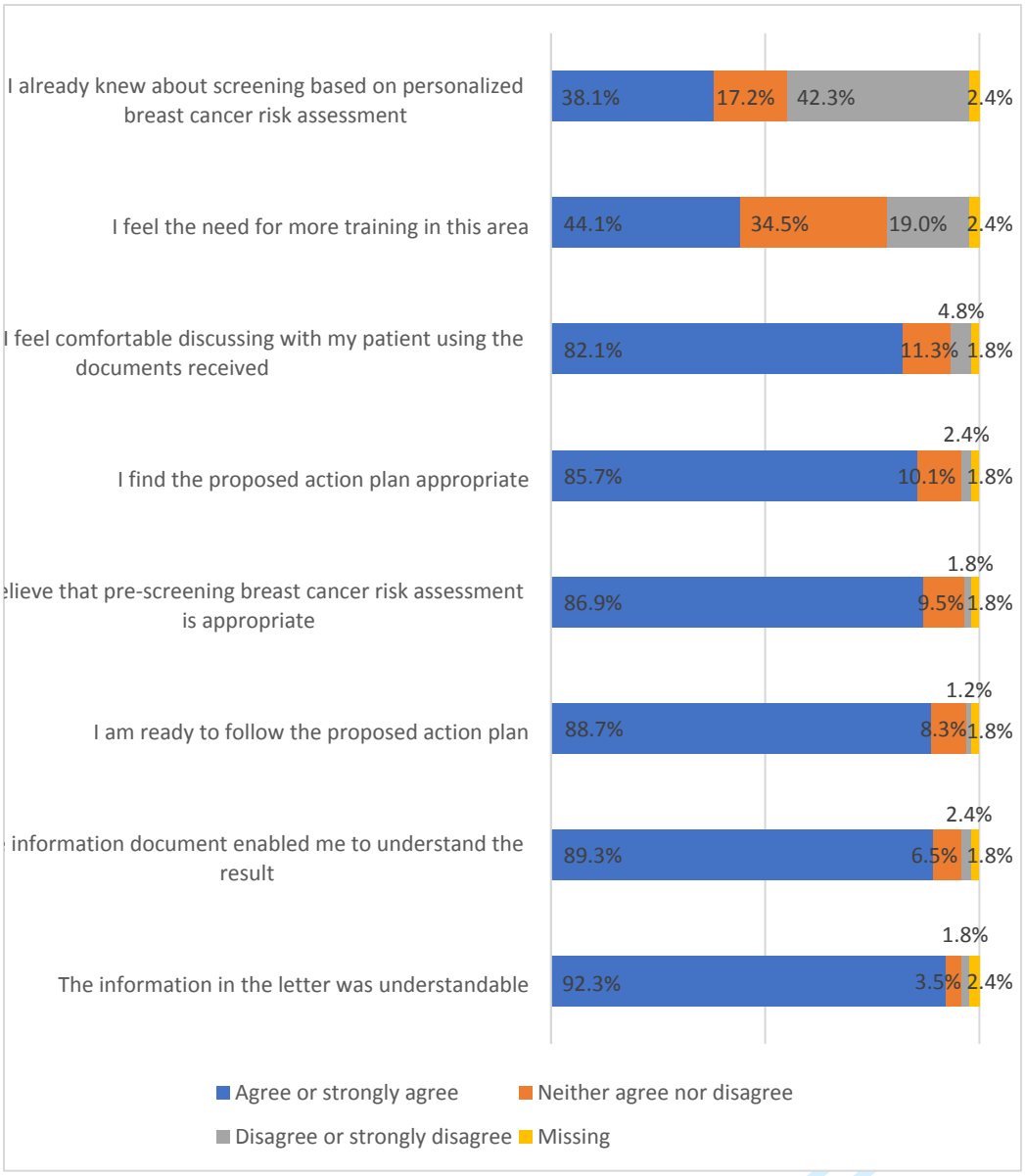

Figure 1. Participants' experience and satisfaction with the risk letter and the risk-based breast cancer screening approach.

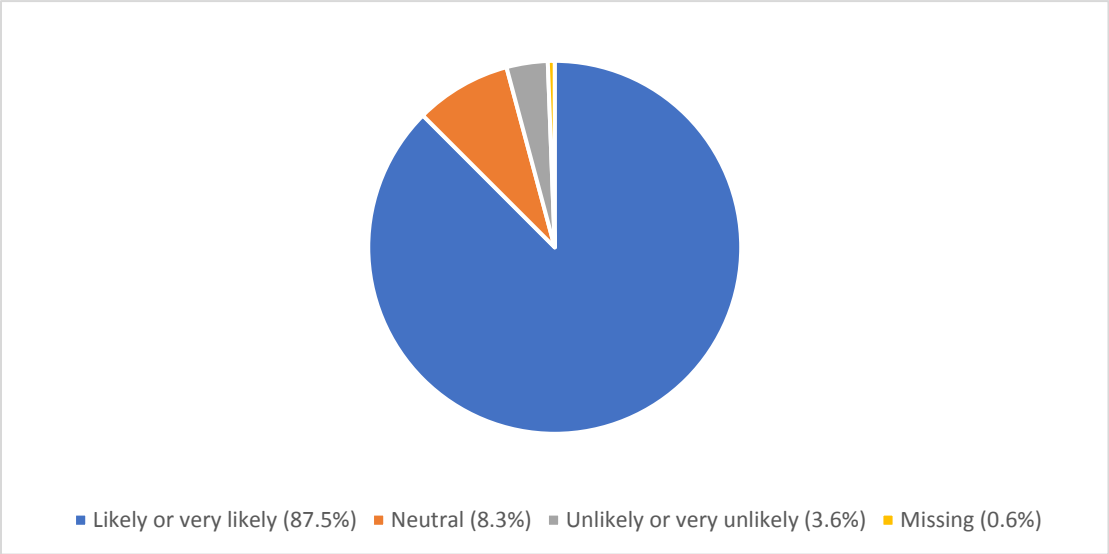

Figure 2. Participants' likeliness to encourage patients to participate in programs that offer personalized risk assessment for breast cancer screening if it were to be offered at population level.

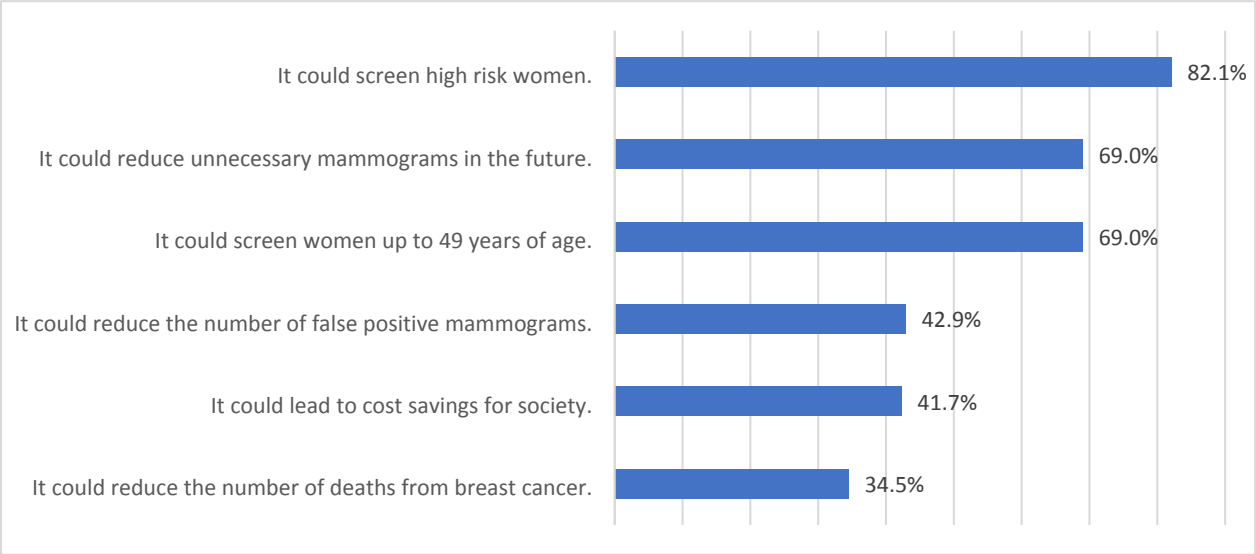

Figure 3. Benefits of personalized risk assessment for breast cancer screening according to participants.

Experience feedback questionnaire on the PERSPECTIVE I&I study

You have recently received one or more results of the personalized breast cancer risk assessment of your patient(s), carried out as part of the PERSPECTIVE research project. To enable us to take your opinions and preferences into account in improving our processes, we invite you to complete this short survey, which will take about 10 minutes. Your answers will be anonymized: we will not collect your name or any information that could link you to your answers to the questions.

Feel free to share your comments about the study.

You may refuse to answer a question at any time.

If you have any questions about the questionnaire, please contact us by telephone at 418 682-7391 (toll-free 1 888 682-7391) or by e-mail at info@etudeperspective.ca.

Q1. After reading the documents received (letter and information document), please indicate your level of agreement with the following statements:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The information in the letter was understandable	○	○	○	○	○
The information document enabled me to understand the result	○	○	○	○	○
I already knew about screening based on personalized breast cancer risk assessment	○	○	○	○	○
I believe that pre-screening breast cancer risk assessment is appropriate	○	○	○	○	○
I find the proposed action plan appropriate	○	○	○	○	○
I am ready to follow the proposed action plan	○	○	○	○	○
I feel comfortable discussing with my	○	○	○	○	○

patient using the documents received					
I feel the need for more training in this area	○	○	○	○	○

Q2. Have you consulted the website mentioned in the letter?

- ○ Yes
- ○ No

Q2a. If yes, what are the reasons? (Check all that apply)

- ○ I had some questions after reading the documents
- ○ I wanted to validate my understanding after reading the documents
- ○ I wanted to find out more about personalized breast cancer risk assessment
- ○ Other (Please specify): _____

Q2b. If yes, after visiting the website, please indicate your level of agreement with the following statements:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The website answered my questions	○	○	○	○	○
The information on the website was clearly presented	○	○	○	○	○
I found the information I was looking for on the website	○	○	○	○	○
I would recommend the website to my colleagues so that they can inform themselves about personalized breast cancer risk assessment.	○	○	○	○	○

Q3. If personalized risk assessment for breast cancer screening were to be offered at population level, how likely would you be to encourage your patients to participate in such programs?

- ○ Very likely
- ○ Likely

- Neutral
- Unlikely
- Very unlikely

Q3a. If you answered 'Unlikely' or 'Very unlikely', what are the reasons for your choice? (Check all that apply)

- This approach requires too much consultation time
- I consider this approach superfluous in relation to the PQDCS
- It is not my responsibility
- I wonder about the medical validity of this approach
- I'm not comfortable enough with this approach
- I will use this approach when others do
- Other (Please specify): _____

Q4. Check the statement(s) with which you agree regarding the use of personalized risk assessment for breast cancer screening.

- It could reduce unnecessary mammograms in the future
- It could screen women up to 49 years of age
- It could screen high risk women
- It could reduce number of false positive mammograms
- It could reduce the number of deaths from breast cancer
- It could lead to cost savings for society

Q5. Are you a:

- Physician
- Primary care nurse practitioner
- Prefer not to answer

Q6. What is your gender?

- Women
- Men
- Other

Q7. For how long have you been working in your profession?

- Less than 5 years
- From 5 to 10 years
- From 11 to 15 years
- From 16 to 20 years
- More than 21 years
- Prefer not to answer

OPTIONAL OPEN-ENDED QUESTIONS

Q8. In your opinion, are there any aspects of the personalized risk assessment approach and the material provided that need to be changed? If so, which ones?

_____

Q9. What additional resources could help you?

_____

Checklist for Reporting Of Survey Studies (CROSS)

Section/topic	Item	Item description	Reported on page #
Title and abstract			
Title and abstract	1a	State the word "survey" along with a commonly used term in title or abstract to introduce the study's design.	1-2-3
	1b	Provide an informative summary in the abstract, covering background, objectives, methods, findings/results, interpretation/discussion, and conclusions.	1-2-3
Introduction			
Background	2	Provide a background about the rationale of study, what has been previously done, and why this survey is needed.	4-5
Purpose/aim	3	Identify specific purposes, aims, goals, or objectives of the study.	5
Methods			
Study design	4	Specify the study design in the methods section with a commonly used term (e.g., cross-sectional or longitudinal).	5
Data collection methods	5a	Describe the questionnaire (e.g., number of sections, number of questions, number and names of instruments used).	6-7
	5b	Describe all questionnaire instruments that were used in the survey to measure particular concepts. Report target population, reported validity and reliability information, scoring/classification procedure, and reference links (if any).	6-7
	5c	Provide information on pretesting of the questionnaire, if performed (in the article or in an online supplement). Report the method of pretesting, number of times questionnaire was pre-tested, number and demographics of participants used for pretesting, and the level of similarity of demographics between pre-testing participants and sample population.	6-7
	5d	Questionnaire if possible, should be fully provided (in the article, or as appendices or as an online supplement).	Supp. Files 1
Sample characteristics	6a	Describe the study population (i.e., background, locations, eligibility criteria for participant inclusion in survey, exclusion criteria).	6
	6b	Describe the sampling techniques used (e.g., single stage or multistage sampling, simple random sampling, stratified sampling, cluster sampling, convenience sampling). Specify the locations of sample participants whenever clustered sampling was applied.	6
	6c	Provide information on sample size, along with details of sample size calculation.	6
	6d	Describe how representative the sample is of the study population (or target population if possible), particularly for population-based surveys.	11
Survey	7a	Provide information on modes of questionnaire administration, including the type and number of contacts, the location where the survey was conducted (e.g., outpatient	6-7

administration		room or by use of online tools, such as SurveyMonkey).	
	7b	Provide information of survey's time frame, such as periods of recruitment, exposure, and follow-up days.	6
		Provide information on the entry process:	N/A
	7c	–>For non-web-based surveys, provide approaches to minimize human error in data entry.	
		–>For web-based surveys, provide approaches to prevent "multiple participation" of participants.	
Study preparation	8	Describe any preparation process before conducting the survey (e.g., interviewers' training process, advertising the survey).	6-7
Ethical considerations	9a	Provide information on ethical approval for the survey if obtained, including informed consent, institutional review board [IRB] approval, Helsinki declaration, and good clinical practice [GCP] declaration (as appropriate).	6
	9b	Provide information about survey anonymity and confidentiality and describe what mechanisms were used to protect unauthorized access.	6
Statistical analysis	10a	Describe statistical methods and analytical approach. Report the statistical software that was used for data analysis.	7-8
	10b	Report any modification of variables used in the analysis, along with reference (if available).	N/A
	10c	Report details about how missing data was handled. Include rate of missing items, missing data mechanism (i.e., missing completely at random [MCAR], missing at random [MAR] or missing not at random [MNAR]) and methods used to deal with missing data (e.g., multiple imputation).	18-Figure
	10d	State how non-response error was addressed.	11
	10e	For longitudinal surveys, state how loss to follow-up was addressed.	N/A
	10f	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for non-representativeness of the sample.	N/A
	10g	Describe any sensitivity analysis conducted.	N/A
Results			
Respondent characteristics	11a	Report numbers of individuals at each stage of the study. Consider using a flow diagram, if possible.	8
	11b	Provide reasons for non-participation at each stage, if possible.	N/A
	11c	Report response rate, present the definition of response rate or the formula used to calculate response rate.	8

Descriptive results	11d	Provide information to define how unique visitors are determined. Report number of unique visitors along with relevant proportions (e.g., view proportion, participation proportion, completion proportion).	8
	12	Provide characteristics of study participants, as well as information on potential confounders and assessed outcomes.	8-18
Main findings	13a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates along with 95% confidence intervals and p-values.	8-9-18
	13b	For multivariable analysis, provide information on the model building process, model fit statistics, and model assumptions (as appropriate).	N/A
	13c	Provide details about any sensitivity analysis performed. If there are considerable amount of missing data, report sensitivity analyses comparing the results of complete cases with that of the imputed dataset (if possible).	N/A
Discussion			
Limitations	14	Discuss the limitations of the study, considering sources of potential biases and imprecisions, such as non-representativeness of sample, study design, important uncontrolled confounders.	11
Interpretations	15	Give a cautious overall interpretation of results, based on potential biases and imprecisions and suggest areas for future research.	9-10-11-12
Generalizability	16	Discuss the external validity of the results.	11
Other sections			
Role of funding source	17	State whether any funding organization has had any roles in the survey's design, implementation, and analysis.	19
Conflict of interest	18	Declare any potential conflict of interest.	19
Acknowledgements	19	Provide names of organizations/persons that are acknowledged along with their contribution to the research.	19