



Determinants of guideline concordant care by family physicians for breast cancer screening in women age 40-49: a qualitative analysis

| | |
|-------------------------------|--|
| Journal: | <i>CMAJ Open</i> |
| Manuscript ID | CMAJOpen-2021-0266 |
| Manuscript Type: | Qualitative |
| Date Submitted by the Author: | 12-Oct-2021 |
| Complete List of Authors: | Nadler, Michelle; Princess Margaret Hospital Cancer Centre, ; University of Toronto, Corrado, Ann ; Women's College Hospital, The Peter Gilgan Centre for Women's Cancers Desveaux, Laura; Women's College Hospital; Trillium Health Partners Neil-Sztramko, Sarah; McMaster University Wilson, Brooke; Princess Margaret Hospital Desnoyers, Alexandra; Laval University Amir, Eitan; Princess Margaret Hospital, Medical Oncology and Hematology Ivers, Noah; Women's College Hospital, Institute for Health System Solutions and Virtual Care; University of Toronto Department of Family and Community Medicine |
| Keywords: | Family medicine, general practice, primary care, Health services research, Knowledge translation, Oncology, Qualitative research, Women's health |
| More Detailed Keywords: | breast cancer screening, mammogram, theoretical domains framework, guideline |
| Abstract: | <p>Background: Guidelines recommend that physicians should inform women aged 40-49 of the potential benefits and harms of screening mammography to support individualized decisions. Given wide variation in clinical practice, we explored determinants of guideline concordant care.</p> <p>Methods: Qualitative semi-structured interviews using the Theoretical Domains Framework (TDF) were performed to explore determinants of five physician screening behaviours: risk assessment, discussion regarding benefits and harms, decision/referral for mammography, referral to genetics, and referral to high-risk screening programs.</p> <p>Analysis: Interviews were transcribed and analysed iteratively. Two independent researchers coded responses deductively for each behaviour by TDF domains to identify key behavioural determinants until saturation was reached.</p> <p>Results: Risk assessment was influenced by knowledge of risk factors,</p> |

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

| | |
|--|--|
| | <p>skills to synthesize risk, and beliefs about utility. Providers had beliefs in their capabilities to have informed patient-centred discussions, but low knowledge regarding harms. The decision/referral for mammography was impacted by emotion of past patient outcome(s), social influences of patients and radiology departments, knowledge and beliefs about consequences. Referrals to genetics and high-risk screening were facilitated by the availability of a comprehensive centre (environment) and knowledge and skills to complete forms. Lack of knowledge regarding which patients qualify and beliefs about consequences were barriers to referral.</p> <p>Discussion/Conclusion: Low knowledge and performance of risk assessment combined with a tendency to over-estimate benefits of screening relative to harms helps explain observed practice variation. These may be effective targets for future interventions to address inappropriate variation in care.</p> |
| | |



COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|--|----------|--|----------------------|
| Domain 1: Research team and reflexivity | | | |
| <i>Personal characteristics</i> | | | |
| Interviewer/facilitator | 1 | Which author/s conducted the interview or focus group? | |
| Credentials | 2 | What were the researcher's credentials? E.g. PhD, MD | |
| Occupation | 3 | What was their occupation at the time of the study? | |
| Gender | 4 | Was the researcher male or female? | |
| Experience and training | 5 | What experience or training did the researcher have? | |
| <i>Relationship with participants</i> | | | |
| Relationship established | 6 | Was a relationship established prior to study commencement? | |
| Participant knowledge of the interviewer | 7 | What did the participants know about the researcher? e.g. personal goals, reasons for doing the research | |
| Interviewer characteristics | 8 | What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic | |
| Domain 2: Study design | | | |
| <i>Theoretical framework</i> | | | |
| Methodological orientation and Theory | 9 | What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis | |
| <i>Participant selection</i> | | | |
| Sampling | 10 | How were participants selected? e.g. purposive, convenience, consecutive, snowball | |
| Method of approach | 11 | How were participants approached? e.g. face-to-face, telephone, mail, email | |
| Sample size | 12 | How many participants were in the study? | |
| Non-participation | 13 | How many people refused to participate or dropped out? Reasons? | |
| <i>Setting</i> | | | |
| Setting of data collection | 14 | Where was the data collected? e.g. home, clinic, workplace | |
| Presence of non-participants | 15 | Was anyone else present besides the participants and researchers? | |
| Description of sample | 16 | What are the important characteristics of the sample? e.g. demographic data, date | |
| <i>Data collection</i> | | | |
| Interview guide | 17 | Were questions, prompts, guides provided by the authors? Was it pilot tested? | |
| Repeat interviews | 18 | Were repeat interviews carried out? If yes, how many? | |
| Audio/visual recording | 19 | Did the research use audio or visual recording to collect the data? | |
| Field notes | 20 | Were field notes made during and/or after the interview or focus group? | |
| Duration | 21 | What was the duration of the interviews or focus group? | |
| Data saturation | 22 | Was data saturation discussed? | |
| Transcripts returned | 23 | Were transcripts returned to participants for comment and/or | |

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|--|----------|--|----------------------|
| | | correction? | |
| Domain 3: analysis and findings | | | |
| <i>Data analysis</i> | | | |
| Number of data coders | 24 | How many data coders coded the data? | |
| Description of the coding tree | 25 | Did authors provide a description of the coding tree? | |
| Derivation of themes | 26 | Were themes identified in advance or derived from the data? | |
| Software | 27 | What software, if applicable, was used to manage the data? | |
| Participant checking | 28 | Did participants provide feedback on the findings? | |
| <i>Reporting</i> | | | |
| Quotations presented | 29 | Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number | |
| Data and findings consistent | 30 | Was there consistency between the data presented and the findings? | |
| Clarity of major themes | 31 | Were major themes clearly presented in the findings? | |
| Clarity of minor themes | 32 | Is there a description of diverse cases or discussion of minor themes? | |

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

1
2
3 **Determinants of guideline concordant care by family physicians for breast cancer screening in**
4 **women age 40-49: a qualitative analysis**
5
6
7

8 Michelle B. Nadler^{1,2}, Ann Marie Corrado³, Laura Desveaux^{4,5,6}, Sarah E. Neil-Sztramko⁷, Brooke E.
9 Wilson^{1,2,8}, Alexandra Desnoyers^{1,2}, Eitan Amir^{1,2,5}, Noah Ivers^{3,5,8,9}
10
11
12

13 Affiliations:

14
15 ¹Division of Medical Oncology & Hematology, Department of Medicine, Princess Margaret Cancer
16 Centre, 700 University Avenue, Toronto, Ontario, M5G 1Z5, Canada.

17
18 ²Department of Medicine, University of Toronto, Ontario, Canada.

19
20 ³The Peter Gilgan Centre for Women's Cancers, Women's College Hospital, 76 Grenville Street, Toronto,
21 Ontario, M5S 1B2, Canada.

22
23 ⁴Institute for Better Health, Trillium Health Partners

24
25 ⁵Institute of Health Policy, Management and Evaluation, Dalla Lana School of Public Health, University
26 of Toronto
27

28
29 ⁶Women's College Hospital Institute for Health System Solutions and Virtual Care (WIHV)

30
31 ⁷Department of Health Research Methods, Evidence & Impact, Faculty of Health Sciences, McMaster
32 University, 175 Longwood Rd S, Suite 210a, Hamilton ON L8P OA1
33

34
35 ⁸University of New South Wales, Sydney, Australia

36
37 ⁹Department of Family and Community Medicine, University of Toronto, Canada
38

39 Word Count:

40 Abstract: 238

41 Manuscript: 3646
42
43
44
45

46 Correspondence:

47 Michelle Nadler, MD MSc

48 Princess Margaret Cancer Centre

49 700 University Ave, 7-821

50 Toronto ON, M5G 1Z5

51 E: michelle.nadler@uhn.ca
52
53
54
55
56
57
58
59
60

Abstract

Background: Guidelines recommend that physicians should inform women aged 40-49 of the potential benefits and harms of screening mammography to support individualized decisions. Given wide variation in clinical practice, we explored determinants of guideline concordant care.

Methods: Qualitative semi-structured interviews using the Theoretical Domains Framework (TDF) were performed to explore determinants of five physician screening behaviours: risk assessment, discussion regarding benefits and harms, decision/referral for mammography, referral to genetics, and referral to high-risk screening programs.

Analysis: Interviews were transcribed and analysed iteratively. Two independent researchers coded responses deductively for each behaviour by TDF domains to identify key behavioural determinants until saturation was reached.

Results: Risk assessment was influenced by *knowledge* of risk factors, *skills* to synthesize risk, and *beliefs* about utility. Providers had *beliefs in their capabilities* to have informed patient-centred discussions, but low *knowledge* regarding harms. The decision/referral for mammography was impacted by *emotion* of past patient outcome(s), *social influences* of patients and radiology departments, *knowledge* and *beliefs about consequences*. Referrals to genetics and high-risk screening were facilitated by the availability of a comprehensive centre (*environment*) and *knowledge and skills* to complete forms. Lack of *knowledge* regarding which patients qualify and *beliefs about consequences* were barriers to referral.

Discussion/Conclusion: Low knowledge and performance of risk assessment combined with a tendency to over-estimate benefits of screening relative to harms helps explain observed practice variation. These may be effective targets for future interventions to address inappropriate variation in care.

Introduction

The lifetime risk of breast cancer in Canadian women is 1 in 9, with approximately 20% of these occurring in women below age 50 (1). For women age 50-74 at average breast cancer risk the Canadian Task Force for Preventive Health Care (CTFPHC) and the United States Preventive Services Task Force (USPSTF) recommend screening mammography every 2 to 3 years based on evidence of reduced breast cancer-specific mortality (2-4). Both recommend against *routine* screening for women age 40 to 49, due to concerns that the harms (psychological, false-positives, and overdiagnosis) outweigh the benefits; however, they state that the decision to undergo screening in this age should be individualized, based on benefits, harms, and a woman's values (2, 4). Radiology societies have published recommendations and/or advocate that screening should start *routinely* at age 40 or 45 (5-7).

An operational definition of guideline concordant mammography screening in this age group includes behaviours of (i) a breast cancer specific risk assessment and (ii) an informed discussion of benefits and harms of screening mammography. If the physician determines that screening is appropriate (benefits > harms) but the patient chooses not to screen, this is considered guideline concordant as patients have the right to decline investigations. If the physician believes that screening is inappropriate (harms > benefits), but the patient expresses a desire for screening, a referral is considered guideline concordant after eliciting patient values, providing education, and obtaining comprehensive informed consent.

Providers report variation in practice patterns for women aged 40-49, with some always ordering screening mammography and others reporting that screening in this age group is unnecessary (8-10), and this variation has been objectively confirmed at the provincial level (11). Physicians report awareness of genetic testing services and the need to consider high-risk screening, but data suggest that many providers have never referred a woman to genetics and/or to high-risk screening (12, 13). Little is known about the underlying determinants (barriers/facilitators) of variation amongst physicians related to guideline-concordant care for these screening behaviours. Understanding these determinants is an important first step to select appropriate implementation strategies, as described in the knowledge-to-action framework (14).

Methods

Design

1
2
3 One-on-one semi-structured interviews were conducted with a sample of primary care physicians in
4 Ontario, Canada between January and November 2020. Ethics approval was obtained at Women's
5 College Hospital # 2019-0141-E. The COREQ checklist was followed (15).
6
7
8
9

10 *Context*

11 The Ontario Health Insurance Plan (OHIP) is a publicly funded health insurance program providing
12 universal coverage for medically necessary care. For Ontario women aged 40-49, a screening
13 mammogram is covered by OHIP if it is accompanied by a physician referral, generally their primary
14 care provider or family physician (16). Therefore, family physicians are the gatekeepers to access
15 screening mammography in this age group. If certain criteria (related to family history and/or ethnic
16 background) are met that classify a woman as higher than average risk, her physician should offer a
17 referral to a genetic counsellor to assess eligibility for genetic testing and/or to the Ontario high-risk
18 breast screening program (OBSP) (>25% lifetime breast cancer risk) (17). Women in the high-risk
19 screening program are offered OHIP insured annual screening mammography and breast MRI.
20
21
22
23
24
25
26
27
28

29 *Sampling & Recruitment*

30 Stratified purposeful sampling (by referral patterns and geographic location; see Table 1) was used to
31 ensure inclusion of a diverse range of perspectives, representative of Ontario family physicians (18).
32 Letters were prepared and mailed by the study team with non-responders receiving up to two reminders,
33 each 3-4 weeks apart, following the Dillman method (19). Physicians were eligible if they held a license
34 to practice in Ontario and consented to participate. Further details in Appendix Table 1.
35
36
37
38
39
40

41 *Data Collection*

42 Physicians were asked to complete a short demographic questionnaire. Interviews lasted approximately
43 30-45 minutes, were conducted over the phone, audio-recorded, transcribed by a third party, and
44 anonymized.
45
46
47
48
49

50 The interview guide was structured around the five provider behaviours of interest: (i) breast cancer risk
51 assessment, (ii) discussion of benefits, harms, and preferences, (iii) decision/referral for screening
52 mammogram, (iv) genetics referral, and (v) high-risk screening enrollement. For each behaviour, the
53 questions sought to understand current practice and explore determinants of behaviour by domains of the
54
55
56
57
58
59
60

1
2
3 theoretical domains framework (TDF) (20, 21). The TDF is a theory-informed, comprehensive
4 determinant framework used to examine the underlying determinants (i.e., barriers/facilitators) of
5 specific behaviour(s). Interviews were conducted by MBN, an early-career breast medical oncologist.
6 During the interviews, asking about “the guidelines” caused confusion; therefore, the guide was
7 modified to ask about routine practice, and this was followed up with the TDF-based questions. The
8 original semi-structured interview guide is presented in Appendix Table 2. Saturation was determined
9 considering the concept of ‘information-power’ (22) and guidance for achieving data saturation for
10 theory-based interview studies (23). Further details in Appendix Table 1.
11
12
13
14
15
16
17

18 *Data Analysis*

19 Interview transcripts were coded independently by two members of the research team (MBN & AMC)
20 using directed content analysis where individual TDF domains were applied as deductive codes as
21 previously described (24, 25). Transcripts were coded first by behaviour of interest, and then by the
22 identification and application of the relevant TDF code. Data were coded to multiple domains where
23 appropriate. Researchers compared the coded text of each transcript and discrepancies were discussed
24 between the two researchers and/or the research team until a consensus was reached. There was no
25 participant checking given the variability in the responses. Transcripts with finalized codes were entered
26 into NVivo software and the matrix tool was used to generate sequences of quotes that applied to each
27 behaviour of interest and each TDF code. First, the less commonly applied TDF codes were reviewed to
28 assess for important (but infrequently discussed) determinants. Next, more commonly used TDF codes
29 were reviewed to generate descriptive narratives for each behaviour which outlined the determinants that
30 directly influenced the key provider behaviours. All relevant codes were discussed with the research
31 team and used to create tables showing the direct barriers and facilitators for each behaviour.
32
33
34
35
36
37
38
39
40
41
42
43

44 **Results**

45 *Participants*

46 Twenty providers expressed interest in participation. Of these, two were not interviewed as their
47 demographic category was already saturated. Mean age was 48 years and 72% identified as women.
48 Five providers (28%) had high referral rates for women aged 40-49, and 9 (50%) had low referral rates
49 in 40-49 despite high rates above 50 (see Table 2).
50
51
52
53
54
55
56
57
58
59
60

Typical Practice and Behavioural Entry Points

Primary care physicians described two situations that could initiate the five behaviours. The first was at a scheduled periodic health visit (complete physical or annual health exam). The appointment served as *reinforcement* for the risk assessment and/or other behaviours as this provided the occasion for providers to update the full family history. Thereafter, some physicians engaged in the remaining guideline-concordant behaviours; however, others only proceeded to discussion / referral if the risk assessment (complete or incomplete) was judged as higher than average. A subset of providers with strong *intentions* to screen due to the belief that screening mammography should be initiated at age 40 for all women described directly referring for screening mammography without risk assessment.

The second entry point to screening behaviours was the *social influence* of a patient asking about screening. This either initiated the behavioural sequence or led directly to physicians providing an explanation to patients that guidelines stated not to screen until age 50. In these situations, it appeared that neither screening nor referrals to genetics/high risk were considered because family history was not reviewed and risk assessment / discussion not performed.

Behaviour 1 – Risk Assessment

Barriers

Barriers to an individualized breast cancer risk assessment included *knowledge* of risk factors and of risk assessment tools, *skills* to synthesize risk factors or use the tools, and the *beliefs about consequences* that the tools don't guide further management. See Table 3. Physicians had difficulty listing breast cancer risk factors aside from family history, such as reproductive factors, ethnicity, or breast density. Some physicians lacked *skills* to calculate an overall breast cancer risk. Physicians were confused about the difference between an individualized risk assessment prompting a discussion regarding mammography versus the family-history criteria that should prompt a genetics referral. Some suggested that if women did not meet the criteria for high-risk screening ($\geq 25\%$ lifetime risk), that this was synonymous with 'not qualifying' for early screening mammography.

Beliefs about consequences were related to the *environment, context, and resources* available (such as a risk assessment tool). Physicians were either were not aware of existing risk calculators, did not know how to use them, or found them time consuming and impractical. They expressed concerns regarding

1
2
3 their limitations, such as the fact that some risk factors (breast density) were not included. Physicians
4 pointed out that the risk-calculation was not tied to any management recommendation and there was no
5 'intermediate' risk management option. They compared this to other primary care stratification tools,
6 such as the Framingham for cardiovascular disease (26) or FRAX fracture risk assessment tool (27) that
7 provide three risk strata with associated recommended management.
8
9
10
11
12

13 *Facilitators*

14
15 Physicians stated that more explicit recommendations within the guidelines regarding the need for risk
16 assessment and the recommended tool would be helpful. They noted that a simple, user-friendly tool that
17 listed all important risk factors would be within their *professional role* and scope to complete and that
18 they had the *skills* to use an online tool or application. If the tool had a checklist of risk factors and could
19 be embedded into their electronic medical record this could help with *knowledge* and *reinforcement* of
20 relevant risk factors.
21
22
23
24
25
26

27 *Behaviour 2 – Discussion about mammography benefits and harms*

28 *Facilitators*

29
30 The discussion about benefits and risks of screening was facilitated by physicians feeling it was their
31 *professional role* to provide patients with as much accurate information as possible to inform their
32 decision. Many stated that they are accustomed to having discussions with patients about benefits and
33 harms of a test or procedure, as these types of discussions are prevalent for other screening tests in
34 primary care. Some physicians expressed that they had the *skills* and *beliefs about capabilities* to explain
35 to specific patients why screening was not recommended routinely. Physicians advocated for the
36 maintenance of the periodic health visit in order to facilitate review of family history and
37 assessment/discussion regarding screening for the major cancer types. See Table 4.
38
39
40
41
42
43
44
45

46 *Barriers*

47 Some physicians appeared not to discuss all of the pertinent harms of screening mammography. This
48 occurred either due to lack of *knowledge* of mammography harms and/or the *beliefs about consequences*
49 that the information would lead a woman to decide against screening. *Knowledge* was specifically low
50 regarding the harm of over-diagnosis. Many believed that this was similar to a call-back screen, biopsy,
51 or pre-cancer (DCIS) diagnosis, which limited a comprehensive, informed discussion.
52
53
54
55
56
57
58
59
60

Behaviour 3 – Decision / Referral for Guideline Concordant Screening Decisions

There were three common physician patterns observed when exploring this behaviour. Physicians with strong intentions to screen sent screening referrals due to *emotion*, *social influence* of patients, or *social influence* of radiologists. In contrast, physicians who interpreted that the guidelines stated not to screen until age 50, had strong *beliefs in their capabilities* to educate patients about why screening was not recommended and did so. A third group of physicians performed the risk assessment and discussion and based their final recommendation based on *beliefs about consequences*; however, they tended to over-estimate the benefits and/or underestimate the harms of screening. This *knowledge* gap contributed to a (potentially unwarranted) perception that their own screening referrals were guideline concordant. See Table 5.

Facilitators to guideline concordant screening decisions

Some physicians had *knowledge*, *skills*, and *beliefs in capabilities* to explain to patients why screening was not routinely recommended. In addition, some radiology departments only accepted referrals if they clearly documented increased risk of breast cancer which *reinforced* guideline concordant referrals.

Barriers to guideline concordant screening decisions

Physicians with strong intentions to screen were primarily influenced by the determinant of *emotion*. They described prior experience of a woman in this age group with a clinically detected (rather than screen-detected) cancer and drew the (potentially inappropriate) conclusion that the outcome would have been different had she engaged in screening. Others sought to avoid regret related to recommending against screening for a woman that may eventually develop breast cancer. Providers cited the *social influence* of radiology guidelines or radiologists, describing that they would have the most accurate information. The *environment*, *context*, and *resources* of radiology departments who routinely accepted these referrals reinforced non-guideline concordant decisions. Some wondered if the guidelines were based on cost-considerations, rather than optimal patient care.

The third group of physicians tended to over-estimate the benefits and under-estimate the harms of screening, such that their *belief about consequences* resulted in a tendency to refer for screening.

Knowledge gaps included the assumption that it was always better to ‘catch something earlier’ and an

1
2
3 incomplete understanding of screening harms. Many discussed risks of discomfort and radiation, but did
4 not comment on frequency of false-positives or the concerning clinical impact of over-diagnosis. There
5 were additional *beliefs about consequences* regarding the financial or time burden impacts of screening
6 on the patient. Physicians noted that marginalized populations, such as those living in remote
7 communities or who did not have the ability to take paid time off work were more at risk of not
8 attending their appointments.
9

15 *Behaviours 4 & 5 – Referral to Genetics and Enrollment into Provincial High-Risk Screening Program*

16 Physicians described similar practice patterns regarding the behaviours of genetics referral and
17 enrollment in the OBSP high-risk screening program. Following elicitation of family history, some
18 physicians referred patients with significant family histories to “high risk breast clinics” or “genetics
19 centres” which provided comprehensive assessment and managed several aspects of care (genetics
20 referral, OBSP high-risk program enrollment, and often a recommendation back to the primary care
21 provider regarding early screening mammography).
22
23
24
25
26
27
28

29 *Facilitators to Genetics / High Risk Screening Referral*

30 Providers who referred to centres described this as an excellent *environmental resource*, one that they
31 could rely on to manage comprehensive patient care and provide advice back to providers about ongoing
32 management. These centres were often discussed by providers who practiced in high-resourced, urban
33 areas. For those aware of the Cancer Care Ontario (CCO) referral forms, the *environment* acted as a
34 facilitator: using the listed criteria on the form, providers described a *belief in their capability* to identify
35 the correct patients and *skills* to complete the forms.
36
37
38
39
40
41
42

43 *Barriers to Genetics / High Risk Screening*

44 Providers who appeared unaware or did not have access to these centres described barriers related to
45 *environment* and *beliefs about consequences* such as genetics not accepting referrals from community
46 physicians, the cumbersome nature of paperwork and forms, and that patients would fall through the
47 cracks. These barriers were exacerbated by patient factors, such as the patient not knowing their
48 complete family history, difficulty finding transportation, and/or financial constraints to attend the
49 appointment. Although physicians felt it was their *role* to identify patients with significant family
50 histories and provide a referral, they described the *knowledge* and *skills* gap of being unaware of the
51
52
53
54
55
56
57
58
59
60

1
2
3 criteria for genetic testing. These providers stated a checklist would help facilitate referrals but appeared
4 unaware that a checklist existed on a standard referral form listed on the provincial website.
5
6
7

8 **Discussion:**

9 This study unpacks the reasons for variation in family physicians' approach to five important behaviours
10 necessary for guideline-concordant for breast cancer screening in women age 40-49: risk assessment,
11 informed discussion regarding benefits and harms, screening decision (accompanied by a referral if
12 deemed appropriate), and referral to genetics and/or the high-risk screening program. The behavioural
13 sequence was often triggered by a periodic health visit (at age 40 or above) or a patient-initiated
14 conversation. Barriers to risk assessment included *knowledge* of risk factors and risk assessment tools,
15 *skills* to synthesize risk, and *beliefs about consequences* that the tools don't help guide management.
16 Providers felt confident in their *professional role* and *capabilities* to have informed discussions with
17 patients to support their choice; however, low *knowledge* and *beliefs about consequences* limited a fully
18 informed discussion. The determinants of *emotion, social influence – patient, social influence –*
19 *radiologist, knowledge, and beliefs about consequences* influenced non-guideline-concordant screening
20 referrals. Referrals to genetics and/or high-risk screening programs were facilitated by the *environment*
21 with centralized clinics; however, barriers included lack of *knowledge and skills* about referral criteria.
22 Overall these barriers led to significant variation in practice across providers which we categorized into
23 variation in risk assessment and variation in discussion/decision-making based on the benefit:harm ratio.
24
25
26
27
28
29
30
31
32
33
34
35
36

37 *Variation in Risk Assessment*

38 Previous qualitative studies have reported corroborating findings related to provider-level barriers
39 related to knowledge of risk factors, skills to combine risk factors, and cumbersome risk-assessment
40 tools (28, 29). An additional requirement for risk assessment is the ability to gather an accurate and
41 comprehensive family history. While physicians in our study describe thoroughly and routinely
42 collecting family history, the literature suggests that this may occur less consistently than assumed (30).
43 Further, physicians described that there was limited information within the guidelines for acting upon
44 risk stratification, in keeping with prior reports highlighting lack of decision-support tools to help
45 physicians make shared decisions with patients (31).
46
47
48
49
50
51
52
53

54 *Discussion and Decision making based on Benefit:Harm Ratio*

1
2
3 Variation in practice has been attributed to differences in beliefs regarding the efficacy of
4 mammography (10, 32). Our data expand upon this, suggesting it's not simply understanding the
5 efficacy of mammography: providers may incorrectly evaluate or mis-represent the balance between
6 benefit and harm *either* by over-estimating the benefit *or* under-estimating the harms (or both). Research
7 on general cancer screening in general suggests that primary care providers are more likely to order
8 screening tests when patients display anxiety about cancer, have expectations about receiving tests, or
9 when providers believe there is more benefit than harm (33), all factors corroborated by our study.
10
11
12
13
14
15
16

17 A breast cancer that is detected clinically (without screening) in a woman in her 40's could be
18 misinterpreted as one where the outcome would have been different if she engaged in routine screening
19 (which is not necessarily the case). This can lead to over-estimation of the benefits of screening, feelings
20 of regret, and increased recommendation for screening (34). This cognitive bias is termed "loss aversion
21 bias", and describes an individual's tendency to prefer avoiding losses rather than acquiring equivalent
22 gains. It can result in misestimation of benefit (ie avoiding "missing" a cancer) and has been
23 demonstrated elsewhere in medicine (35). In behavioural science, this "anticipated regret" is strongly
24 correlated with intentions and behaviour (36).
25
26
27
28
29
30
31

32 Physician under-estimation of screening harms occurred due to low *knowledge* or did not communicate
33 them due to the *belief about consequences* that it would lead patients to decide against screening.
34 Previous studies have found that when women are told about the harms of screening, and in particular
35 the possibility of over-diagnosis, this changes their attitudes and intentions to screen (37). Lack of
36 accurate communication regarding screening harms, with many omitting over-diagnosis, is prevalent in
37 patient-education materials (38-40), demonstrating another way the *environment* influences patient and
38 provider knowledge. This omission speaks broadly to the ethical implications of an informed decision
39 (41). The medical ethical principle of respect for patient autonomy affirms the right of patients to the
40 information necessary to make decisions and therefore the obligation of health professionals to provide
41 this to patients (42). Overcoming the barriers to under-estimation of harms will increase the likelihood
42 of a more accurate estimation of the benefit: harm ratio to guide discussions and decisions, which could
43 improve the variation in practice.
44
45
46
47
48
49
50
51
52
53
54

55 *Role of Environment and Policy*
56
57
58
59
60

1
2
3 Family physicians described that some radiology departments accepted all, none, or only select
4 screening mammography referrals and that this *reinforced* their behaviour (appropriately or not). The
5 differences in radiology departments described is corroborated by a recent study showing that up to 80%
6 of radiology department decisions differed from the USPSTF recommendations (43), creating confusion
7 amongst providers about optimal referral behaviour. This suggests that an intervention standardizing
8 practice or referral forms for physicians to communicate that risk assessment and discussion have been
9 performed could help to reinforce guideline concordant behaviour.
10
11
12
13
14
15
16

17 *Limitations*

18 There are important limitations to this study. First, guideline-concordance could not be confirmed, but
19 only inferred through listening and analysis of the physician's approach. Second, our recruitment was
20 limited to a major urban centre and we did not interview rural participants, potentially contributing to
21 participation bias. Third, the axiology of the primary researcher should be considered. MBN prioritized
22 understanding the problem over any personal opinions about screening. Fourth, other forms of
23 qualitative inquiry such as direct observation or document analysis may have revealed other
24 barriers/facilitators. Despite these limitations, physicians described significant variation in practice and
25 were forthcoming with answers with regards to approaches, barriers, and knowledge gaps. It did not
26 appear that the barriers (with the exception of *environment*) were location specific. This, along with
27 confirmatory data in the literature, suggests that our results are credible, confirmable, and that our key
28 findings are transferrable to others working in similar healthcare systems in which women are insured
29 for these services.
30
31
32
33
34
35
36
37
38
39
40

41 **Conclusion & Future Directions**

42 Guidelines state the physicians should make individualized screening mammography decisions with
43 women aged 40-49; however, there is variation in practice related to physician barriers of *knowledge*,
44 *skills*, *beliefs about consequences*, *environment*, *emotion* and *social influences*. The TDF framework
45 allows mapping of these behavioral determinants to behaviour change techniques (BCTs) (44, 45) to
46 inform interventions that may increase guideline-concordant behaviour. Important BCTs may include
47 *information regarding the behaviour*, *persuasive communication*, *rehearsal of relevant skills*, and
48 *training*. Important skills and training include use of risk-assessment calculator. To target *emotion* and
49 *social influences*, BCTs of *coping planning*, *cognitive restructuring*, and *modeling* would likely be
50
51
52
53
54
55
56
57
58
59
60

1
2
3 helpful with a focus on addressing the misunderstanding that all breast cancers detected clinically could
4 be prevented by screening. These BCTs should also target provider knowledge and ability to
5 communicate the concept of length time bias to patients. Overall, interventions to target knowledge and
6 skills related to risk assessment, knowledge and awareness of benefits and harms, improved guideline
7 clarity with decision-making support, and policy changes regarding radiology departments may improve
8 guideline concordance.
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Confidential

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 1: Stratified Purposeful Sampling Categories

| | |
|--|--|
| Toronto Providers with history of Many referrals in age 50-74, <i>but</i> Few referrals in age 40-49 | Outside Toronto Providers with history of Many referrals in age 50-74, <i>but</i> Few referrals in age 40-49 |
| Toronto Providers with history of Many referrals in age 50-74, <i>and</i> Many referrals in age 40-49 | Outside Toronto Providers with history of Many referrals in age 50-74, <i>and</i> Many referrals in age 40-49 |

Confidential

Table 2: Demographic Information of Participants

| Demographic | Participants n (%) |
|--|---|
| Female | 13 (72%) |
| Male | 5 (28%) |
| Age; average (range) | 48 years (33-65) |
| Location | Toronto: 8 (44%) Thornhill: 2 (11%) North York: 2 (11%) Sub-Urban*: 6 (33%) |
| Number of Physicians in Practice | 1-5 Physicians: 10 (56%) 6-10 Physicians: 6 (33%) 10-20 Physicians: 1 (5%) > 20 Physicians: 1 (5%) |
| Estimated Practice Size (patients): Average (range) | 1690 (800 – 3000) |
| Estimated Patients Seen Weekly Average (range) | 123 (60 – 250) |
| Mammography Referral Rates (at JDMI) | |
| • High in 40-49 | 5 (28%) |
| • Low in 40-49 | 9 (50%) |
| • Low Overall | 4 (22%) |

*Sub-Urban includes Orangeville, Vaughan, Scarborough, Brampton, Pickering, and Ajax

Table 3: Unique Barriers and Facilitators of Risk Assessment

| Behaviour 1: Risk Assessment | | |
|--|---|--|
| Facilitators | Barriers | Example Quotes: |
| 1. <i>Social influence of the patient on the provider</i> | 1. <i>Knowledge of risk factors & risk assessment tools</i> 2. <i>Skills to synthesize risk</i> 3. <i>Beliefs about consequences: tools don't guide management</i> 4. <i>Environment, Context, and Resources: tools are cumbersome, time-consuming, and difficult to do in real-time</i> | <p><i>B - "I don't know exactly. I definitely don't exactly know what high risk is, except family history." – P001</i></p> <p><i>B - "Honestly I've tried to look into figuring out a formal percentage risk and I came across things like the IBIS score. When I've tried to figure out how to do that it's been very difficult to figure out" – P017</i></p> <p><i>B (role confusion) - "So, when I send patients {to genetics} who I think they're high risk and... could potentially warrant earlier mammography screening. And they're not, I'm often surprised." -P014</i></p> <p><i>B - "Yes, otherwise I think {the tool} is useless. If it spews something out to me but I don't know how to interpret it or what the next step is... if I were to just calculate something and not know how to interpret it or not know how to implement it in practice, it probably wouldn't be so useful." -P014</i></p> |
| <p align="center">Facilitator AND/OR Barrier:</p> <p align="center"><i>Behaviour Regulation / Reinforcement – Some providers described that prompts or reminders at age 40 described would be helpful as reminders. Others stated it would be helpful or cumbersome/costly to add to medical record</i></p> | | |

Table 4: Unique Barriers and Facilitators of Discussion

| Behaviour 2: Discussion | | |
|---|--|---|
| Facilitators | Barriers | Example Quotes: |
| 1. <i>Professional Role</i> to inform patients 2. <i>Beliefs about capabilities / Skills</i> for discussion to support patient choice and/or explain why screening not optimal for a specific patient | 1. <i>Knowledge:</i> incomplete knowledge of benefits and harms 2. <i>Beliefs about Consequences:</i> harms will sway women against screening | <p><i>F - "Patients deserve to have information to make their decision... I just think that's part of family doctor's role is not to make the decision for the patient but to explain to them you know, what the guidelines are, what the reasons are for that. Patients still have an opportunity to make a decision for themselves with the right information." – P012</i></p> <p><i>F - "I would say most of the time I do not have difficulties...I think most, like I would say 98% of the women I've spoken to, as long as I sit down and give them a proper explanation, and sometimes I would even refer them to Task Force. Most of them were very satisfied and don't bring it up again." – P016</i></p> <p><i>B - "I guess there's the risk of benign call-back false positives, the biopsy, the discomfort, the anxiety, the fear, but you know, I'm not going to tell somebody, "Oh, you might have a false positive and you're going to put yourself through hell for nothing." I don't see that as such a big event...I wouldn't put that scenario as the most likely thing for them so that they're afraid to go in." -P005</i></p> <p><i>B - "I think over-diagnosis for me is a false positive, where they're seeing things that are just related to a younger patient being put through a protocol that's been tested really on older patients. So to me, over-diagnosis is that, like, a positive result that comes back to being nothing, but causes anxiety." -P003</i></p> |
| Facilitator AND/OR Barrier: <i>Skills</i> to explain why/when screening not required. Providers who had this knowledge had the skill to explain this to patients, but this was a barrier without that specific knowledge. | | |

Table 5: Unique Barriers and Facilitators of Decision/Referral for Mammography

| Behaviour 3: Decision/Referral | | |
|--|--|---|
| Facilitators | Barriers | Example Quotes: |
| 1. Skills & Beliefs about capabilities to explain why screening not recommended | 1. <i>Emotion</i> : past experience & belief that screening would have changed outcome 2. <i>Social Influence</i> : radiology guidelines, patient concerns about cancer risk 3. <i>Knowledge / Beliefs about consequences</i> : Overestimate benefits ± underestimate harms of screening | <p>F - "I say look, it's not recommended...[explains harms]... And it's your choice, I'm happy to send you if you want. But the reality is... you've got a higher risk of having unnecessary procedures and it's not recommended." – P018</p> <p>F - "Based on your experience and as if having like ten denials from the hospital, you know, that you have to have a good and complete family history. You try to justify your decision, why I'm going to do a mammogram at age 45 in this patient, put the family history and the risk factors. And in this way most of the time they are very cooperative" – P013</p> <p>B - "I think you screen. And I know it's certainly not guideline-based, but I find it really hard to extrapolate guidelines to a person sitting in front of me. And you know, we all know women in their forties that have been diagnosed with breast cancer, they all have stories, and those stories are pretty impactful." -P003</p> <p>B - "It's very hard to tell someone they can't have something and then take on the burden of, oh, I hope they don't develop breast cancer at forty five and I'm the one that told them not to do it." – P002</p> <p>B - "The medical post had a very good short blurb from Dr. XX [radiologist]... she basically said that the Canadian task force was flawed, that the people on the panel weren't mammographers, their stats were flawed. And I believed her, she had good data and she does this every day" -P005</p> |
| Facilitator AND/OR Barrier: | | |
| <p><i>Environment</i>: Actions of radiology department (to accept all or decline all) reinforce behaviour. If the department acted in a guideline-concordant manner, this was a facilitator; if not, it was a barrier.</p> | | |

Table 6: Unique Barriers and Facilitators of Genetics Referral and OBSP High-Risk Screening Program

| Behaviour 4/5: Genetics / OBSP High Risk Screening | | |
|--|--|---|
| Facilitators | Barriers | Example Quotes: |
| <p>1. <i>Environment</i>: a comprehensive referral location such as a ‘breast clinic’ or ‘genetics centre’ is a facilitator, if it exists locally</p> <p>2. <i>Knowledge, Skills, Beliefs about Capabilities</i>: if aware of CCO form, find them useful, easy to complete</p> | <p>1. <i>Belief about Consequences</i>:</p> <ul style="list-style-type: none"> • <u>Genetics</u>: referral burdensome, confusing who qualifies (if unaware of forms), patients can fall through the cracks; • <u>breast clinic</u>: provider pays for outside use <p>2. <i>Social, Professional Role</i>: confusion about the responsibilities of primary care providers versus genetics (in general and on CCO form)</p> <p>3. <i>Knowledge/Skills</i> – who warrants referrals, how to find/complete forms</p> | <p>F- “I find that’s when it’s nice to have everything through the high risk clinic...they do a comprehensive intake, and they can coordinate the genetics piece. -FP 006</p> <p>B – (breast clinic) – “So, I will refer my patients there, because I want the best for them, but it’s, it result in a bunch of outside use, so I’m paying for it” -FP017</p> <p>B – “And I’m finding that very burdensome, like, just knowing where to send them, or making sure I’m picking the right people to send”. – FP002</p> <p>B – “Patchy... it would help if I had a checklist you know, maybe you know something to work through an algorithm with patients coming in who might be a high risk” – FP008</p> <p>B – [Referring to genetics] is hard and there’s not a lot of follow through. I’ve had patients fall through the cracks. Genetic actually wants – if there’s a living relative who had breast cancer, of course anywhere in North America, they want to use them as the index case to test, not your patient. I just find for me to facilitate it – data kind of gets lost and drags on and patients fall through.” – FP006</p> <p>B - “And I had a look at that [form], and in category A, it talks about IBIS and BOADICEA. I’m a family doctor, I have no idea what those things are. Since I can’t answer those questions, I don’t think I can legally fill this form out... I could fill out part two of the form, which is the date and location and most recent mammogram, and any previous breast cancer.” -FP018</p> |

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Confidential

Data Sharing:

Data is not available for use by other authors.

Contribution Statement:

MBN, LD, EA, and NI conceived the study idea and methods MBN, AMC, LD, SNS, EA, and NI were involved in primary data analysis. All authors were involved in data review and interpretation, manuscript preparation and review and gave final publication approval.

Acknowledgements:

Dr. Michelle B. Nadler was supported as a Dream Hold 'Em For Life clinical oncology fellow.

Ann Marie Corrado was supported by the Peter Gilgan Centre for Women's Cancers at Women's College Hospital, in partnership with the Canadian Cancer Society.

Dr. Brooke E. Wilson was supported as a National Breast Cancer Foundation of Australia International Fellow.

Dr. Alexandra Desnoyers was supported as a Hold'Em clinical oncology fellow.

Dr. Noah M. Ivers is supported by a Canada Research Chair (tier 2) in Implementation of Evidence-Based Practice and as a Clinician Scientist by the University of Toronto Department of Family and Community Medicine, University of Toronto.

Declaration of Interests:

Dr. Eitan Amir reports personal fees from Genentech/Roche, personal fees from Apobiologix, personal fees from Myriad Genetics, personal fees from Agendia, outside the submitted work.

No Conflict of Interest for Dr. Michelle B. Nadler, Ann Marie Corrado, Dr. Alexandra Desnoyers, Dr. Brooke E. Wilson, and Dr. Noah M. Ivers, Dr. Sarah Neil-Sztramko.

References

1. Society CC. Canadian Cancer Statistics Publication 2017 [Available from: <http://www.cancer.ca/en/cancer-information/cancer-101/canadian-cancer-statistics-publication/?region=on>].
2. Klarenbach S, Sims-Jones N, Lewin G, Singh H, Theriault G, Tonelli M, et al. Recommendations on screening for breast cancer in women aged 40-74 years who are not at increased risk for breast cancer. *CMAJ*. 2018;190(49):E1441-E51.
3. Tonelli M, Connor Gorber S, Joffres M, Dickinson J, Singh H, Lewin G, et al. Recommendations on screening for breast cancer in average-risk women aged 40-74 years. *CMAJ*. 2011;183(17):1991-2001.
4. Siu AL, Force USPST. Screening for Breast Cancer: U.S. Preventive Services Task Force Recommendation Statement. *Ann Intern Med*. 2016;164(4):279-96.
5. Bevers TB, Helvie M, Bonaccio E, Calhoun KE, Daly MB, Farrar WB, et al. Breast Cancer Screening and Diagnosis, Version 3.2018, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Canc Netw*. 2018;16(11):1362-89.
6. Radiologists CAO. Statement on the Canadian Task Force on Preventive Health Care (CTFPHC) 2018 updated guidelines for Breast Cancer Screening 2019 [Available from: https://car.ca/wp-content/uploads/2019/05/CAR_Statement_CTFPHC_2019_02_07_FINAL.pdf].
7. Oeffinger KC, Fontham ET, Etzioni R, Herzig A, Michaelson JS, Shih YC, et al. Breast Cancer Screening for Women at Average Risk: 2015 Guideline Update From the American Cancer Society. *JAMA*. 2015;314(15):1599-614.
8. Smith P, Hum S, Kakzanov V, Del Giudice ME, Heisey R. Physicians' attitudes and behaviour toward screening mammography in women 40 to 49 years of age. *Can Fam Physician*. 2012;58(9):e508-13.
9. Nguyen MN, Larocque D, Paquette D, Irace-Cima A. Quebec breast cancer screening program: A study of the perceptions of physicians in Laval, Que. *Can Fam Physician*. 2009;55(6):614-20.
10. Haas JS, Barlow WE, Schapira MM, MacLean CD, Klabunde CN, Sprague BL, et al. Primary Care Providers' Beliefs and Recommendations and Use of Screening Mammography by their Patients. *J Gen Intern Med*. 2017;32(4):449-57.
11. Nadler MB, Ivers N, Marchand-Austin A, Lofters A, Austin PC, Wilson BE, et al. Patient and provider determinants of breast cancer screening among Ontario women aged 40-49: a population-based retrospective cohort study. *Breast Cancer Res Treat*. 2021;189(3):631-40.
12. Carroll JC, Cappelli M, Miller F, Wilson BJ, Grunfeld E, Peeters C, et al. Genetic services for hereditary breast/ovarian and colorectal cancers - physicians' awareness, use and satisfaction. *Community Genet*. 2008;11(1):43-51.
13. Sabatino SA, McCarthy EP, Phillips RS, Burns RB. Breast cancer risk assessment and management in primary care: provider attitudes, practices, and barriers. *Cancer Detect Prev*. 2007;31(5):375-83.
14. Munce S, Kastner M, Cramm H, Lal S, Deschene SM, Auais M, et al. Applying the knowledge to action framework to plan a strategy for implementing breast cancer screening guidelines: an interprofessional perspective. *J Cancer Educ*. 2013;28(3):481-7.
15. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349-57.

16. Ontario HQ. Quality in Primary Care: Setting a foundation for monitoring and reporting in Ontario Toronto: Queen's Printer for Ontario; 2015 [Available from: <http://www.hqontario.ca/Portals/0/Documents/pr/theme-report-quality-in-primary-care-en.pdf>].
17. Ontario CC. OBSP Screening for Women at High Risk [updated 2016. Available from: <https://www.cancercare.on.ca/cms/one.aspx?portalId=1377&pageId=99638>].
18. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Adm Policy Ment Health*. 2015;42(5):533-44.
19. Hoddinott SN, Bass MJ. The dillman total design survey method. *Can Fam Physician*. 1986;32:2366-8.
20. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implement Sci*. 2012;7:37.
21. Michie S, Johnston M, Abraham C, Lawton R, Parker D, Walker A, et al. Making psychological theory useful for implementing evidence based practice: a consensus approach. *Qual Saf Health Care*. 2005;14(1):26-33.
22. Malterud K, Siersma VD, Guassora AD. Sample Size in Qualitative Interview Studies: Guided by Information Power. *Qual Health Res*. 2016;26(13):1753-60.
23. Francis JJ, Johnston M, Robertson C, Glidewell L, Entwistle V, Eccles MP, et al. What is an adequate sample size? Operationalising data saturation for theory-based interview studies. *Psychol Health*. 2010;25(10):1229-45.
24. National Institute of Health NNCI, NCI. Implementation Science White Paper: Qualitative Methods in Implementation Science.
25. Atkins L, Francis J, Islam R, O'Connor D, Patey A, Ivers N, et al. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implement Sci*. 2017;12(1):77.
26. Armstrong DW, Brouillard D, Matangi MF. The effect of the change in the Framingham Risk Score calculator between the 2006 and 2009 Canadian lipid guidelines. *Can J Cardiol*. 2011;27(2):167-70.
27. Papaioannou A, Morin S, Cheung AM, Atkinson S, Brown JP, Feldman S, et al. 2010 clinical practice guidelines for the diagnosis and management of osteoporosis in Canada: summary. *CMAJ*. 2010;182(17):1864-73.
28. Puzhko S, Gagnon J, Simard J, Knoppers BM, Siedlikowski S, Bartlett G. Health professionals' perspectives on breast cancer risk stratification: understanding evaluation of risk versus screening for disease. *Public Health Rev*. 2019;40:2.
29. Guerra CE, Sherman M, Armstrong K. Diffusion of breast cancer risk assessment in primary care. *J Am Board Fam Med*. 2009;22(3):272-9.
30. Kaplan CP, Livaudais-Toman J, Tice JA, Kerlikowske K, Gregorich SE, Perez-Stable EJ, et al. A randomized, controlled trial to increase discussion of breast cancer in primary care. *Cancer Epidemiol Biomarkers Prev*. 2014;23(7):1245-53.
31. Kiyang LN, Labrecque M, Doualla-Bell F, Turcotte S, Farley C, Cionti Bas M, et al. Family physicians' intention to support women in making informed decisions about breast cancer screening with mammography: a cross-sectional survey. *BMC Res Notes*. 2015;8:663.
32. Kadaoui N, Guay M, Baron G, St-Cerny J, Lemaire J. Breast cancer screening practices for women aged 35 to 49 and 70 and older. *Can Fam Physician*. 2012;58(1):e47-53.

- 1
- 2
- 3
- 4 33. Tudiver F, Guibert R, Haggerty J, Ciampi A, Medved W, Brown JB, et al. What influences family
- 5 physicians' cancer screening decisions when practice guidelines are unclear or conflicting? *J Fam Pract.*
- 6 *2002;51(9):760.*
- 7 34. Radhakrishnan A, Nowak SA, Parker AM, Visvanathan K, Pollack CE. Linking physician attitudes
- 8 to their breast cancer screening practices: A survey of US primary care providers and gynecologists.
- 9 *Prev Med.* 2018;107:90-102.
- 10 35. Ogdie A, Asch DA. Changing health behaviours in rheumatology: an introduction to behavioural
- 11 economics. *Nat Rev Rheumatol.* 2020;16(1):53-60.
- 12 36. Brewer NT, DeFrank JT, Gilkey MB. Anticipated regret and health behavior: A meta-analysis.
- 13 *Health Psychol.* 2016;35(11):1264-75.
- 14 37. Hersch J, Barratt A, Jansen J, Irwig L, McGeechan K, Jacklyn G, et al. Use of a decision aid
- 15 including information on overdetected to support informed choice about breast cancer screening: a
- 16 randomised controlled trial. *Lancet.* 2015;385(9978):1642-52.
- 17 38. Zapka JG, Geller BM, Bulliard JL, Fracheboud J, Sancho-Garnier H, Ballard-Barbash R, et al. Print
- 18 information to inform decisions about mammography screening participation in 16 countries with
- 19 population-based programs. *Patient Educ Couns.* 2006;63(1-2):126-37.
- 20 39. Gummersbach E, Piccoliori G, Zerbe CO, Altiner A, Othman C, Rose C, et al. Are women getting
- 21 relevant information about mammography screening for an informed consent: a critical appraisal of
- 22 information brochures used for screening invitation in Germany, Italy, Spain and France. *Eur J Public*
- 23 *Health.* 2010;20(4):409-14.
- 24 40. Jorgensen KJ, Gotzsche PC. Content of invitations for publicly funded screening mammography.
- 25 *BMJ.* 2006;332(7540):538-41.
- 26 41. Parker LM, Rychetnik L, Carter SM. The role of communication in breast cancer screening: a
- 27 qualitative study with Australian experts. *BMC Cancer.* 2015;15:741.
- 28 42. Han PK. Conceptual, methodological, and ethical problems in communicating uncertainty in
- 29 clinical evidence. *Med Care Res Rev.* 2013;70(1 Suppl):14S-36S.
- 30 43. Patel NS, Lee M, Marti JL. Assessment of Screening Mammography Recommendations by Breast
- 31 Cancer Centers in the US. *JAMA Intern Med.* 2021;181(5):717-9.
- 32 44. Susan Michie MJ, Jill Francis, Wendy Hardeman, Martin Eccles. From Theory to Intervention:
- 33 Mapping Theoretically Derived Behavioural Determinants to Behaviour Change Techniques. *Applied*
- 34 *Psychology.* 2008;57(4):660-80.
- 35 45. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for
- 36 characterising and designing behaviour change interventions. *Implement Sci.* 2011;6:42.
- 37
- 38
- 39
- 40
- 41
- 42
- 43
- 44
- 45
- 46
- 47
- 48
- 49
- 50
- 51
- 52
- 53
- 54
- 55
- 56
- 57
- 58
- 59
- 60

Appendix Table 1: Supplementary Methodological Details

| | |
|--|--|
| <p>Sampling & Recruitment</p> | <ul style="list-style-type: none"> • A list of physicians who referred a patient for mammography in 2018 was generated by the Joint Department of Medical Imaging (JDMI). The JDMI is affiliated with most academic institutions in downtown Toronto but also accepts referrals from outside Toronto from a wide catchment area. • Lists were scanned to identify family physicians practicing in rural areas. The physicians were separated into high and low referral rates for each age category and location, and lists were scrambled to facilitate arbitrary recruitment. • Potential participants were invited to join the study in batches of 100 (25 per category). |
| <p>Data Collection & Determination of Saturation</p> | <ul style="list-style-type: none"> • All project collaborators met to discuss questions which were then pilot tested with a primary care provider not participating in the study. • There were no prior relationships, knowledge about practice, or other goals (other than to understand practice, barriers, and facilitators) between interviewer and interviewees. • Given the multiple behaviours of interest, we estimated 10-12 interviews as the lower limit for saturation. Additional interviews were performed targeting recruitment in male and non-Toronto area providers due to low numbers of respondents in these categories. • Recruitment, data collection, transcription, and analysis continued until saturation was reached in all relevant TDF-domains. • Transcripts were not returned to participants for comments or corrections as data was clarified during the interviews. |

Overview / Knowledge

1. **What are your thoughts, in general, related to breast cancer screening in women age 40-49?**
 - a. Have your thoughts on this changed over time? What influences that?
2. **Are you aware of any guideline recommendations for breast cancer screening amongst women aged 40-49?**
 - a. What is your interpretation of the evidence on which these guidelines are based?
3. **Can you tell me about your general approach for women presenting for a general check-up or periodic health review who are between age 40-49 in regard to breast cancer screening?**
 - a. Prompt re: symptoms and re: risk factors (FamHx, breast density, lifestyle, reproductive factors)
 - b. Have you ever tried to formally calculate breast cancer risk?
4. **What would you do if you thought a woman aged 40-49 had elevated risk for breast cancer?**
 - a. Have you ever referred to a specialized breast clinic or breast screening program? (prompt: OBSP high risk program? Aware of what this is?)
 - b. Have you ever referred a woman to a genetic counsellor?
 - c. What might prompt you to refer to these places?

Skills (5 min)

1. **What skills do you think a family physician requires to follow the guidelines in this age group?**
 - a. Prompt re: content skills (calculating risk) and values-based discussion skills
2. **If you thought a patient should be part of the OBSP high risk screening, do you know how to get her enrolled?**
 - a. Consider prompt for risk calculator – IBIS, BOADICEA, etc – if they mention ask if they calculate?
3. **If you thought a patient should be referred to a genetic counsellor, do you know how to do this?**
 - a. Have you used any other tools to have a woman receive genetic testing? (Prompt: Screen Project). Do you know how to use this?

Beliefs about Capabilities

1. **How easy or difficult is it for you personally to apply the guidelines in practice? Why or why not?**
 - a. How easy or difficult is it for you personally to estimate a woman's breast cancer risk?
 - b. How easy or difficult is it for you to discuss benefits, risks, and personal preferences with a woman in their 40's and come to a decision about screening?
 - i. Why is it easy? What makes it difficult?
 - c. How easy or difficult is it for you to a) enroll a patient in the OBSP program? b) refer a patient to genetics? c) Use an online referral such as 'the screen project'?
 - i. Why is it easy? What makes it difficult?

Beliefs about Consequences

1. **What benefits or harms do you think about related to sending a woman in this age group for screening mammogram?**
 - a. What kind of harm?
 - b. Prompt for psychological harm vs. over-diagnosis
2. **Do you have any concerns related to genetics referrals? What has your experience been with these in the past?**
3. **If you were to have a discussion with patients in this age group about the benefits and harms of breast screening, do you feel it would be helpful in coming to a decision?**
 - a. Do you have any concerns about the discussion itself?
4. **Do you consider the patient's social determinants of health (educational, financial situation, ethnicity, etc) when deciding to have a discussion with a patient?**
 - a. How does this affect your decision to have the discussion?
 - b. Does it affect your decision to refer for SM? Genetics? How?
5. **Do the involvement of a patient's family members or religious / spiritual beliefs affect your decision to have this discussion? Offer referral?**

Environment Context & Resources AND Memory, Attention & Decision Processes AND Intention

1. **Do you ever forget to discuss screening in this age group?**
 - a. What factors lead to forgetting?
2. **What helps you to remember to discuss breast cancer screening?**
 - a. Prompt: Do you think of breast screening together with any other type of cancer screening? (cervical, colon)
3. **What things in your clinical environment make it easier or more difficult to follow the aspects of breast cancer guidelines that we've been discussing for women in their 40s?**
 - a. How easy or difficult is it for you to find forms you might need?
 - b. Do you use any other helpful resources? {Prompts: forms in office, computer-based}
 - c. What do you think about virtual connections for genetic testing / genetic counsellor?
4. **Are there other competing priorities that might influence your ability to discuss screening?**
5. **How do you proceed if you believe risk level is incongruent with patient values?**
 - a. Consider prompt for high risk, low patient value and low risk, high patient value
 - b. Are there any patient-related factors which you consider when making these decisions?

Social/Professional role & identity AND Social Influences

1. **If a woman never brought up breast screening or breast cancer before the age of 50, do you feel it is your job as a family physician to discuss this?**
 - a. What about if a woman requests more screening than you think is warranted?
2. **How do you think your colleagues approach screening in this age group?**
3. **What do you think your colleagues would do in a similar situation (to high risk, low value and low risk high value)?**

Optimism

1. **Do you believe that discussing benefits and harms is a useful approach with these patients?**
2. **Do you believe that referring the appropriate patient to a genetic counsellor is valuable to a patient? How so?**



Breast Screening in Primary Care
Interview Guide
Version Number: 1.0
Date: September 3, 2019

Behavioural Regulation

1. What do you think would help ensure that you more consistently follow guidelines?

Goals / Reinforcement

1. **If there was one thing which you could change in your practice to improve risk assessment, breast cancer screening, or genetic referrals in this age group, what would it be?**
2. **Have you ever set goals for yourself related to discussions, screening, or referral?**
 - a. What were they and what happened?
 - b. Do you have any you plan to start?
3. **What do you think would be helpful to you to achieve this goal?**
 - a. Support tools?
 - b. Automated?
 - c. Remuneration?
4. **What do you think would be helpful to improve guideline-concordant care for patients in this age group on a *routine* basis?**

General Invitation for Comments and Closing

We have covered several topics related to your general approach to screening mammography and genetics / high risk referrals. In 2 or 3 sentences, could you summarize any key take-home messages or recommendations you would like to make regarding this topic?