


BMJ Open Social media and mobile health technology for cancer screening: a systematic review and meta-analysis protocol

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ABSTRACT

Introduction Cancer is one of the leading causes of death globally and many jurisdictions have developed population-based cancer screening programmes to reduce the public health burden of disease. However, screening participation remains suboptimal. Social media and other mobile health (mHealth) technologies are increasingly being used for health promotion and behaviour change. This paper reports on the protocol for a systematic review exploring the effect of social media and other mHealth interventions on cancer screening participation and intention.

Methods and analysis This protocol is reported in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) checklist. We will include any randomised controlled trials or quasi-experimental studies with a pre/post design conducted in adults ≥18 years of age that report on the effectiveness of a social media or mHealth intervention on screening participation or intention (inclusive of breast, cervical, colorectal, prostate and lung cancer). Interventions will be inclusive of those delivered online or through a computer using an established social media platform or a new purpose-built platform, or those delivered through cellphones or other wireless technologies. Any comparator will be acceptable (control group, alternate intervention or pre/post design). We will search Medline, EMBASE, PsycINFO, Scopus, CINAHL, the Cochrane Central Register of Controlled Trials, and Communication and Mass Media Complete from 1 January 2000 to 31 May 2019. Two independent reviewers will screen titles, abstracts and full-text articles with conflicts resolved through discussion or by a third reviewer, as needed. The two reviewers will also independently complete risk of bias assessments for each included study. We will report on the characteristics of the studies, participants and interventions in descriptive narrative form and report the absolute and relative differences in screening and intention attributable to social media and mobile technology interventions.

Ethics and dissemination As this is a systematic review, ethical approval for conduct of this study is not required. We will pursue publication of study results in a relevant peer-reviewed journal and report our findings according to the PRISMA checklist.

Trial registration number CRD42019139615.

Strengths and limitations of this study

- No previous systematic reviews addressing the effectiveness of both social media and mobile health (mHealth) technology interventions on cancer screening participation and intention inclusive of breast, cervical, colorectal, lung and prostate cancer exist.
- The review will undertake a rigorous selection process with screening of articles and risk of bias assessment for each study to be conducted by two independent reviewers and mediated by a third reviewer if necessary.
- The review will be limited to the English language, which may result in exclusions of potentially relevant studies published in other languages.
- This will be the most comprehensive and up-to-date systematic review as it relates to social media and mHealth interventions for cancer screening participation and intention.

INTRODUCTION

Cancer is one of the leading causes of death globally. Almost 19 million people will be diagnosed with cancer in 2020.¹ Cancer screening has been shown to reduce disease-specific mortality and is an important step in reducing the public health burden of the disease.²⁻³ As a result, many jurisdictions have implemented population-based cancer screening programmes.⁴⁻⁶ However, despite the infrastructure and availability of organised screening programmes, screening participation for many cancers remains below established targets. For example, screening participation for colorectal cancer with stool testing in many Canadian provinces remains lower than the national target of 60%.⁷⁻⁹ A review of colorectal cancer screening programmes worldwide found that participation rates for first round screening ranged from 16% to 47% for guaiac faecal occult

blood testing (FOBT) and from 17% to 77% for faecal immunochemical test (FIT).⁵

Many factors can influence screening participation including best-practice guidelines, physician reimbursement models, screening modalities available, physician recommendation for screening, the infrastructure and design of the screening programme itself, and participant-level factors.^{10–13} Interventions designed to increase screening participation are generally expensive, challenging to implement and have limited impact.^{14–16}

The popularity of social media and the use of mobile health (mHealth) technologies have increased dramatically over the last decade.¹⁷ The WHO defines mHealth as the use of mobile or wireless devices for medical and public health practice while social media allows those with information and communication technology access to become content creators, changing communication to a dialogue rather than a monologue.¹⁷ This includes sharing of information and ideas, messages and even potentially collaborating with others in real time among various platforms.

Use of social media and mHealth may constitute better, innovative ways to reach out to screen-eligible individuals while potentially being less expensive and easier to implement. These tools may also provide the opportunity to address health problems in many developing nations as access to mobile phones and devices has increased internationally with similar access reported in these nations compared with those in developed countries.¹⁷ Benefits of social media for health communication include increased interactions with others, more available, shared and tailored information, and increased accessibility to health information.¹⁸ Healthcare organisations may also use social media to seek feedback on services, make emergency or general health announcements, or to launch health promotion campaigns among other things.¹⁷

Therefore, a better understanding of how these technologies may be leveraged for cancer screening is needed. Recent studies have explored the use of social media for health promotion and behaviour change.^{19–25} A recent systematic review on health behaviour change interventions that use online social networks found that of the 10 studies included in the review, four showed significant improvements in some aspect of health behaviour change (weight loss, physical activity or dietary awareness).²¹ Systematic reviews specifically reporting on cancer screening have been limited to only one type of intervention (eg, text messaging)²⁶ or only to one particular cancer.²⁷ No systematic review exists to our knowledge comparing the effectiveness of both social media and mHealth interventions on cancer screening participation or intention.

The objective of our systematic review is to explore the effect of social media and other mHealth interventions on cancer screening participation and intention.

METHODS AND ANALYSIS

Study design and registration

This systematic review protocol was written and reported according to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) checklist.²⁸

Patient and public involvement

Patient and public involvement in the design, conduct or reporting of this study was not possible in this case. We will present the results of our study at relevant conferences and pursue publication in a relevant journal to disseminate findings to patients and relevant communities.

Eligibility criteria

Eligibility criteria will include any experimental study (randomised controlled trial or quasi-experimental with pre/post design) reporting on the effectiveness of a social media or mHealth intervention on cancer screening participation and/or intention. Cancer will be inclusive of breast, cervical, colorectal, prostate and lung cancer for which guidelines for screening are in place. Social media interventions will include any intervention delivered online or through a computer using an established social media platform (eg, Facebook, Twitter) or a new purpose-built platform. This will be inclusive of websites and applications that allow users to create profiles and share content with other users (virtual communities/networks).¹⁹ Mobile technology-based interventions will include those that deliver some type of health-related information via telecommunication (eg, smartphones) or other wireless technologies (eg, tablets, handheld devices).¹⁹ Any comparator will be acceptable (control group, alternate intervention or pre/post design). We anticipate interventions to fall into one of these categories based on the nature of the intervention: (1) reminders; (2) education/awareness; (3) navigation/counselling; (4) peer support; (5) decision aids; (6) mixed. We have kept the definition of our intervention broad in order to take a conservative approach and capture all potentially relevant articles. Many interventions can be single or multi-component. Interventions with multiple components will be included in the review if at least one component of the intervention involves a social media-based or other mHealth-based strategy. We will include studies conducted in adults who are ≥ 18 years of age regardless of health status and will limit our search to published articles in the English language only. If we are not able to find the full text of potentially relevant articles, we will contact the study authors. Commentaries, editorials and letters will be excluded.

Information sources

A senior information specialist (TK) will draft the initial search strategy and conduct the search on the following databases: Medline, EMBASE, PsycINFO, Scopus, CINAHL, the Cochrane Central Register of Controlled Trials, and Communication and Mass Media Complete

from 1 January 2000 to 31 May 2019 as use of social media and mHealth technologies was not widespread before this time.¹⁹ Other systematic reviews focusing on social media or mHealth have also used similar cut-offs as the beginning date of their reviews.^{18 21} Moreover, many of the well-known social media platforms were launched after this time including Facebook (2004), Twitter (2006), LinkedIn (2003) and Instagram (2010),

Search strategy

We will use a combination of text words and MeSH terms depending on the database to capture the following concepts: cancer, screening, and social media or other mHealth interventions. Search terms will include Early Detection of Cancer and Neoplasm, screening, as well as the names of specific screening tests for each of the cancers previously listed. To capture social media or other mHealth interventions, we will include several terms capturing specific social media platforms (Facebook, Twitter, Instagram, Snapchat etc) or interventions delivered through wireless technologies including through text messaging, telephone or cellphone, email, World Wide Web, telehealth or telemedicine. An example of the search strategy for the Medline database is included in online supplementary file 1. The search strategy will be peer reviewed by a second information specialist in accordance with the PRESS (Peer Review of Electronic Search Strategies) checklist.²⁹

Data management

We will use bibliographic (EndNote; Clarivate Analytics, Philadelphia, PA, USA) and systematic review software (DistillerSR; Evidence Partners, Ottawa, Canada) to manage identified records during the screening and study selection phase.

Study selection

Two independent reviewers (AR, FD) will use a piloted form to perform screening in three stages—title, abstract and full-text screen—to assess eligibility of each study for inclusion in the systematic review. To maximise sensitivity in the early stages of screening, any citation for which either reviewer suggests for inclusion at the title stage will be included. Any discrepancies between the two reviewers at the abstract or full-text stages will be resolved by discussion or a third investigator (NNB) if consensus is not reached.

Data extraction

We will use a piloted data collection form in Excel (V.15.0; Microsoft, Redmond, Washington, USA) to extract data from included studies. The two reviewers will perform data extraction independently with discrepancies resolved by discussion or a third reviewer. Information to be collected from each study includes study characteristics (authors, date of publication, location/country, funding, type of screening programme, study design), participant characteristics (sample size, age, sex, ethnicity), intervention details (components of the intervention, comparator or

control group intervention(s), follow-up/duration, technology platform and delivery of intervention by whom, and cost of intervention if available) and outcomes of interest (screening participation and/or intention including timeframe). We will contact study authors if data on outcomes are missing from the article.

Outcomes

Screening participation (primary outcome) will be defined as the proportion of screen-eligible adults who complete a relevant screening test depending on the particular cancer (eg, FOBT/FIT/colonoscopy/flexible sigmoidoscopy for colorectal cancer) including self-reported outcomes in addition to those confirmed through administrative records. Screening intention (secondary outcome) will be defined as per primary study authors. Typically, this is defined as the proportion of screen-eligible adults who intend to undergo screening within a certain timeframe (eg, within 3 months). As there is a strong association between intention and screening participation,^{30 31} intention is commonly used as a secondary outcome measure in cancer screening trials. For example, Sutton *et al*³² found that screening intention had a strong association with participation and that those who had intention to screen were more likely to attend screening. This finding remained significant even in the multivariate analysis (ORs 2.27 (1.78 to 2.91)).³²

Assessment of bias

The Cochrane Risk of Bias tool will be used to assess the quality of randomised controlled trials included in the review. For quasi-experimental studies using a pre/post design, we will use the Cochrane Effective Practice and Organisation of Care framework to assess bias.³³ The framework outlines seven domains for all interrupted time series which include the following: intervention independent of other changes; shape of the intervention effect pre-specified; intervention unlikely to affect data collection; knowledge of the allocated interventions adequately prevented during the study; incomplete outcome data reported adequately; selective outcome reporting; other risks of bias. Risk of bias assessment will be completed for each study by the two reviewers independently (AR, FD). Discrepancies will be resolved by discussion or a third investigator (NNB) if needed.

Data synthesis and analysis

We will report the study, participant and intervention characteristics in descriptive narrative form and in a table format as appropriate. We will also report the outcomes of interest in a table format and report absolute and relative screening and intention rates between the intervention and comparator/control group(s). We will report the results of the quality assessment of studies in table format. We will attempt to meta-analyse the data for each intervention to determine the average effect sizes. Prior to quantitative analysis, we will assess the degree of clinical heterogeneity between studies. If quantitative



synthesis is deemed appropriate, for each study, we will calculate the ORs comparing the intervention and comparator/control group(s). We will then pool ORs using the Mantel-Haenszel method in a random-effects meta-analysis to generate an overall summary effect. Randomised controlled trials and quasi-experimental studies will be pooled separately. We will graphically display these analyses using forest plots. Separate analyses will be performed for our primary and secondary outcomes. Depending on the number of studies included, we may perform subgroup analyses examining the effect of cancer disease site or by intervention category. In addition, we will conduct a subgroup analysis of solely social media or mHealth interventions, separate from multi-component interventions where social media or mHealth is just one aspect or where there is overlap between both social media and mHealth interventions. In addition, there may be the opportunity to stratify results for developed countries versus lower middle-income countries (LMICs). Statistical heterogeneity will be assessed with the I^2 statistic where a cut-off of $\geq 75\%$ will be defined as considerable heterogeneity. If studies with high risk of bias exist, we will conduct a sensitivity analysis excluding these studies in order to explore whether this materially and significantly changes our outcomes. If more than 10 studies are included in the primary meta-analysis, we will create a funnel plot to check for publication bias. A two-tailed p value < 0.05 will be considered statistically significant. Meta-analyses will be performed using Review Manager (RevMan) V.5.0 and the *Meta* and *Metafor* packages in R. We will report the results of the study in accordance with the PRISMA guidelines.³⁴

Confidence in cumulative evidence

Confidence in the cumulative evidence for the primary and secondary outcomes across all included studies will be assessed using the GRADE approach. This will be done independently by two reviewers (AR, FD). If there is a discrepancy, it will be resolved by discussion or a third reviewer as needed. The quality of evidence will be graded as high, moderate, low or very low, and the GRADEpro platform will be used to summarise the findings.

DISCUSSION

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The proposed systematic review will report on the effectiveness of social media and mHealth interventions on cancer screening participation and intention and will be inclusive of breast, cervical, colorectal, lung and prostate cancer. Reviews to date on this topic are commonly limited to one particular intervention or one particular cancer.^{26 27} For example, a recent systematic review published by Uy *et al*²⁶ reports on the effect of solely text messaging interventions for cancer screening participation. Our review will also include screening intention as a secondary outcome, making this one of the most comprehensive and up-to-date reviews on this topic summarising

the evidence on social media and mHealth interventions for cancer screening participation.

Depending on the included studies of this review, there may be an opportunity to explore the use of social media and mHealth in low-resource settings. This may be of particular interest as one of the benefits of using social media or mHealth includes broad reach with relatively low cost.²⁰ This may be especially beneficial for those in resource-poor settings as despite this limitation, we continue to see a rise in access to mobile phones and Internet use in many LMICs.^{17 35} However, it must also be acknowledged that there may be a shortage of providers and limited ability to screen and treat persons in these settings and that acceptance and social norms may influence screening. As such, it would be important to look at the nature of these interventions to compare and contrast with those implemented in developed countries where capacity to screen and treat may be different.

There is the possibility that our review will include studies with high risk of bias. To address this, we will conduct sensitivity analyses to explore whether our findings are materially changed when studies with a high risk of bias are excluded or when only randomised controlled trials are included. There is also the possibility that the studies included in our review may be quite heterogeneous. We will explore heterogeneity through pre-planned subgroup analyses. In the event that the data are too heterogeneous for quantitative synthesis, we will consider important sources of heterogeneity (eg, cancer type, intervention type) in our narrative review of the results. To mitigate any selection bias regarding the studies that get included in the review, we will use a rigorous selection process with two independent reviewers conducting the screening and a third reviewer for mediation of conflicts.

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Contributors All authors (AR, FD, JT, DL, TK, NNB) contributed substantially to the design and conception of the study. AR and NNB conceived the initial study and all authors (AR, FD, JT, DL, TK, NNB) contributed to the development of the study protocol and inclusion criteria. TK developed the search strategy with input from all other authors (AR, FD, JT, DL, NNB). All authors (AR, FD, JT, DL, TK, NNB) drafted the manuscript and revised it critically for important intellectual content, approved the final submission and agree to be held accountable for all aspects of the work.

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