Benefits and barriers to participation in colorectal cancer screening: A protocol for a systematic review and synthesis of qualitative studies

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Benefits and barriers to participation in colorectal cancer screening: A protocol for a systematic review and synthesis of qualitative studies

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ABSTRACT:

Introduction: Colorectal cancer (CRC) poses a serious health problem worldwide. While screening is effective in reducing CRC mortality, participation in screening tests is generally suboptimal and social inequities in participation are frequently reported. The goal of this review is to synthesize factors that influence individuals' decisions to participate in CRC screening, and to explore how those factors vary by sex, ethnicity and socio-economic status.

Data sources: A primary search of CINAHL, MEDLINE, EMBASE, PsycINFO, and a secondary search of grey literature and articles taken from references of included articles.

Design: A systematic review and Meta-study synthesis of qualitative studies that address perceived benefits and barriers to participation in CRC screening tests among adults 50 years of age or older.

Review methods: The two-staged Meta-study methodology by Paterson will be used to conduct this review. In stage 1, similarities/differences, patterns and themes will be identified across three levels of analysis while preserving the context of original studies. In stage 2, synthesis will extend beyond the analysis to generate new theory of the phenomenon through a process called Meta-synthesis.

Discussion: This review offers to generate a framework to better understand benefits and barriers that affect decision-making to participate in CRC screening among different sectors of the population. This framework will be a relevant tool for policy makers in framing educational materials, for patient-centered communication, and for researchers interested in the science of equity.

This review is registered in PROSPERO (registration number: CRD42013005025)

Article Summary

Strengths and limitations of this study

Quality of included studies will be assessed using the CASP tool for qualitative studies (Critical Appraisal Skills Programme)

Findings may be limited to individuals from different ethnic minorities living in developed countries, which may be a potential source of bias and limit the generalisability of our findings to the overall ethnic population.

INTRODUCTION:

Colorectal cancer (CRC) poses a serious health problem worldwide. CRC is the second most common cause of cancer death in United States (US) (1), Canada (2), United Kingdom (UK) (3, 4), Germany (5), Australia (6) and Japan (7). It is estimated that by 2013, 142,820 new CRC cases and 50,830 CRC deaths will occur in the US (1) and 23,900 new CRC cases and 9,200 CRC deaths will occur in Canada (2).

Screening for CRC can reduce the burden of the disease. Screening tests for CRC include fecal occult blood testing (guaiac FOBT) and fecal immunochemical test (FIT), flexible sigmoidoscopy, colonoscopy, computed tomographic colonography (CTC), and fecal DNA testing. Several of these tests are effective in reducing the incidence of, and in some instances, the mortality from the disease. Three landmark randomized controlled trials (RCTs) demonstrated that biennial use of guaiac FOBT coupled with colonoscopy in persons who tested positive was associated with a reduction in colorectal cancer (CRC) mortality of 15% (8-10).

Screening for CRC is a complex process and many publicly funded health care systems have implemented an organized, population-based approach for screening such as in the UK (11), most provinces in Canada (12), 19 out of the 27 of the European Union (EU) countries (13), Japan (14), and Korea (15). Population-based organized screening programs involve inviting a defined population at average risk for the disease (i.e. people who do not have CRC, or strong family history of CRC, or medical conditions that put them at higher risk of developing CRC such as Crohn's disease or ulcerative colitis) to attend screening. The success of a high-quality organized, population-based CRC screening program depends on adequate uptake as well as social equity in uptake (16). Early evaluation indicates an overall low participation and social inequity in participation. Participation in CRC screening tends to be lower among ethnic

minorities (11, 17-19), low socioeconomic status individuals (11, 20-22), and among men (20, 22-24). A better understanding of the causes of the overall low participation and the inequities in participation needs to be identified and addressed.

Qualitative studies have shown that difficulties in doing screening tests at home (i.e. FOBT) and the perceived need for screening while having no symptoms of colorectal disease are the main barriers for participation across different population groups(25, 26). In certain cultures, men perceive colonoscopy as embarrassing, invasive, and an affront to their masculinity (22-24, 27-35). Women, in general, believe that their experience with other cancer screening tests such as mammography encourages them to do CRC screening (36), and because they often assume the role of caregiver in a family, they value the importance of self-care and early detection in order to prevent personal and family suffering (22). Less education, consistently equated with poorer health literacy skills, is often cited as the main barrier for CRC screening among low SES individuals. Poor health literacy is associated with reduced ability to 'obtain, process and understand health information' (22), and the likelihood of engaging in preventive health behaviors such as CRC screening (37-39). Other reported factors influencing participation in CRC screening among certain ethnic populations include a fatalistic view of the disease (12, 9,17), the sanctity of the body, the inappropriateness of being seen naked in public (17, 28), maintaining a positive energy (qi) and spirit (jing shen), as well as the belief that moderation of exercise and diet were enough to control the 'toxins' and prevent CRC (19).

While previous systematic reviews of quantitative studies have focused on the efficacy of CRC screening tests (40, 41), the determinants of CRC screening participation (42, 43), and the effectiveness of interventions to increase screening participation (43-45), no previous review of qualitative studies have reported on issues such as why CRC screening is or is not appealing to individuals, experiences with CRC screening, aspects of screening that are valued and those that are culturally acceptable. A well designed synthesis review of the literature, based on a comprehensive method for searching and locating studies, a rigorous approach for assessing

quality of studies and a transparent method for synthesizing studies, is needed for CRC screening.

In this study, we propose to systematically review the literature for qualitative evidence that explores the factors that influence the decision of individuals aged 50 years or over at average risk for CRC to participate in CRC screening, how those factors vary by sex, ethnicity and SES, and to generate a framework to better understand the perceived benefits and barriers that affect individual decision-making.

METHODS

Synthesis methodology

We will use the Meta-study methodology to conduct our review, which is a systematic analytic and synthesis research method pioneered by Paterson (46). We selected this methodology because it was the most suitable to answer our research question. It is a multi-faceted, interpretive qualitative approach aimed at better understanding how people construct knowledge (47). In the context of our study, this is related to better understanding the determinants of CRC screening test participation. The proposed flow of our Meta-study methods is represented in Figure 1.

Our Meta-study will be guided by the reporting standards as outlined in the ENTREQ criteria (Enhancing Transparency in Reporting the Synthesis of Qualitative Research) (48). This is a 21-item checklist grouped into 5 main domains: introduction, methods and methodology, literature search and selection, appraisal, and synthesis of findings. The protocol has been registered in the PROSPERO database (registration number: CRD42013005025, available at www.crd.york.ac.uk/PROSPERO)

Eligibility criteria

The review will use the following PICOS (Population, Intervention, Context, Outcomes, and Study design) elements: *1) Population*: Adults aged 50 years or over referred for colorectal cancer (CRC) screening; exclusion criteria are studies investigating participants previously diagnosed with CRC; a hereditary, personal or family history of CRC (e.g., Familial Adenomatous Polyposis [AFP] and hereditary non-polyposis colorectal cancer [HNPCC]); and a history of inflammatory bowel disease (e.g., ulcerative colitis and Crohn's disease). *2) Intervention:* We will identify all articles investigating perceptions of colorectal cancer screening as well as those investigating colorectal cancer as a disease ; *3) Context*: We will investigate any variations in perceptions by sex, ethnicity, SES, and other factors influencing CRC screening behavior; *4) Outcomes:* Perceptions related to CRC as a disease, causes of CRC, benefits and barriers to CRC screening, and any other contextual factors that motivate or influence people's decision to participate in CRC screening; *5) Study design*: We will include all qualitative studies and mixed-methods studies with a qualitative component. We will exclude experimental, observational, and any non-empirical studies (i.e., not based on observation or experience, opinion-driven or no hypothesis testing) such as editorials, letters, commentaries and narrative reviews.

Information sources

We will conduct a systematic search in the following electronic databases from inception to July 2013: MEDLINE, EMBASE, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO, and Social Science Abstracts (SSA). We will conduct a secondary search of the grey literature (unpublished) from sources such as Cancer Care Ontario and the National Health System Bowel Cancer Screening Programme. We will also search the reference lists of included articles and identify other articles through contact with experts in the field and linkages

with our team members (e.g. Cancer Care Ontario). There will be no language restrictions in our searches.

Search strategy

Literature searching will be conducted by an experienced information specialist. The search strategy for the main database (MEDLINE) will be peered reviewed by another experienced information specialist using the PRESS checklist (i.e. Peer Review of Electronic Search Strategies) (49). The resulting retrieval yield will be limited to qualitative studies and mixed methods with a qualitative component using the optimized search strategy filter for qualitative studies of selected databases: MEDLINE (50), EMBASE (51), PsycINFO (52), and CINAHL (53). The draft search strategy for MEDLINE is available in Appendix 2. For the other databases, the search strategies are available from the authors on request.

Study selection

We will first perform a calibration exercise to ensure reliability of screening. Using the inclusion/exclusion criteria available in Appendix 1, two reviewers will independently screen a random sample of citations (25-50 citations) using our online Synthesi.SR Tool (proprietary online systematic review software developed for our Knowledge Synthesis Center at St. Michael's Hospital)(54). We will calculate inter-rater agreement for study inclusion using percent agreement, and repeat our pilot screening exercise until we reach at least 90% agreement at which point investigators will independently review titles and abstracts of potentially relevant articles in duplicate (level 1 screening). For level 2 screening, we will follow a similar calibration exercise as described for level 1 screening to identify full-text articles. Conflicts will be resolved through research team consensus for both levels of screening.

Data collection process

Two reviewers will abstract data independently using a standardized data collection form. The form will first be pilot tested on a random sample of 5-10 included studies and modified accordingly. Data abstraction will begin only if agreement is at least 95% among the two abstractors. We will extract data on study characteristics (e.g., first author, citation) and qualitative study quality criteria according to the CASP tool (Critical Appraisal Skills Programme), which includes 10- item checklist to assess the clarity of research aims, appropriateness of methodology and recruitment strategy, data collection, ethical considerations including the relationship between researcher and participants, the rigor of analysis, clear statement of findings, and the value of the research(55). All data abstraction will be conducted using our online Synthesi.SR Tool, which provides a platform to resolve conflicts between reviewers directly in the system. Discrepancies will be reviewed and resolved by discussion amongst the team. The reporting of our review will be guided by the ENTREQ criteria (Enhancing Transparency in reporting the synthesis of qualitative research)(48)

Data synthesis

We will perform a two-staged analysis and synthesis process with the goal of creating a new interpretation of the phenomenon under investigation. In stage 1, similarities/differences, patterns and themes will be identified across three levels of analysis (46, 47, 56):

Meta-data analysis: This will involve the interpretive analysis of research findings from primary studies to identify similarities and discrepancies among them using any one of several qualitative data analytic approaches (e.g., line of argument; grounded theory; thematic analysis). In the context of our work, this will involve using thematic analysis to group themes (such as the benefits and barriers to CRC screening) according to sex, SES or other factors that emerge, and then noting the similarities and differences between them.

Meta-method: This level of analysis will examine how the research methods and procedures in primary studies were used to generate and interpret data and shape the findings. It includes a process of appraising each included study according to the CASP tool for quality assessment of qualitative studies (55). A third reviewer will be available to settle discrepancies between reviewers for applying the CASP criteria.

Meta-theory: This level of analysis examines the theories that underpin study authors' framing of their research questions, their criteria for inclusion, and their conceptual framework for interpretation. It is the level at which the theoretical perspectives in qualitative reports can be interrogated to explain the phenomenon under study. This level of analysis will be used to identify the theoretical perspectives or "schools of thought" around CRC screening, and to determine how context may influence such perspectives.

In stage 2, synthesis will extend beyond the three levels of analysis to generate new and expanded theory of the phenomenon through a process called Meta-synthesis. In contrast to the 3-level analytic stage, Meta-synthesis is "a creative, dynamic, and interactive process that defies codification" (46). It involves interpreting the influence of method and theory variation in the findings to produce a new understanding of the phenomenon. This interpretation will be documented during data extractions. To reduce the potential of bias introduced from such an interpretive process, two investigators will independently perform this interpretation, which will be discussed and finalized with input of the entire research team. We will use findings informed by the 3-level analysis to develop a framework that shows the perceived benefits and barriers of CRC screening participation according to sex, SES, cultural beliefs, and other factors that may emerge.

Discussion and dissemination

The proposed review offers to generate a framework through an in-depth analysis of qualitative studies to better understand the benefits and barriers that affect decision-making to participate in CRC screening among different sectors of the population. This framework will be a relevant tool to a wide range of knowledge users. Policy makers can use it as a tool while framing educational materials. Physicians may use it as a tool in patient-centered communication or in group education sessions in order to engage culturally homogeneous population into a discussion on CRC screening. This review also offers advancement in the science of equity by identifying the determinants of social inequities in CRC screening participation. Using the anticipated framework, researchers may also design novel interventions to address those inequities, leading to improved quality in practice and advancement in evidence-based decision-making. Furthermore, synthesis of available qualitative evidence of barriers to participation in CRC screening currently does not exist. Therefore, our findings may trigger other systematic reviews of gaps in information that we may identify.

We will ensure broad dissemination of this synthesis review to include publication in open access journals as well as conference presentations. We may also hold a meeting with our key stakeholders (i.e. clinicians, researchers and decision-makers) to discuss the findings and generate key messages most relevant to each and to discuss the next steps including the development of educational materials that will address gaps in CRC screening participation.

Contributorship statement

Contributors: GHA and NB helped conceive the study, GHA, NB, MK and VV conceived the study design. GHA and MK helped draft the protocol. LP developed and executed the search strategy and edited the draft protocol. All authors helped editing the draft protocol, read and approved the final manuscript.

Ethics declaration

Ethics approval not required for this study

Funding

This research was supported through a Cancer Care Ontario research grant and Canadian Cancer Society Research Institute award. Dr Baxter holds the Cancer Care Ontario Health Services Research Chair.

Competing interests

LP, MK, LR, JT, SS & NB have no support from any organisation for the submitted work, no financial relationships with any organizations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

GHA, VV have support from Cancer Care Ontario and Canadian Cancer Society Research Institute for the submitted work; GHA, VV have no financial relationships with any organizations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

Provenance and peer review

Not commissioned; internally peer reviewed.

Data sharing statement

Unpublished study data such as the search strategies for the other databases (EMBASE, CINAHL, PsycINFO, SSA) are available upon request to the corresponding author.

Copyright statement

Data sharing statement

Additional data on the assessment of quality of included papers are available from gladys.honein@mail.utoronto.ca

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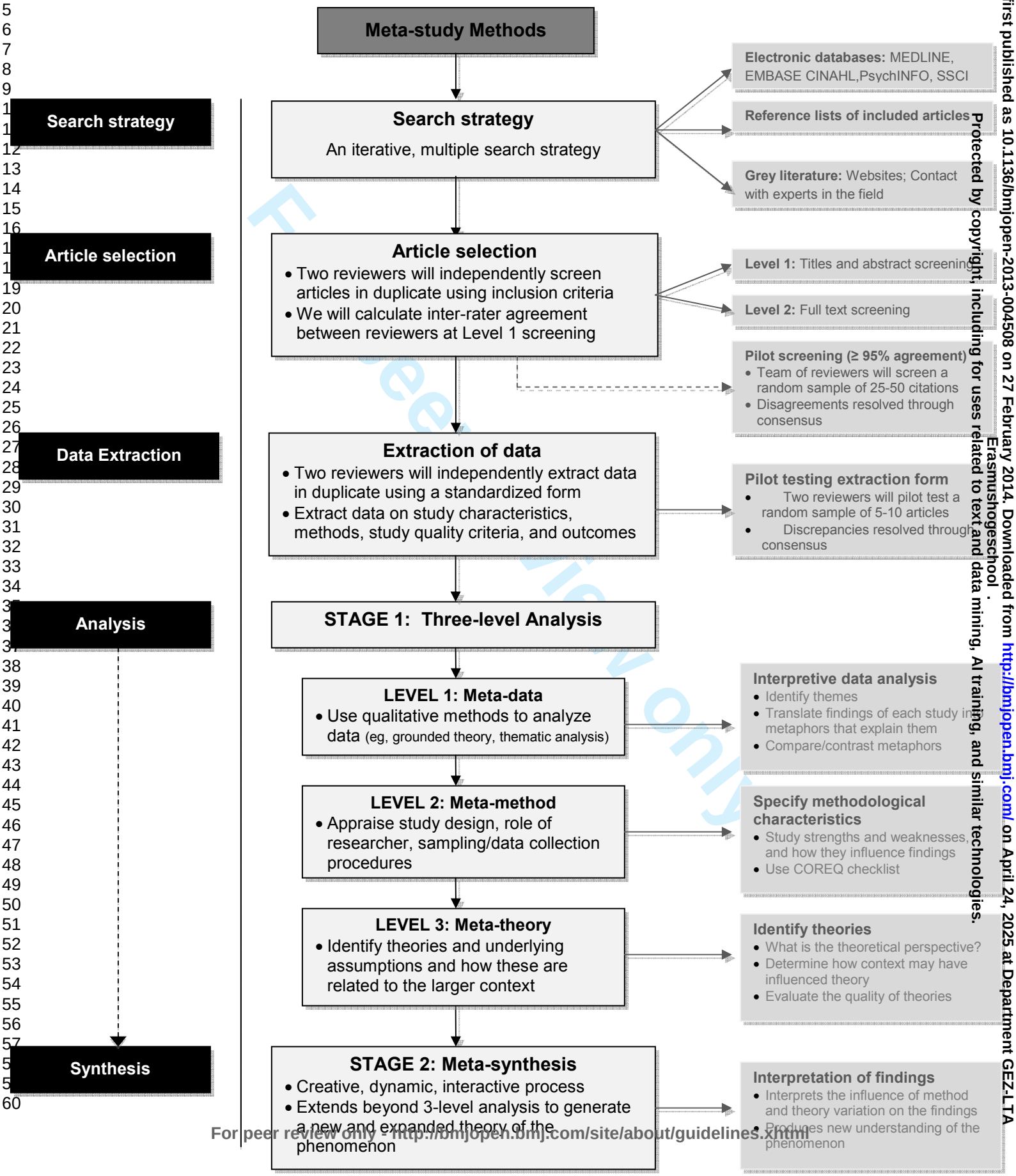
Figure 1: Flow of proposed Meta-study methods



Appendix 1
Draft eligibility criteria

Level 1 screening (title and abstract review):

1. Is this study about colorectal cancer (CRC), CRC screening or both? YES/NO/UNCLEAR (YES = either or both)
2. Is this a qualitative study? YES/NO/UNCLEAR (we will be over-inclusive: any qualitative methodology is in)

If you answer NO to any of these questions, the study will be excluded. All other citations will be included.

Level 2 screening (full-text review):

1. Is this study about colorectal cancer (CRC), CRC screening or both? YES/NO/UNCLEAR (YES = either or both)
2. Is this a qualitative study? YES/NO/UNCLEAR (we will be over-inclusive: any qualitative methodology is in)
3. Does the study report on any of the relevant outcomes?

If you answer NO to any of these questions, the study will be excluded. All other citations will be included.

Appendix 2

Draft MEDLINE search strategy

Database: Ovid MEDLINE(R), Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid OLDMEDLINE(R) <1946 to July 26, 2013>

Search Strategy:

---

1 exp Colorectal Neoplasms/

2 exp Colonic Neoplasms/

3 exp Rectal Neoplasms/

4 (anal adj cancer$).mp.

5 (anal adj carcinoma$).mp.

6 (anal adj adeno?carcinoma$).mp.

7 (anal adj neoplasm$).mp.

8 (anal adj tumo?r$).mp.

9 (anal adj lesion$).mp.

10 (anal adj adenom$).mp.

11 (anal adj sarcom$).mp.

12 (anal adj malignan$).mp.

13 (anus adj cancer$).mp.

14 (anus adj carcinoma$).mp.

15 (anus adj adeno?carcinoma$).mp.

16 (anus adj neoplasm$).mp.

17 (anus adj tumo?r$).mp.

18 (anus adj lesion$).mp.

19 (anus adj adenom$).mp.

20 (anus adj sarcom$).mp.

21 (anus adj malignan$).mp.

22 (bowel adj cancer$).mp.

23 (bowel adj carcinoma$).mp.

24 (bowel adj adeno?carcinoma$).mp.

25 (bowel adj neoplasm$).mp.

26 (bowel adj tumo?r$).mp.

27 (bowel adj lesion$).mp.

28 (bowel adj adenom$).mp.

29 (bowel adj sarcom$).mp.

30 (bowel adj malignan$).mp.

31 (colorectal adj cancer$).mp.

32 (colorectal adj carcinoma$).mp.

33 (colorectal adj adeno?carcinoma$).mp.

34 (colorectal adj neoplasm$).mp.

35 (colorectal adj tumo?r$).mp.

36 (colorectal adj lesion$).mp.

37 (colorectal adj adenom$).mp.

38 (colorectal adj sarcom$).mp.

39 (colorectal adj malignan$).mp.

40 (colon$ adj cancer$).mp.

41 (colon$ adj carcinoma$).mp.

42 (colon$ adj adeno?carcinoma$).mp.

43 (colon adj neoplasm$).mp.

44 (colon$ adj tumo?r$).mp.

45 (colon$ adj lesion$).mp.

46 (colon$ adj adenom$).mp.

47 (colon$ adj sarcom$).mp.

48 (colon$ adj malignan$).mp.

49 (rectal adj carcinoma$).mp.

50 (rectal adj cancer$).mp.

51 (rectal adj adeno?carcinoma$).mp.

52 (rectal adj neoplasm$).mp.

53 (rectal adj tumo?r$).mp.

54 (rectal adj lesion$).mp.

55 (rectal adj adenom$).mp.

56 (rectal adj sarcom$).mp.

57 (rectal adj malignan$).mp.

58 (rectum adj carcinoma$).mp.

59 (rectum adj cancer$).mp.

60 (rectum adj adeno?carcinoma$).mp.

61 (rectum adj neoplasm$).mp.

62 (rectum adj tumo?r$).mp.

63 (rectum adj lesion$).mp.

64 (rectum adj adenom$).mp.

65 (rectum adj sarcom$).mp.

66 (rectum adj malignan$).mp.

67 (sigmoid adj cancer$).mp.

68 (sigmoid adj adeno?carcinoma$).mp.

69 (sigmoid adj neoplasm$).mp.

70 (sigmoid adj tumo?r$).mp.

71 (sigmoid adj lesion$).mp.

72 (sigmoid adj adenom$).mp.

73 (sigmoid adj sarcom$).mp.

74 (sigmoid adj malignan$).mp.

75 or/1-74

76 Early Detection of Cancer/

77 exp Occult Blood/

78 exp Immunochemistry/

79 exp Endoscopy, Gastrointestinal/

80 exp Colonoscopy/

81 exp Sigmoidoscopy/

82 Colonography, Computed Tomographic/

83 (disease adj2 detect$).tw.

84 endoscop$.mp.

85 colonograph$.mp.

86 colonoscop$.mp.

87 sigmoidoscop$.mp.

88 rectosigmoidoscop$.mp.

89 proctosigmoidoscop$.mp.

90 COL.mp.

91 SIG.mp.

92 FSIG.mp.

93 (flex$ adj3 sig$).mp.

94 faecal.mp.

95 fecal.mp.

96 feces.mp.

97 faeces.mp.

98 gFOBT.mp.

99 FOBT.mp.

100 FOB.mp.

101 haemoccult.mp.

102 hemoccult.mp.

103 sensa.mp.

104 hemocare.mp.

105 (hema adj screen).mp.

106 hemofec.mp.

107 fecatest.mp.

108 fecatwin.mp.

109 coloscreen.mp.

110 seracult.mp.

111 colocare.mp.

112 flexsure.mp.

113 immocare.mp.

114 hemochaser.mp.

115 hemeselect.mp.

116 immudia.mp.

117 monohaem.mp.

118 insure.mp.

119 hemodia.mp.

120 immocare.mp.

121 magstream.mp.

122 guaiac.mp.

123 (occult adj blood).mp.

124 (stool adj3 occult).mp.

125 (immunochemical$ adj3 test$).mp.

126 (immunochemical$ adj3 screen$).mp.

127 (immunochemical$ adj3 diagn$).mp.

128 (immunologic$ adj3 test$).mp.

129 (immunologic$ adj3 screen$).mp.

130 (immunologic$ adj3 diagn$).mp.

131 EIA.mp.

132 RPHA.mp.

133 exp Mass Screening/

134 exp Population Surveillance/

135 surveillance.mp.

136 (early adj3 detect$).mp.

137 (early adj3 prevent$).mp.

138 screen$.mp.

139 or/76-138

140 interview$.mp. [qualitative search filter - validated]

141 experience$.mp.

142 qualitative.tw.

143 or/140-142

144 75 and 139 and 143

145 exp Animals/ not (exp Animals/ and Humans/)

146 144 not 145

Enhancing transparency in reporting the synthesis of qualitative research: the ENTREQ statement

No	Item	Guide and description
1	Aim	To systematically review the literature for qualitative evidence that explores the factors that influence the decision of individuals aged 50 years or over at average risk for Colorectal cancer (CRC) to participate in CRC screening, how those factors vary by sex, ethnicity and SES, and to generate a framework to better understand the perceived benefits and barriers that affect individual decision-making
2	Synthesis methodology	Meta-study approach
3	Approach to searching	Preplanned comprehensive search strategies will be used to seek all available studies
4	Inclusion criteria	Qualitative research methods (data collection and analysis) Population: Adults aged 50 years or over referred for colorectal cancer (CRC) screening. Topic: to better understand the benefits and barriers that affect decision-making to participate in CRC screening among different sectors of the population. No language or year limits
5	Data sources	MEDLINE, EMBASE, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO, and Social Science Abstracts (SSA), Grey literature databases included Cancer Care Ontario and the National Health System Bowel Cancer Screening Programme. We will also search the reference lists of included articles and identify other articles through contact with experts in the field and linkages with our team members (e.g. Cancer Care Ontario).
6	Electronic Search strategy	Literature search terms are described in detail in Appendix 2
7	Study screening methods	The titles and abstracts of retrieved citations will be scanned by two reviewers (GHA, VV). Full papers will be ordered for all potentially relevant abstracts. Full papers will be reviewed by two researchers (GHA, VV) and will be included if they meet our inclusion criteria
8	Study characteristics	Qualitative studies and mixed methods with a qualitative component will be included. The characteristics of the included studies are presented in Appendix 1.
9	Study selection results	We will exclude experimental, observational, and any non-empirical studies (i.e. not based on observation or experience, opinion-driven or no hypothesis testing) such as editorials, letters, commentaries and narrative reviews as well as those that do not focus on CRC, CRC screening or both. The characteristics of the excluded studies are described in Appendix 1
10	Rationale for appraisal	We will appraise the quality of included studies including clarity of research aims, appropriateness of methodology, rigor of analysis and value of study
11	Appraisal items	The CASP tool will be used to appraise all included studies
12	Appraisal process	Two reviewers (GHA, MK) will abstract data independently using a standardized data collection form. Data abstraction will begin only if agreement is at least 95% among the two abstractors. Discrepancies will be reviewed and resolved by discussion amongst the team.
13	Appraisal results	All appraisal results will be conducted using our online Synthesi.SR Tool, which provides a platform to resolve conflicts between reviewers directly in the system and will be available for review if required.
14	Data extraction	We will use a standardized data collection form. We will pilot test the form on a random sample of 5-10 included studies and will modify it accordingly. The form includes information on the study details, study methods and quality, outcomes and results. All text under outcomes and results will be considered data from the primary studies. This data collection form will be stored in an excel sheet software in order to facilitate data management.
15	Software	Synthesi.SR /Microsoft excel
16	Number of reviewers	Three reviewers – GHA, MK, VV

17	Coding	The meta-study approach described by Paterson.
18	Study comparison	Similarities/differences, patterns and themes will be identified across three levels of analysis: Meta data analysis which will involve using thematic analysis to group themes Meta method which will examine how the research methods and procedures in primary studies were used to generate and interpret data and shape the findings. Meta theory which will identify the theoretical perspectives or "schools of thought" around CRC screening, and to determine how context may influence such perspectives.
19	Derivation of themes	Themes were derived initially as key concepts representing the entire dataset. The contribution of each paper to each key concept was determined and the meaning of the key concept modified accordingly.
20	Quotations	Quotations from the primary studies will be provided in the results section.
21	Synthesis output	The Meta-synthesis will generate new and expanded theory of the phenomenon, which will aid to develop a framework that shows the perceived benefits and barriers of CRC screening participation according to sex, SES, cultural beliefs, and other factors that may emerge.

Benefits and barriers to participation in colorectal cancer screening: A protocol for a systematic review and synthesis of qualitative studies

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Benefits and barriers to participation in colorectal cancer screening: A protocol for a systematic review and synthesis of qualitative studies

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ABSTRACT:

Introduction: Colorectal cancer (CRC) poses a serious health problem worldwide. While screening is effective in reducing CRC mortality, participation in screening tests is generally suboptimal and social inequities in participation are frequently reported. The goal of this review is to synthesize factors that influence individuals' decisions to participate in CRC screening, and to explore how those factors vary by sex, ethnicity and socio-economic status.

Data sources: A primary search of CINAHL, MEDLINE, EMBASE, PsycINFO, and a secondary search of grey literature and articles taken from references of included articles (from inception to July 2013).

Design: A systematic review and Meta-study synthesis of qualitative studies that address perceived benefits and barriers to participation in CRC screening tests among adults 50 years of age or older.

Review methods: The two-staged Meta-study methodology by Paterson will be used to conduct this review. In stage 1, similarities/differences, patterns and themes will be identified across three levels of analysis while preserving the context of original studies. In stage 2, synthesis will extend beyond the analysis to generate new theory of the phenomenon through a process called Meta-synthesis.

Discussion: This review offers to generate a framework to better understand benefits and barriers that affect decision-making to participate in CRC screening among different sectors of the population. This framework will be a relevant tool for policy makers in framing educational materials, for patient-centered communication, and for researchers interested in the science of equity.

This review is registered in PROSPERO (registration number: CRD42013005025)

Article Summary

Strengths and limitations

- This will be the first synthesis of qualitative studies to investigate why individuals undergo colorectal cancer (CRC) screening, their perceptions of and experiences with CRC screening, and which aspects of screening are valued and culturally acceptable
- The work will advance the science of conducting Meta-study reviews by rigorously executing its steps in the context of our research question and to document this process extensively in our final report
- The work will advance the science of equity by identifying the determinants of social inequities in CRC screening participation
- Findings from this Meta-study will be used to generate a framework to better understand the perceived benefits and barriers that affect individual decision-making of CRC screening
- Findings may be limited to individuals from different ethnic minorities living in developed countries, which may limit the transferability of our findings to the overall ethnic population

This review is registered in PROSPERO (registration number: CRD42013005025)

INTRODUCTION:

Colorectal cancer (CRC) poses a serious health problem worldwide. CRC is the second most common cause of cancer death in United States (US) (1), Canada (2), United Kingdom (UK) (3, 4), Germany (5), Australia (6) and Japan (7). It is estimated that by 2013, 142,820 new CRC cases and 50,830 CRC deaths will occur in the US (1) and 23,900 new CRC cases and 9,200 CRC deaths will occur in Canada (2).

Screening for CRC can reduce the burden of the disease. Screening tests for CRC include fecal occult blood testing (guaiac FOBT) and fecal immunochemical test (FIT), flexible sigmoidoscopy, colonoscopy, computed tomographic colonography (CTC), and fecal DNA testing. Several of these tests are effective in reducing the incidence of, and in some instances, the mortality from the disease. Three landmark randomized controlled trials (RCTs) demonstrated that biennial use of guaiac FOBT coupled with colonoscopy in persons who tested positive was associated with a reduction in colorectal cancer (CRC) mortality of 15% (8-10).

Screening for CRC is a complex process and many publicly funded health care systems have implemented an organized, population-based approach for screening such as in the UK (11), most provinces in Canada (12), 19 out of the 27 of the European Union (EU) countries (13), Japan (14), and Korea (15). Population-based organized screening programs involve inviting a defined population at average risk for the disease (i.e. people who do not have CRC, or strong family history of CRC, or medical conditions that put them at higher risk of developing CRC such as Crohn's disease or ulcerative colitis) to attend screening. The success of a high-quality organized, population-based CRC screening program depends on adequate uptake as well as social equity in uptake (16). Early evaluation indicates an overall low participation and social inequity in participation. Participation in CRC screening tends to be lower among ethnic minorities (11, 17-19), low socioeconomic status individuals (11, 20-22), and among men (20, 22-24).

While social inequities in uptake are well described in the literature (25, 26) , what is missing, is a clear understanding of why CRC screening is or is not appealing to individuals, aspects of screening that are valued and those that are culturally acceptable. Qualitative studies are important sources for this information. To date, a wide range of qualitative studies have elicited views on the perceived benefits and barriers to participation in screening from a range of ethnic and socioeconomic groups in various countries. The in-depth analyses in these studies reveal the complexity of social factors that affect individuals' decision to participate in screening. For example, studies have shown that difficulties in doing screening tests at home (i.e. FOBT) and the perceived need for screening while having no symptoms of colorectal disease are the main barriers for participation across different population groups(27, 28). In certain cultures, men perceive colonoscopy as embarrassing, invasive, and an affront to their masculinity (22-24, 29-37). Women, in general, believe that their experience with other cancer screening tests such as mammography encourages them to do CRC screening (38), and because they often assume the role of caregiver in a family, they value the importance of self-care and early detection in order to prevent personal and family suffering (22). Less education, consistently equated with poorer health literacy skills, is often cited as the main barrier for CRC screening among low SES individuals. Poor health literacy is associated with reduced ability to 'obtain, process and understand health information' (22), and the likelihood of engaging in preventive health behaviors such as CRC screening (39-41). Other reported factors influencing participation in CRC screening among certain ethnic populations include maintaining a positive energy (qi) and spirit (jing shen), as well as the belief that moderation of exercise and diet were enough to control the 'toxins' and prevent CRC (19).

Systematic reviews of quantitative studies have focused on investigating the efficacy of CRC screening tests (42, 43), the determinants of CRC screening participation (25, 26), and the effectiveness of interventions to increase screening participation (26, 44, 45). However, no synthesis of qualitative studies exists to investigate *why* individuals undergo CRC screening or

not, their perceptions of and experiences with CRC screening, and which aspects of screening are valued and culturally acceptable. A well-designed synthesis of qualitative studies is needed to achieve a greater conceptual understanding of the perceived barriers and benefits associated with participation in CRC screening. This understanding is a necessary step to direct intervention designs to raise overall participation, reduce inequities in participation and eventually reduce mortality from CRC.

The Meta-study approach, a commonly used method to synthesize qualitative studies, was the most suitable approach to answer our research question. We considered other methods such as a Realist review (which seeks to understand what works for whom, under what circumstances and why) and meta-ethnography (which aims to uncover a new theory to explain a range of findings) neither focuses on the experiences of people specifically nor considers the quality of included studies as part of the analysis.

The objectives of our study are to systematically review the literature for qualitative evidence that explores the factors that influence the decision of individuals aged 50 years or over at average risk for CRC to participate in CRC screening, and how those factors vary by sex, ethnicity and SES. Our secondary aim will be to generate a framework to better understand the perceived benefits and barriers that affect individual decision-making.

METHODS

Synthesis methodology

We will use the Meta-study methodology to conduct our review, which is a systematic analytic and synthesis research method pioneered by Paterson et al (46). We selected this methodology because it was the most suitable to answer our research question. Meta-study is a multi-faceted, systematic knowledge synthesis method aimed at better understanding how people construct knowledge (47). In the context of our study, this is related to better understanding the determinants of CRC screening test participation. More specifically, it is an

interpretive qualitative research approach in the constructivist paradigm (i.e., the role of the investigator is to understand how people construct knowledge about the phenomenon under study) (48). The aims of Meta-study are to "analyze" and "synthesize" what has been reported in the literature – these are considered distinct. *Analysis* involves identifying commonalities, differences, patterns, and themes in a body of qualitative research (i.e., what is typically done in a qualitative systematic review). *Synthesis* extends beyond analysis to identify "truths" about the phenomenon under study, by considering how the primary researchers interpreted the data (i.e., Meta-data), the design and quality of studies (Meta-method), and the theoretical frameworks or perspectives used in these research reports (Meta-theory). To answer our research questions, we need to go beyond the "analysis" of existing literature, as CRC screening is complex and currently, it is unknown why people do or do not undergo CRC screening. We hypothesize that there may be underlying factors involved in individuals' perceptions and experiences well beyond CRC as a disease itself that influences their decision to undergo diagnostic testing (e.g., cultural beliefs). Meta-study will allow us to extend beyond the typical "analysis" phase because it considers the triangulation of the raw data (meta-data) and its quality (meta-method) as well as the theoretical underpinnings of this data (meta-theory). This level of "synthesis" called "Meta-synthesis" will lead to a new understanding of CRC and screening decisions (e.g., colonoscopy) beyond what would be discovered in a qualitative systematic review (which tends to focus entirely on the primary research findings).

The proposed flow of our Meta-study methods is represented in Figure 1. Our Meta-study will be guided by the reporting standards as outlined in the ENTREQ criteria (Enhancing Transparency in Reporting the Synthesis of Qualitative Research) (49). This is a 21-item checklist grouped into 5 main domains: introduction, methods and methodology, literature search and selection, appraisal, and synthesis of findings. The protocol has been registered in the PROSPERO database (registration number: CRD42013005025, available at www.crd.york.ac.uk/PROSPERO)

Eligibility criteria

We developed our eligibility criteria from our research questions. The review will use the following PICOS (Population, Intervention, Context, Outcomes, and Study design) elements: *1) Population*: Adults aged 50 years or over referred for colorectal cancer (CRC) screening; exclusion criteria are studies investigating participants previously diagnosed with CRC; a hereditary, personal or family history of CRC (e.g., Familial Adenomatous Polyposis [AFP] and hereditary non-polyposis colorectal cancer [HNPCC]); and a history of inflammatory bowel disease (e.g., ulcerative colitis and Crohn's disease). *2) Intervention:* We will identify all articles investigating perceptions of colorectal cancer screening as well as those investigating colorectal cancer as a disease ; *3) Context*: We will investigate any variations in perceptions by sex, ethnicity, SES, and other factors influencing CRC screening behavior; *4) Outcomes:* Perceptions related to CRC as a disease, causes of CRC, benefits and barriers to CRC screening, and any other contextual factors that motivate or influence people's decision to participate in CRC screening; *5) Study design*: We will include all qualitative studies and mixed-methods studies with a qualitative component. We will exclude experimental, observational, and any non-empirical studies (i.e., not based on observation or experience, opinion-driven or no hypothesis testing) such as editorials, letters, commentaries and narrative reviews.

Information sources

We will conduct a systematic search in the following electronic databases from inception to July 2013: MEDLINE, EMBASE, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO, and Social Science Abstracts (SSA). We will conduct a secondary search of the grey literature (unpublished) from sources such as Cancer Care Ontario and the National Health System Bowel Cancer Screening Programme. We will also search the reference lists of included articles and identify other articles through contact with experts in the field and linkages with our team members (e.g. Cancer Care Ontario). There will be no language restrictions in our searches. We anticipate completing the review by April 2014.

Search strategy

Literature searching will be conducted by an experienced information specialist. The search strategy for the main database (MEDLINE) will be peered reviewed by another experienced information specialist using the PRESS checklist (i.e. Peer Review of Electronic Search Strategies) (50). The resulting retrieval yield will be limited to qualitative studies and mixed methods with a qualitative component using the optimized search strategy filter for qualitative studies of selected databases: MEDLINE (51), EMBASE (52), PsycINFO (53), and CINAHL (54). The draft search strategy for MEDLINE is available in Appendix 2. For the other databases, the search strategies are available from the authors on request.

Study selection

We will first perform a calibration exercise to ensure reliability of screening. Using the inclusion/exclusion criteria available in Appendix 1, two reviewers will independently screen a random sample of citations (25-50 citations) using our online Synthesi.SR Tool (proprietary online systematic review software developed for our Knowledge Synthesis Center at St. Michael's Hospital)(55). We will calculate inter-rater agreement for study inclusion using percent agreement, and repeat our pilot screening exercise until we reach at least 90% agreement at which point investigators will independently review titles and abstracts of potentially relevant articles in duplicate (level 1 screening). For level 2 screening, we will follow a similar calibration exercise as described for level 1 screening to identify full-text articles. Conflicts will be resolved through research team consensus for both levels of screening.

Data collection process

Two reviewers will abstract data independently using a standardized data collection form. The form will first be pilot tested on a random sample of 5-10 included studies and modified accordingly. Data abstraction will begin only if agreement is at least 95% among the two abstractors. We will extract data on study characteristics (e.g., first author, citation) and qualitative study quality criteria according to the CASP tool (Critical Appraisal Skills

Programme), which includes 10- item checklist to assess the clarity of research aims, appropriateness of methodology and recruitment strategy, data collection, ethical considerations including the relationship between researcher and participants, the rigor of analysis, clear statement of findings, and the value of the research(56). All data abstraction will be conducted using our online Synthesi.SR Tool, which provides a platform to resolve conflicts between reviewers directly in the system. Discrepancies will be reviewed and resolved by discussion amongst the team. The reporting of our review will be guided by the ENTREQ criteria (Enhancing Transparency in reporting the synthesis of qualitative research)(49)

Data synthesis

We will perform a two-staged synthesis of the data (i.e., *Analysis* and *Synthesis*) with the goal of creating a new interpretation of the phenomenon under investigation (i.e., a new understanding of CRC and screening decisions). Please see Figure 1.

Stage 1 (Analysis of data = Meta-data + Meta-method + Meta-theory): We will identify the similarities and differences, patterns and themes across three levels of analysis (46, 47, 57): Level 1 - Meta-data analysis: This will involve the interpretive analysis of research findings from primary studies to identify similarities and discrepancies among them using any one of several qualitative data analytic approaches (e.g., line of argument; grounded theory; thematic analysis). The type of analysis method we select will be driven by the data that will emerge. In the context of our work, we anticipate that this will likely involve using thematic analysis to group themes (such as the benefits and barriers to CRC screening) according to sex, SES or other factors that emerge, and then noting the similarities and differences between them. Level 2 – Meta-method: This level of analysis will examine how the research methods and procedures in primary studies were used to generate and interpret data and shape the findings. It will include a process of appraising each included study according to the CASP tool for quality assessment of

qualitative studies (56). A third reviewer will be available to settle discrepancies between reviewers for applying the CASP criteria. Level 3 – Meta-theory: This level of analysis examines the theories that underpin study authors' framing of their research questions, their criteria for inclusion, and their conceptual framework for interpretation. It is the level at which the theoretical perspectives in qualitative reports can be interrogated to explain the phenomenon under study. We will review each report to identify the theoretical perspective used and the "schools of thought" around CRC screening, and to determine how context may influence such perspectives.

Stage 2 (synthesis of data = Meta-synthesis): In stage 2, synthesis will extend beyond the three levels of analysis to generate new and expanded theory of the phenomenon through a process called *Meta-synthesis*. In contrast to the 3-level analytic stage, Meta-synthesis is "a creative, dynamic, and interactive process that defies codification" (46). It involves interpreting the influence of method and theory variation in the findings to produce a new understanding of the phenomenon. For example, we will determine these influences by documenting how each study performs their data analysis (e.g., thematic analysis of semi-structured interviews = Meta-data analysis); whether they used a theoretical framework to drive their study (e.g., the Health Belief Model = Meta-theory); and to determine the study quality (e.g., the CASP criteria = Meta-method). Once we collect this data from all studies, we will be able to triangulate this data from individual studies to reveal a new, collective understanding of CRC screening participation. This interpretation will be documented during data extractions. To reduce the potential of bias introduced from such an interpretive process, two investigators will independently perform this interpretation, which will be discussed and finalized with input of the entire research team. We will use findings informed by the 3-level analysis to develop a framework that shows the perceived benefits and barriers of CRC screening participation according to sex, SES, cultural beliefs, and other factors that may emerge.

Discussion and dissemination

We will use findings from our in-depth analysis of qualitative studies to generate a framework to better understand the benefits and barriers that affect decision-making to participate in CRC screening among different sectors of the population. We anticipate that this framework will be relevant for a wide range of knowledge users: Policy makers will be able to use the framework as a tool to frame educational materials to address barriers to CRC screening; and physicians may use it as a tool in patient-centered communication or in group education sessions in order to engage culturally heterogeneous population into a discussion on CRC screening. This review also offers advancement in the science of equity by identifying the determinants of social inequities in CRC screening participation. Using the anticipated framework, researchers may also design novel interventions to address those inequities, which may lead to improved quality in practice and advancement in evidence-based decision-making. Furthermore, synthesis of available qualitative evidence of barriers to participation in CRC screening currently does not exist. Therefore, our findings may trigger other systematic reviews of gaps in information that we may identify. We will also advance the knowledge of conducting Meta-study reviews by rigorously executing its steps in the context of our research question and to document this process extensively in our final report.

Our study may also have some limitations. As with any qualitative studies, our work may be susceptible to threats to internal validity (i.e., credibility), external validity (i.e., transferability) and reliability (dependability) [57]. We will address potential threats to credibility by pilot testing the data abstraction forms and involving group team discussions throughout the interpretation of findings. The knowledge produced in our review may not be transferable to other people or settings. For example, findings may be limited to individuals from different ethnic minorities living in developed countries, which may limit the transferability of our findings to the overall ethnic population. However, we will abstract a detailed account of the population and setting of

each included qualitative study to maximize the potential for transferability of our findings. To limit the potential of biases that may be introduced by investigators with respect to the dependability and confirmability of our work, we will standardize procedures, methods, and analysis strategies across all aspects of the review process.

We will ensure broad dissemination of this synthesis review to include publication in open access journals as well as conference presentations. We will also plan to hold a meeting with our key stakeholders (i.e. clinicians, researchers, people with CRC, and decision-makers) to discuss the findings, to generate key messages most relevant to each, and to discuss the next steps including the development of educational materials that will address gaps in CRC screening participation.

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Contributorship statement

Contributors: GHA and NB helped conceive the study, GHA, NB, MK and VV conceived the study design. GHA and MK helped draft the protocol. LP developed and executed the search strategy and edited the draft protocol. All authors helped editing the draft protocol, read and approved the final manuscript.

Competing interests

LP, MK, LR, JT, SS & NB have no support from any organisation for the submitted work, no financial relationships with any organizations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

GHA, VV have support from Cancer Care Ontario and Canadian Cancer Society Research Institute for the submitted work; GHA, VV have no financial relationships with any organizations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

Data sharing statement

Unpublished study data such as the search strategies for the other databases (EMBASE, CINAHL, PsycINFO, SSA) are available upon request to the corresponding author.

Copyright statement

Provenance and peer review

Not commissioned; internally peer reviewed.

Ethics declaration

Ethics approval not required for this study

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Benefits and barriers to participation in colorectal cancer screening: A protocol for a systematic review and synthesis of qualitative studies

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ABSTRACT:

Introduction

: Colorectal cancer (CRC) poses a serious health problem worldwide. While screening for CRC is effective in reducing CRC mortality from the disease, participation in screening tests is generally suboptimal and male, ethnic minorities and low socio-economic individualssocial inequities in participation are frequently reported to have lower participation. A better understanding of the causes of lower participation in screening needs to be addressed.. The goal of this studyreview is to synthesize factors better expressed in qualitative studies that influence individuals' decisions to participate in CRC screening, and to explore how those factors vary by sex, ethnicity and socio-economic status (SES).

Methods and analysis

The Meta-study methodology will be used to conduct this review. The bibliography search will include aData sources: A primary search of CINAHL, MEDLINE, EMBASE, PsycINFO, and a secondary search of grey literature and articles taken from the references of included articles (from inception to July 2013).

Design: A systematic review and theses databases. Studies addressingMeta-study synthesis of qualitative studies that address perceived benefits and barriers to participation in CRC screening tests among adults 50 years of age or older who are eligible for CRC screening.

Review methods: The two-staged Meta-study methodology by Paterson will be used to conduct this review. In stage 1, similarities/differences, patterns and themes will be included. Studies investigating persons previously diagnosed with CRC or at a high risk for the disease will be excluded. Level 1 screening will consist of two investigators independently reviewing titles and

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abstractsidentified across three levels of potentially relevant articles in duplicate. Similar to level 1 screening, level 2 screening will consistanalysis while preserving the context of two investigators reviewing full text articles in duplicate.original studies. In stage 2, synthesis will extend beyond the analysis to generate new theory of the phenomenon through a process called Meta-synthesis.

Discussion and dissemination

The proposed synthesis: This review offers to generate a framework through an in-depth analysis of qualitative studies to better understand the benefits and barriers that affect decision-making to participate in CRC screening among different sectors of the population. This framework will be a relevant tool for policy makers in framing educational materials, for patient-centered communication, and for researchers interested in the science of equity.

Registration details: this review is registered in PROSPERO (registration number: CRD42013005025)

Article Summary

Strengths and limitations

- This will be the first synthesis of this studyqualitative studies to investigate why individuals undergo colorectal cancer (CRC) screening, their perceptions of and experiences with CRC screening, and which aspects of screening are valued and culturally acceptable
- The work will advance the science of conducting Meta-study approach proposed in this review will provide a broader interpretation of reviews by rigorously executing its steps in the context of our research question and to document this process extensively in our final report

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- The work will advance the science of equity by identifying the determinants of social inequities in CRC screening ~~test~~ participation ~~while preserving the context of the original studies. At the analysis level, this approach allows for the examination of how the research methods and procedures in primary studies were~~
- Findings from this Meta-study will be used to generate ~~and interpret data and shape the findings.~~ a framework to better understand the perceived benefits and barriers that affect individual decision-making of CRC screening

~~The quality of included studies will be assessed using the CASP tool for qualitative studies (Critical Appraisal Skills Programme), which includes 10 item checklist to assess the clarity of research aims, appropriateness of methodology and recruitment strategy, data collection, ethical considerations including the relationship between researcher and participants, the rigor of analysis, clear statement of findings, and the value of the research.~~

~~Despite the use of a validated search strategy, we may not capture all relevant literature related to our topic.~~

- ~~Our findings~~Findings may be limited to individuals from different ethnic minorities living in developed countries, which ~~represents a potential bias and~~may limit the ~~generalisability~~transferability of our findings to the overall ethnic population~~.~~

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This review is registered in PROSPERO (registration number: CRD42013005025)

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INTRODUCTION:

Colorectal cancer (CRC) poses a serious health problem worldwide. CRC is the second most common cause of cancer death in United States (US) ~~(1)~~(1), Canada ~~(2)~~(2), United Kingdom (UK) ~~(3, 4)~~(3, 4), Germany ~~(5)~~(5), Australia ~~(6)~~(6) and Japan ~~(7)~~(7). It is estimated that by 2013, 142,820 new CRC cases and 50,830 CRC deaths will occur in the US ~~(1)~~(1) and 23,900 new CRC cases and 9,200 CRC deaths will occur in Canada ~~(2)~~(2).

Screening for CRC can reduce the burden of the disease. Screening tests for CRC include fecal occult blood testing (guaiac FOBT) and fecal immunochemical test (FIT), flexible sigmoidoscopy, colonoscopy, computed tomographic colonography (CTC), and fecal DNA testing. Several of these tests are effective in reducing the incidence of, and in some instances, the mortality from the disease. Three landmark randomized controlled trials (RCTs) demonstrated that biennial use of guaiac FOBT coupled with colonoscopy in persons who tested positive was associated with a reduction in colorectal cancer (CRC) mortality of 15% ~~(8-10)~~(8-10).

Screening for CRC is a complex process and many publicly funded health care systems have implemented ~~-~~an organized, population-based ~~-~~approach for screening such as in the UK ~~(11)~~(11), most provinces in Canada ~~(12)~~(12), 19 out of the 27 of the European Union (EU) countries ~~(13)~~(13), Japan ~~(14)~~(14), and Korea ~~(15).~~(15). Population-based organized screening programs involve inviting a defined population at average risk for the disease (i.e. people who do not have CRC, or strong family history of CRC, or medical conditions that put them at higher risk of developing CRC ~~-~~such as Crohn's disease or ulcerative colitis) to attend screening. The success of a high-quality organized, population-based CRC screening program depends on adequate uptake as well as social equity in uptake ~~(16)~~(16). Early evaluation indicates an overall low participation and social inequity in participation. Participation in CRC screening tends

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to be lower among ethnic minorities ~~(11, 17-19)~~(11, 17-19), low socioeconomic status individuals ~~(11, 20-22)~~(11, 20-22), and among men ~~(20, 22-24)~~(20, 22-24). ~~A better~~

While social inequities in uptake are well described in the literature (25, 26) , what is missing, is a clear understanding of ~~the causes~~why CRC screening is or is not appealing to individuals, aspects of screening that are valued and those that are culturally acceptable. Qualitative studies are important sources for this information. To date, a wide range of qualitative studies have elicited views on the ~~overall low~~perceived benefits and barriers to participation ~~and~~ in screening from a range of ethnic and socioeconomic groups in various countries. The in-depth analyses in these studies reveal the ~~inequities in participation needs to be identified and addressed.~~

~~Qualitative~~complexity of social factors that affect individuals' decision to participate in screening. For example, studies have shown that difficulties in doing screening tests at home (i.e. FOBT) and the perceived need for screening while having no symptoms of colorectal disease are the main barriers for participation across different population groups~~(25, 26).~~(27, 28). In certain cultures, men perceive colonoscopy as embarrassing, invasive, and an affront to their masculinity ~~(22-24, 27-35).~~(22-24, 29-37). Women, in general, believe that their experience with other cancer screening tests such as mammography encourages them to do CRC screening ~~(36)~~(38), and because they often assume the role of caregiver in a family, they value the importance of self-care and early detection in order to prevent personal and family suffering ~~(22).~~(22). Less education, consistently equated with poorer health literacy skills, is often cited as the main barrier for CRC screening among low SES individuals. Poor health literacy is associated with reduced ability to 'obtain, process and understand health information' ~~(22)~~(22), and the likelihood of engaging in preventive health behaviors such as CRC screening ~~(37-39).~~(39-41). Other reported factors influencing participation in CRC screening among certain ethnic populations include ~~a fatalistic view of the disease (12, 9,17), the sanctity of the body, the inappropriateness of being seen naked in public (17, 28),~~ maintaining a positive energy (qi) and

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spirit (jing shen), as well as the belief that moderation of exercise and diet were enough to control the 'toxins' and prevent CRC ~~(19)~~(19).

~~While previous systematic~~Systematic reviews of quantitative studies have focused on investigating the efficacy of CRC screening tests ~~(40, 41),~~(42, 43), the determinants of CRC screening participation ~~(42, 43),~~(25, 26), and the effectiveness of interventions to increase screening participation ~~(43-45),~~(26, 44, 45). However, no ~~previous review~~ synthesis of qualitative studies ~~have reported on issues such as~~ exists to investigate *why* individuals undergo CRC screening ~~is~~ or ~~is~~ not ~~appealing to individuals,~~ , their perceptions of and experiences with CRC screening, and which aspects of screening ~~that~~ are valued and ~~those that are~~ culturally acceptable. A well-designed synthesis ~~review of the literature, based on a comprehensive method for searching and locating~~of qualitative studies~~, a rigorous approach for assessing quality of studies and a transparent method for synthesizing studies,~~ is needed ~~for~~to achieve a greater conceptual understanding of the perceived barriers and benefits associated with participation in CRC screening. This understanding is a necessary step to direct intervention designs to raise overall participation, reduce inequities in participation and eventually reduce mortality from CRC.

The Meta-study approach, a commonly used method to synthesize qualitative studies, was the most suitable approach to answer our research question. We considered other methods such as a Realist review (which seeks to understand what works for whom, under what circumstances and why) and meta-ethnography (which aims to uncover a new theory to explain a range of findings) neither focuses on the experiences of people specifically nor considers the quality of included studies as part of the analysis.

The objectives of our study are to systematically review the literature for qualitative evidence that explores the factors that influence the decision of individuals aged 50 years or over at average risk for CRC to participate in CRC screening, and how those factors vary by

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sex, ethnicity and SES~~, and~~. Our secondary aim will be to generate a framework to better understand the perceived benefits and barriers that affect individual decision-making.

METHODS

Synthesis methodology

We will use the Meta-study methodology to conduct our review, which is a systematic analytic and synthesis research method pioneered by Paterson et al ~~(46)~~(46). We selected this methodology because it was the most suitable to answer our research question. ~~It~~Meta-study is a multi-faceted, ~~interpretive qualitative approach~~systematic knowledge synthesis method aimed at better understanding how people construct knowledge ~~(47)~~(47)~~. In the context of our study, this is related to better understanding the determinants of CRC screening test participation. The proposed flow of our Meta-study methods is represented in Figure 1.~~

. In the context of our study, this is related to better understanding the determinants of CRC screening test participation. More specifically, it is an interpretive qualitative research approach in the constructivist paradigm (i.e., the role of the investigator is to understand how people construct knowledge about the phenomenon under study) (48). The aims of Meta-study are to "analyze" and "synthesize" what has been reported in the literature – these are considered distinct. *Analysis* involves identifying commonalities, differences, patterns, and themes in a body of qualitative research (i.e., what is typically done in a qualitative systematic review). *Synthesis* extends beyond analysis to identify "truths" about the phenomenon under study, by considering how the primary researchers interpreted the data (i.e., Meta-data), the design and quality of studies (Meta-method), and the theoretical frameworks or perspectives used in these research reports (Meta-theory). To answer our research questions, we need to go beyond the "analysis" of existing literature, as CRC screening is complex and currently, it is unknown why people do or do not undergo CRC screening. We hypothesize that there may be underlying factors

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involved in individuals' perceptions and experiences well beyond CRC as a disease itself that influences their decision to undergo diagnostic testing (e.g., cultural beliefs). Meta-study will allow us to extend beyond the typical "analysis" phase because it considers the triangulation of the raw data (meta-data) and its quality (meta-method) as well as the theoretical underpinnings of this data (meta-theory). This level of "synthesis" called "Meta-synthesis" will lead to a new understanding of CRC and screening decisions (e.g., colonoscopy) beyond what would be discovered in a qualitative systematic review (which tends to focus entirely on the primary research findings).

The proposed flow of our Meta-study methods is represented in Figure 1. Our Meta-study will be guided by the reporting standards as outlined in the ENTREQ criteria (Enhancing Transparency in Reporting the Synthesis of Qualitative Research) ~~(48)~~(49). This is a 21-item checklist grouped into 5 main domains: introduction, methods and methodology, literature search and selection, appraisal, and synthesis of findings. The protocol has been registered in the PROSPERO database (registration number: CRD42013005025, available at www.crd.york.ac.uk/PROSPERO)

Eligibility criteria

We developed our eligibility criteria from our research questions. The review will use the following PICOS (Population, Intervention, Context, Outcomes, and Study design) elements: *1) Population*: Adults aged 50 years or over referred for colorectal cancer (CRC) screening; exclusion criteria are studies investigating participants previously diagnosed with CRC; a hereditary, personal or family history of CRC (e.g., Familial Adenomatous Polyposis [AFP] and hereditary non-polyposis colorectal cancer [HNPCC]); and a history of inflammatory bowel disease (e.g., ulcerative colitis and Crohn's disease). *2) Intervention:* We will identify all articles investigating perceptions of colorectal cancer screening as well as those investigating

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colorectal cancer as a disease ; *3) Context*: We will investigate any variations in perceptions by sex, ethnicity, SES, and other factors influencing CRC screening behavior; *4) Outcomes:* Perceptions related to CRC as a disease, causes of CRC, benefits and barriers to CRC screening, and any other contextual factors that motivate or influence people's decision to participate in CRC screening; *5) Study design*: We will include all qualitative studies and mixed-methods studies with a qualitative component. We will exclude experimental, observational, and any non-empirical studies (i.e., not based on observation or experience, opinion-driven or no hypothesis testing) such as editorials, letters, commentaries and narrative reviews.

Information sources

We will conduct a systematic search in the following electronic databases from inception to July 2013: MEDLINE, EMBASE, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO, and Social Science Abstracts (SSA). We will conduct a secondary search of the grey literature (unpublished) from sources such as Cancer Care Ontario and the National Health System Bowel Cancer Screening Programme. We will also search the reference lists of included articles and identify other articles through contact with experts in the field and linkages with our team members (e.g. Cancer Care Ontario). There will be no language restrictions in our searches. We anticipate completing the review by April 2014.

Search strategy

Literature searching will be conducted by an experienced information specialist. The search strategy for the main database (MEDLINE) will be peered reviewed by another experienced information specialist using the PRESS checklist (i.e. Peer Review of Electronic Search Strategies) ~~(49)~~(50). The resulting retrieval yield will be limited to qualitative studies and mixed methods with a qualitative component using the optimized search strategy filter for qualitative studies of selected databases: MEDLINE ~~(50)~~(51), EMBASE ~~(51)~~(52), PsycINFO ~~(52)~~(53), and CINAHL ~~(53)~~(54). The draft search strategy for MEDLINE is available in Appendix 2. For the other databases, the search strategies are available from the authors on request.

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Study selection

We will first perform a calibration exercise to ensure reliability of screening. Using the inclusion/exclusion criteria available in Appendix 1, two reviewers will independently screen a random sample of citations (25-50 citations) using our online Synthesi.SR Tool (proprietary online systematic review software developed for our Knowledge Synthesis Center at St. Michael's Hospital)~~(54)~~(55). We will calculate inter-rater agreement for study inclusion using percent agreement, and repeat our pilot screening exercise until we reach at least 90% agreement at which point investigators will independently review titles and abstracts of potentially relevant articles in duplicate (level 1 screening). For level 2 screening, we will follow a similar calibration exercise as described for level 1 screening to identify full-text articles. Conflicts will be resolved through research team consensus for both levels of screening.

Data collection process

Two reviewers will abstract data independently using a standardized data collection form. The form will first be pilot tested on a random sample of 5-10 included studies and modified accordingly. Data abstraction will begin only if agreement is at least 95% among the two abstractors. We will extract data on study characteristics (e.g., first author, citation) and qualitative study quality criteria according to the CASP tool (Critical Appraisal Skills Programme), which includes 10- item checklist to assess the clarity of research aims, appropriateness of methodology and recruitment strategy, data collection, ethical considerations including the relationship between researcher and participants, the rigor of analysis, clear statement of findings, and the value of the research~~(55)~~(56). All data abstraction will be conducted using our online Synthesi.SR Tool, which provides a platform to resolve conflicts between reviewers directly in the system. Discrepancies will be reviewed and resolved by

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discussion amongst the team. The reporting of our review will be guided by the ENTREQ criteria (Enhancing Transparency in reporting the synthesis of qualitative research)~~(48)~~(49)

Data synthesis

We will perform a two-staged ~~analysis and~~ synthesis ~~process~~of the data (i.e., *Analysis and Synthesis*) with the goal of creating a new interpretation of the phenomenon under investigation~~. In stage~~ (i.e., a new understanding of CRC and screening decisions). Please see Figure 1~~.~~.

Stage 1 (Analysis of data = Meta-data + Meta-method + Meta-theory): We will identify the similarities~~/~~ and differences, patterns and themes ~~will be identified~~ across three levels of analysis ~~(46, 47, 56):~~

(46, 47, 57): Level 1 - Meta-data analysis: This will involve the interpretive analysis of research findings from primary studies to identify similarities and discrepancies among them using any one of several qualitative data analytic approaches (e.g., line of argument; grounded theory; thematic analysis). The type of analysis method we select will be driven by the data that will emerge. In the context of our work, we anticipate that this will likely involve using thematic analysis to group themes (such as the benefits and barriers to CRC screening) according to sex, SES or other factors that emerge, and then noting the similarities and differences between them.

Level 2 – Meta-method: This level of analysis will examine how the research methods and procedures in primary studies were used to generate and interpret data and shape the findings. It ~~includes~~will include a process of appraising each included study according to the CASP tool for quality assessment of qualitative studies ~~(55)~~(56). A third reviewer will be available to settle discrepancies between reviewers for applying the CASP criteria.

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Level 3 – Meta-theory: This level of analysis examines the theories that underpin study authors' framing of their research questions, their criteria for inclusion, and their conceptual framework for interpretation. It is the level at which the theoretical perspectives in qualitative reports can be interrogated to explain the phenomenon under study. ~~This level of analysis~~We will ~~be used~~ review each report to identify the theoretical ~~perspectives or~~perspective used and the "schools of thought" around CRC screening, and to determine how context may influence such perspectives.

Stage 2 (synthesis of data = Meta-synthesis): In stage 2, synthesis will extend beyond the three levels of analysis to generate new and expanded theory of the phenomenon through a process called *Meta-synthesis*. In contrast to the 3-level analytic stage, Meta-synthesis is "a creative, dynamic, and interactive process that defies codification" ~~(46)~~(46). It involves interpreting the influence of method and theory variation in the findings to produce a new understanding of the phenomenon. For example, we will determine these influences by documenting how each study performs their data analysis (e.g., thematic analysis of semi-structured interviews = Meta-data analysis); whether they used a theoretical framework to drive their study (e.g., the Health Belief Model = Meta-theory); and to determine the study quality (e.g., the CASP criteria = Meta-method). Once we collect this data from all studies, we will be able to triangulate this data from individual studies to reveal a new, collective understanding of CRC screening participation. This interpretation will be documented during data extractions. To reduce the potential of bias introduced from such an interpretive process, two investigators will independently perform this interpretation, which will be discussed and finalized with input of the entire research team. We will use findings informed by the 3-level analysis to develop a framework that shows the perceived benefits and barriers of CRC screening participation according to sex, SES, cultural beliefs, and other factors that may emerge.

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Discussion and dissemination

~~The proposed review offers to generate a framework through an~~ We will use findings from our in-depth analysis of qualitative studies to generate a framework to better understand the benefits and barriers that affect decision-making to participate in CRC screening among different sectors of the population. ~~This~~We anticipate that this framework will be ~~a~~ relevant ~~tool to~~for a wide range of knowledge users~~.~~: Policy makers ~~can~~ will be able to use ~~it~~the framework as a tool ~~while framing~~to frame educational materials~~. Physicians~~ to address barriers to CRC screening; and physicians may use it as a tool in patient-centered communication or in group education sessions in order to engage culturally ~~homogeneous~~heterogeneous population into a discussion on CRC screening. This review also offers advancement in the science of equity by identifying the determinants of social inequities in CRC screening participation. Using the anticipated framework, researchers may also design novel interventions to address those inequities, ~~leading~~which may lead to improved quality in practice and advancement in evidence-based decision-making. Furthermore, synthesis of available qualitative evidence of barriers to participation in CRC screening currently does not exist. Therefore, our findings may trigger other systematic reviews of gaps in information that we may identify. We will also advance the knowledge of conducting Meta-study reviews by rigorously executing its steps in the context of our research question and to document this process extensively in our final report.

Our study may also have some limitations. As with any qualitative studies, our work may be susceptible to threats to internal validity (i.e., credibility), external validity (i.e., transferability) and reliability (dependability) [57]. We will address potential threats to credibility by pilot testing the data abstraction forms and involving group team discussions throughout the interpretation of findings. The knowledge produced in our review may not be transferable to other people or settings. For example, findings may be limited to individuals from different ethnic minorities

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living in developed countries, which may limit the transferability of our findings to the overall ethnic population. However, we will abstract a detailed account of the population and setting of each included qualitative study to maximize the potential for transferability of our findings. To limit the potential of biases that may be introduced by investigators with respect to the dependability and confirmability of our work, we will standardize procedures, methods, and analysis strategies across all aspects of the review process.

We will ensure broad dissemination of this synthesis review to include publication in open access journals as well as conference presentations. We ~~may~~will also plan to hold a meeting with our key stakeholders (i.e. clinicians, researchers, people with CRC, and decision-makers) to discuss the findings ~~and~~, to generate key messages most relevant to each, and to discuss the next steps including the development of educational materials that will address gaps in CRC screening participation.

Contributorship statement

Contributors: GHA and NB helped conceive the study, GHA, NB, MK and VV conceived the study design. GHA and MK helped draft the protocol. LP developed and executed the search strategy and edited the draft protocol. All authors helped editing the draft protocol, read and approved the final manuscript.

Ethics declaration

Ethics approval not required for this study

Funding

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Competing interests

LP, MK, LR, JT, SS & NB have no support from any organisation for the submitted work, no financial relationships with any organizations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

GHA, VV have support from Cancer Care Ontario and Canadian Cancer Society Research Institute for the submitted work; GHA, VV have no financial relationships with any organizations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

Provenance and peer review

Not commissioned; internally peer reviewed.

Data sharing statement

Unpublished study data such as the search strategies for the other databases (EMBASE, CINAHL, PsycINFO, SSA) are available upon request to the corresponding author.

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Data sharing statement

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Additional data on the assessment of quality of included papers are available from gladys.honein@mail.utoronto.ca

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Figure 1: Flow of proposed Meta-study methods

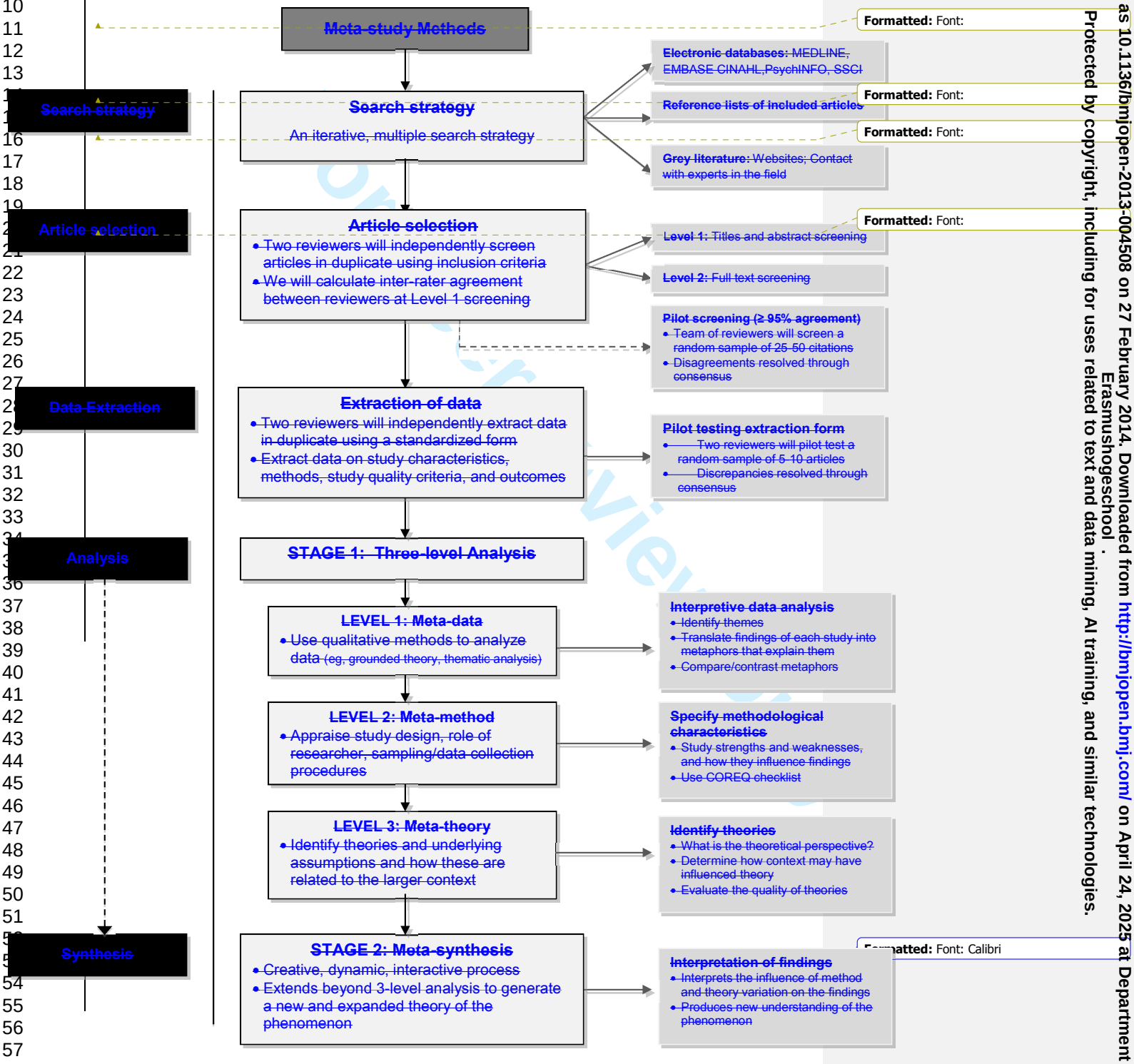

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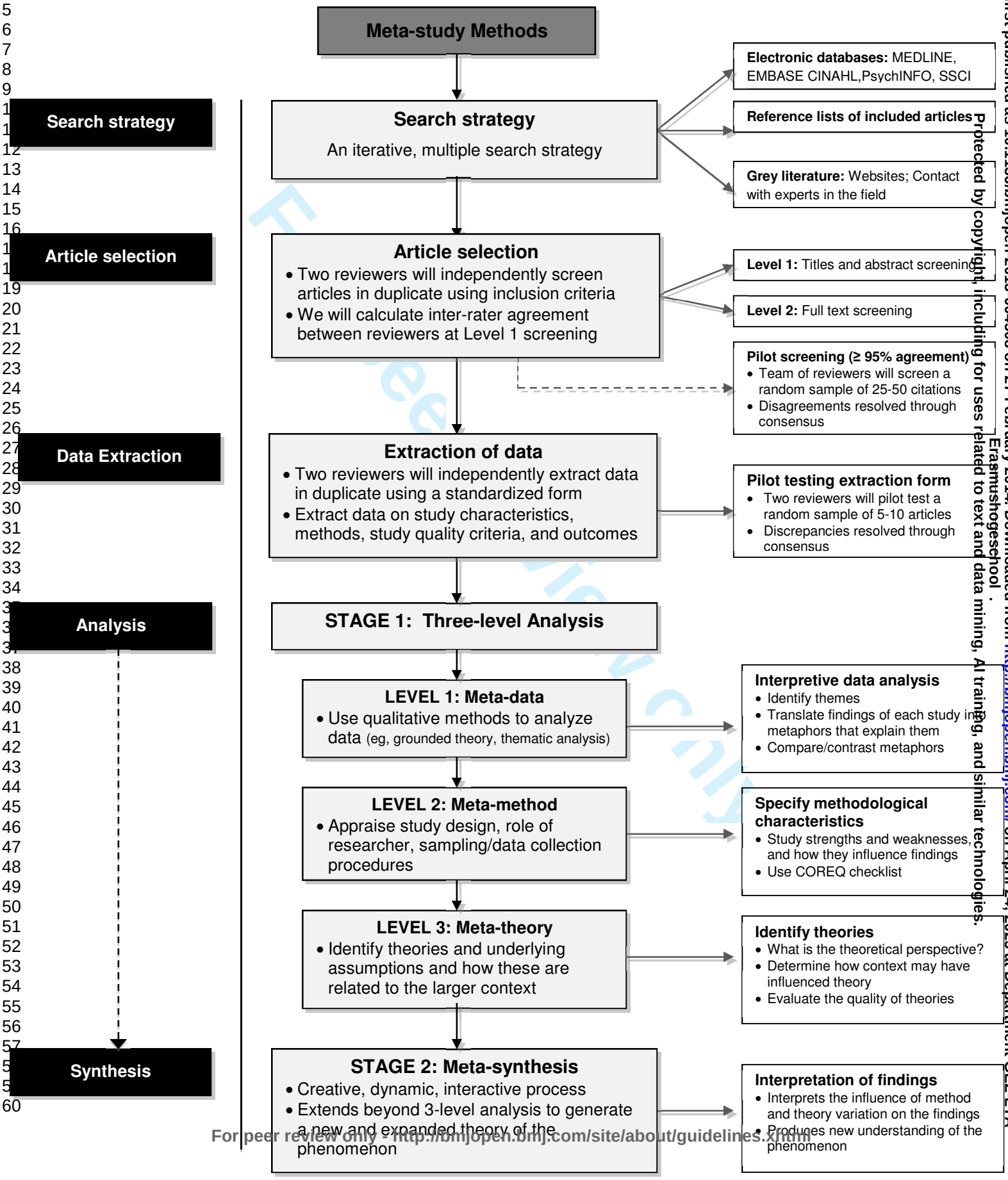
Figure 1: Flow of proposed Meta-study methods



Appendix 1

Draft eligibility criteria

Level 1 screening (title and abstract review):

1. Is this study about colorectal cancer (CRC), CRC screening or both? YES/NO/UNCLEAR (YES = either or both)
2. Is this a qualitative study? YES/NO/UNCLEAR (we will be over-inclusive: any qualitative methodology is in)

If you answer NO to any of these questions, the study will be excluded. All other citations will be included.

Level 2 screening (full-text review):

1. Is this study about colorectal cancer (CRC), CRC screening or both? YES/NO/UNCLEAR (YES = either or both)
2. Is this a qualitative study? YES/NO/UNCLEAR (we will be over-inclusive: any qualitative methodology is in)
3. Does the study report on any of the relevant outcomes?

If you answer NO to any of these questions, the study will be excluded. All other citations will be included.

Appendix 2

Draft MEDLINE search strategy

Database: Ovid MEDLINE(R), Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid OLDMEDLINE(R) <1946 to July 26, 2013>

Search Strategy:

---

1 exp Colorectal Neoplasms/

2 exp Colonic Neoplasms/

3 exp Rectal Neoplasms/

4 (anal adj cancer$).mp.

5 (anal adj carcinoma$).mp.

6 (anal adj adeno?carcinoma$).mp.

7 (anal adj neoplasm$).mp.

8 (anal adj tumo?r$).mp.

9 (anal adj lesion$).mp.

10 (anal adj adenom$).mp.

11 (anal adj sarcom$).mp.

12 (anal adj malignan$).mp.

13 (anus adj cancer$).mp.

14 (anus adj carcinoma$).mp.

15 (anus adj adeno?carcinoma$).mp.

16 (anus adj neoplasm$).mp.

17 (anus adj tumo?r$).mp.

18 (anus adj lesion$).mp.

19 (anus adj adenom$).mp.

20 (anus adj sarcom$).mp.

21 (anus adj malignan$).mp.

22 (bowel adj cancer$).mp.

23 (bowel adj carcinoma$).mp.

24 (bowel adj adeno?carcinoma$).mp.

25 (bowel adj neoplasm$).mp.

26 (bowel adj tumo?r$).mp.

27 (bowel adj lesion$).mp.

28 (bowel adj adenom$).mp.

29 (bowel adj sarcom$).mp.

30 (bowel adj malignan$).mp.

31 (colorectal adj cancer$).mp.

32 (colorectal adj carcinoma$).mp.

33 (colorectal adj adeno?carcinoma$).mp.

34 (colorectal adj neoplasm$).mp.

35 (colorectal adj tumo?r$).mp.

36 (colorectal adj lesion$).mp.

37 (colorectal adj adenom$).mp.

38 (colorectal adj sarcom$).mp.

39 (colorectal adj malignan$).mp.

40 (colon$ adj cancer$).mp.

41 (colon$ adj carcinoma$).mp.

42 (colon$ adj adeno?carcinoma$).mp.

43 (colon adj neoplasm$).mp.

44 (colon$ adj tumo?r$).mp.

45 (colon$ adj lesion$).mp.

46 (colon$ adj adenom$).mp.

47 (colon$ adj sarcom$).mp.

48 (colon$ adj malignan$).mp.

49 (rectal adj carcinoma$).mp.

50 (rectal adj cancer$).mp.

51 (rectal adj adeno?carcinoma$).mp.

52 (rectal adj neoplasm$).mp.

53 (rectal adj tumo?r$).mp.

54 (rectal adj lesion$).mp.

55 (rectal adj adenom$).mp.

56 (rectal adj sarcom$).mp.

57 (rectal adj malignan$).mp.

58 (rectum adj carcinoma$).mp.

59 (rectum adj cancer$).mp.

60 (rectum adj adeno?carcinoma$).mp.

61 (rectum adj neoplasm$).mp.

62 (rectum adj tumo?r$).mp.

63 (rectum adj lesion$).mp.

64 (rectum adj adenom$).mp.

65 (rectum adj sarcom$).mp.

66 (rectum adj malignan$).mp.

67 (sigmoid adj cancer$).mp.

68 (sigmoid adj adeno?carcinoma$).mp.

69 (sigmoid adj neoplasm$).mp.

70 (sigmoid adj tumo?r$).mp.

71 (sigmoid adj lesion$).mp.

72 (sigmoid adj adenom$).mp.

73 (sigmoid adj sarcom$).mp.

74 (sigmoid adj malignan$).mp.

75 or/1-74

76 Early Detection of Cancer/

77 exp Occult Blood/

78 exp Immunochemistry/

79 exp Endoscopy, Gastrointestinal/

80 exp Colonoscopy/

81 exp Sigmoidoscopy/

82 Colonography, Computed Tomographic/

83 (disease adj2 detect$).tw.

84 endoscop$.mp.

85 colonograph$.mp.

86 colonoscop$.mp.

87 sigmoidoscop$.mp.

88 rectosigmoidoscop$.mp.

89 proctosigmoidoscop$.mp.

90 COL.mp.

91 SIG.mp.

92 FSIG.mp.

93 (flex$ adj3 sig$).mp.

94 faecal.mp.

95 fecal.mp.

96 feces.mp.

97 faeces.mp.

98 gFOBT.mp.

99 FOBT.mp.

100 FOB.mp.

101 haemoccult.mp.

102 hemoccult.mp.

103 sensa.mp.

104 hemocare.mp.

105 (hema adj screen).mp.

106 hemofec.mp.

107 fecatest.mp.

108 fecatwin.mp.

109 coloscreen.mp.

110 seracult.mp.

111 colocare.mp.

112 flexsure.mp.

113 immocare.mp.

114 hemochaser.mp.

115 hemeselect.mp.

116 immudia.mp.

117 monohaem.mp.

118 insure.mp.

119 hemodia.mp.

120 immocare.mp.

121 magstream.mp.

122 guaiac.mp.

123 (occult adj blood).mp.

124 (stool adj3 occult).mp.

125 (immunochemical$ adj3 test$).mp.

126 (immunochemical$ adj3 screen$).mp.

127 (immunochemical$ adj3 diagn$).mp.

128 (immunologic$ adj3 test$).mp.

129 (immunologic$ adj3 screen$).mp.

130 (immunologic$ adj3 diagn$).mp.

131 EIA.mp.

132 RPHA.mp.

133 exp Mass Screening/

134 exp Population Surveillance/

135 surveillance.mp.

136 (early adj3 detect$).mp.

137 (early adj3 prevent$).mp.

138 screen$.mp.

139 or/76-138

140 interview$.mp. [qualitative search filter - validated]

141 experience$.mp.

142 qualitative.tw.

143 or/140-142

144 75 and 139 and 143

145 exp Animals/ not (exp Animals/ and Humans/)

146 144 not 145

Enhancing transparency in reporting the synthesis of qualitative research: the ENTREQ statement

No	Item	Guide and description
1	Aim	To systematically review the literature for qualitative evidence that explores the factors that influence the decision of individuals aged 50 years or over at average risk for Colorectal cancer (CRC) to participate in CRC screening, how those factors vary by sex, ethnicity and SES, and to generate a framework to better understand the perceived benefits and barriers that affect individual decision-making
2	Synthesis methodology	Meta-study approach
3	Approach to searching	Preplanned comprehensive search strategies will be used to seek all available studies
4	Inclusion criteria	Qualitative research methods (data collection and analysis) Population: Adults aged 50 years or over referred for colorectal cancer (CRC) screening. Topic: to better understand the benefits and barriers that affect decision-making to participate in CRC screening among different sectors of the population. No language or year limits
5	Data sources	MEDLINE, EMBASE, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO, and Social Science Abstracts (SSA), Grey literature databases included Cancer Care Ontario and the National Health System Bowel Cancer Screening Programme. We will also search the reference lists of included articles and identify other articles through contact with experts in the field and linkages with our team members (e.g. Cancer Care Ontario).
6	Electronic Search strategy	Literature search terms are described in detail in Appendix 2
7	Study screening methods	The titles and abstracts of retrieved citations will be scanned by two reviewers (GHA, VV). Full papers will be ordered for all potentially relevant abstracts. Full papers will be reviewed by two researchers (GHA, VV) and will be included if they meet our inclusion criteria
8	Study characteristics	Qualitative studies and mixed methods with a qualitative component will be included. The characteristics of the included studies are presented in Appendix 1.
9	Study selection results	We will exclude experimental, observational, and any non-empirical studies (i.e. not based on observation or experience, opinion-driven or no hypothesis testing) such as editorials, letters, commentaries and narrative reviews as well as those that do not focus on CRC, CRC screening or both. The characteristics of the excluded studies are described in Appendix 1
10	Rationale for appraisal	We will appraise the quality of included studies including clarity of research aims, appropriateness of methodology, rigor of analysis and value of study
11	Appraisal items	The CASP tool will be used to appraise all included studies
12	Appraisal process	Two reviewers (GHA, MK) will abstract data independently using a standardized data collection form. Data abstraction will begin only if agreement is at least 95% among the two abstractors. Discrepancies will be reviewed and resolved by discussion amongst the team.
13	Appraisal results	All appraisal results will be conducted using our online Synthesi.SR Tool, which provides a platform to resolve conflicts between reviewers directly in the system and will be available for review if required.
14	Data extraction	We will use a standardized data collection form. We will pilot test the form on a random sample of 5-10 included studies and will modify it accordingly. The form includes information on the study details, study methods and quality, outcomes and results. All text under outcomes and results will be considered data from the primary studies. This data collection form will be stored in an excel sheet software in order to facilitate data management.
15	Software	Synthesi.SR /Microsoft excel
16	Number of reviewers	Three reviewers – GHA, MK, VV

17	Coding	The meta-study approach described by Paterson.
18	Study comparison	Similarities/differences, patterns and themes will be identified across three levels of analysis: Meta data analysis which will involve using thematic analysis to group themes Meta method which will examine how the research methods and procedures in primary studies were used to generate and interpret data and shape the findings. Meta theory which will identify the theoretical perspectives or "schools of thought" around CRC screening, and to determine how context may influence such perspectives.
19	Derivation of themes	Themes were derived initially as key concepts representing the entire dataset. The contribution of each paper to each key concept was determined and the meaning of the key concept modified accordingly.
20	Quotations	Quotations from the primary studies will be provided in the results section.
21	Synthesis output	The Meta-synthesis will generate new and expanded theory of the phenomenon, which will aid to develop a framework that shows the perceived benefits and barriers of CRC screening participation according to sex, SES, cultural beliefs, and other factors that may emerge.