

Barriers and facilitators to implementing a cancer risk assessment tool (QCancer) in primary care: a qualitative interview study

Joseph Akanuwe¹, Sharon Black², Sara Owen³, and Aloysius Siriwardena²

¹University of Lincoln - Brayford Campus

²University of Lincoln College of Social Sciences

³Waterford Institute of Technology, Ireland

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Abstract

Rationale, aims and objectives: QCancer is a cancer risk assessment tool that has been advocated for use in primary care to improve early detection and diagnosis of cancer, but little is known about the views of service users and practitioners on barriers and facilitators to implementing the tool in practice. We aimed to explore the perspectives of service users (adults without a current cancer) and primary care practitioners (GPs and practice nurses) about barriers and facilitators to using QCancer in primary care consultations. Methods: We used a qualitative design, conducting individual interviews and focus groups with a purposive sample of service users and practitioners. Interviews were recorded and transcribed verbatim. Data were analysed using the Framework approach facilitated by NVivo version 10. Results: We interviewed 36 participants (19 service users, 17 practitioners). Barriers to using the tool included: the need for additional consultation time; unnecessary worry generated for some patients; potential for over-referral; practitioner scepticism; potential conflict with existing guidelines; certain symptoms requiring referral at any risk; requirement for training on use of the tool; evidence of effectiveness; and the need to integrate the tool in general practice systems. Participants identified facilitators to use of the tool: supporting decision making; modifying health behaviours; improving speed of referral; and personalising care. Conclusion: The barriers and facilitators identified should be considered when seeking to implement QCancer in primary care. In particular, evidence is needed that the use of this tool improves diagnosis rates without an unacceptable increase in harm from unnecessary investigation.

1 INTRODUCTION

Primary care particularly in the UK plays an important role in the referral to and coordination of specialist care leading to early detection of risk and diagnosis of cancer. In spite of this important role played by primary care practitioners, the UK has one of the highest cancer mortality rates (particularly for women) in Europe.¹ This may be due to patients presenting late with symptoms, general practitioners (GPs) failing to recognise potential cancer symptoms during primary care consultations or delayed referral to specialist care.²⁻⁴

Cancer risk assessment tools designed for symptomatic individuals have been advocated for use in primary care to estimate an individual's risk of developing cancer based on their risk factors and symptoms, to enable earlier detection or diagnosis of the condition.^{5,6} Two cancer risk assessment tools designed for symptomatic patients presenting to primary care are currently being promoted in UK general practice: QCancer⁶ and the Risk Assessment Tool (RAT).⁵

QCancer has been independently validated^{7,8} and found to accurately predict risk of cancer in primary care. However, little is known about service users' and practitioners' views on this tool in terms of the perceived barriers and facilitators to the implementation of the tool. Our aim was to explore what service users

(adults without a cancer) and primary care practitioners (GPs and practice nurses) perceived as barriers and facilitators to the implementation of QCancer in primary care consultations.

2 METHODS

We used the same methodological approach for this study as in a recently published study,⁹ because both studies arose from one research project based on the same methodological approach.

We used semi-structured individual interviews and focus groups to collect qualitative data from participants in Lincolnshire in the East Midlands region of England. The School of Health and Social Care Ethics Committee at the University of Lincoln granted ethics approval for the study.

We recruited a convenience sample of service users (adults without active cancer) and primary care practitioners (GPs and nurses) who agreed to participate in the study. Cancer patients were not recruited because they were not likely to use the tool for a cancer which was already known, and we felt it was not worth the stress, even if some cancer patients had some information to offer.

The interview schedule seeking barriers and facilitators to use of the tool was informed by an implementation theoretical framework, the Consolidated Framework for Implementation Research [CFIR],¹⁰ which seeks to understand human and other factors involved in the deployment of innovations such as cancer risk assessment tools for symptomatic individuals. The data analysis and interpretation were also informed by relevant constructs within the CFIR¹⁰: relative advantage (for the facilitators); patient needs and resources, compatibility, knowledge and beliefs of individuals involved, and reflecting and monitoring the implementation process (for the barriers). This theoretical framework was selected because some of its constructs (those relating to barriers), helped to explain how the different barriers may make the implementation of the tool difficult, while other constructs of the framework (those relating to facilitators) also helped to explain how the different facilitators identified by participants may aid the implementation of the tool in patient consultations.

Some service users were recruited using flyers in local public places (e.g. the public library, advertisements on notice boards) while others were recruited through members of the patient and public involvement group who helped to identify and invite potential participants. Service users were offered individual interviews because these were considered more feasible for them than focus groups. Service users who were willing to participate in the interviews contacted the researcher (JNA) for more information and an appointment for individual face-to-face interviews. These interviews were subsequently conducted in the preferred place of interviewees – in their own homes or at the university.

Following invitation letters to practitioners through their general practices, interested practitioners contacted the researcher for more information and an appointment to meet the researcher (JNA) for either individual interviews or focus groups. Some practitioners were unable to find time to be interviewed individually, and were focus groups instead, enriching the data through participant interactions. Other willing practitioners were interviewed individually.

Before asking for the views of participants on the barriers and facilitators to the implementation of the tool in general practice consultations, a vignette of the QCancer tool was shown, explained, and demonstrated to participants where there was Internet access.

Prior to commencing the individual interviews and focus groups, participants gave a written consent by signing a consent form, and they were assured of their freedom to discontinue with at any point. All participants gave permission for audio-recording of the interviews and focus groups, and notes were taken to complement the audio recorded data.

After transcribing the data verbatim, the Framework approach¹¹ was used to analyse which was facilitated by NVivo version 10. A priori codes, which informed the interview guide, formed an initial coding framework, and further inductive codes were identified as analysis of the interview data progressed. Two investigators (JA, ANS) read the transcripts thoroughly and derived an initial coding framework which was discussed

and agreed by the research team. Through further interpretation and discussion, the initial themes were developed iteratively into a smaller number of overarching themes. There was no need for further collection of data from both service user and practitioner participants as the data analysis achieved saturation, which meant that no new codes or themes were generated.¹² The service user and practitioner data were analysed separately and then compared for similarities and differences.

3 RESULTS

Nineteen (19) service users (aged from 21 to 71 years) and seventeen (17) practitioners (aged from 33 to 55 years) were interviewed between September 2014 and September 2015. Two (2) service users had a previous diagnosis of cancer, and all the other service user participants had relatives or friends who had a previous diagnosis of cancer, which may have motivated them to participate in the study. Once they had agreed to take part, no participants dropped out of the study. The demographic characteristics of interviewees are shown in table 1.

[Insert Table 1 here]

The overarching themes identified barriers and facilitators to implementing the tool. The barriers were: the need for additional consultation time; unnecessary worry relating to cancer investigations; over-referral that could over-burden services; practitioner scepticism; conflict with existing guidelines; certain symptoms needing referral at any risk; the need to train practitioners on use of the tool; the need to establish effectiveness of the tool against existing practice before introducing it into practice; and the need to integrate the tool into general practice systems. These are discussed in more detail below.

3.1 Barriers to implementing QCancer

3.1.2 Additional consultation time

In line with the CFIR constructs of readiness for implementation and patient needs and resources, [9] service users and practitioners were concerned that general practices were already busy and that additional time would be needed for using a cancer risk assessment tool in patient consultations:

“Practitioners in general practice would need more time to use the tool in consultations” (Service User 7: individual interview).

“It’s more a question of more time really, because at the moment we’re in crisis, GPs are in crisis, and the future is very bleak for GPs. Because you come in at 5 [o’clock] in the morning and you get back home in the night and it’s a nightmare really. So we don’t want more work ” (Practitioner 11 [GP], focus group [FG] 1).

3.1.2 Unnecessary worry relating to cancer investigations

Unnecessary worry or anxiety could be generated by increased number of cancer investigations. This relates to the concept of ‘patient needs, and resources’ expressed within the CFIR.¹⁰ Indeed, service users and practitioners agreed that people might worry if it was not explained to them that the tool provided a risk assessment rather than a cancer diagnosis:

“Some people may not understand and they can be too worried especially if they don’t explain that it is just a risk but it is not guaranteed that they will get cancer, then it is not good enough ethically” (Service User 11, individual interview).

“The thing is if you tell the patient they’ve got 1% cancer, which is creating unnecessary anxiety, they will say doctor, you said I have got 1% chance of getting cancer and you are not doing anything about it” (Practitioner 2 [GP]: individual interview); *“you can probably make them more worried”* (Practitioner 16 [Practice Nurse]: FG 2).

3.1.3 Over-referral and over-burdening services

In relation to the CFIR construct of patient needs and resources,¹⁰ there were concerns from some participants that additional referrals could over-burden services:

“It could be useful if the right patients are referred but it could also lead to over-referral as some people may have a certain risk but will not have cancer after they have been referred and tested ” (Service User 17: individual interview).

“But on the other side it will put a strain on the NHS; you know what I mean, on the services there. You know, you don’t want to over burden the services as well” (Practitioner 4 [GP]: individual interview).

In contrast, other practitioners felt that while there was a potential for over-referral, their use of clinical judgement alongside the tool to refer patients for investigations and specialists’ attention could reduce the potential for over-referral:

“But as we have said, we are not just referring but we are using our clinical judgements as well, so we would only refer those patients that need to be referred – so I don’t think there will be over-referrals” (Practitioner 1 [GP]: FG 3).

3.1.4 Practitioner scepticism

In line with the CFIR construct of knowledge and beliefs of individuals involved in the implementation process,¹⁰ participants, particularly practitioners, felt that colleagues who had doubts about new tools may be unwilling to use them, especially if they did not know much about how a tool could be used:

“Until you said this thing, you know initially I was very sceptical about this tool. But there was this chap who was here this morning, if he was to come tomorrow and I use the tool if he gets above 5% I will refer” (Practitioner 3 [GP]: individual interview).

However, many practitioners interviewed said they were willing to roll out the QCancer tool after the necessary preparation was completed:

“I have no problem using the tool, and I believe it will be good to use a cancer risk assessment tool to facilitate earlier diagnosis of cancer, and as you know, earlier diagnosis will help with earlier treatment” (Practitioner 2 [GP]: FG 3).

3.1.5 Conflict with existing guidelines

Service users felt that guidance needed to be consistent, while practitioners felt it might be confusing to use a cancer risk assessment tool with existing guidelines e.g. National Institute for Health and Care Excellent (NICE) guidelines. This relates to the constructs of compatibility and complexity within the CFIR.¹⁰ In line with this, participants stated:

“I think it is good for everybody to have the same sort of guidelines, so to use risk assessment tools, everybody should use the same sort of guidelines” (Service User 1: individual interview).

“I will be quite confused about using the tool. I mean you know with the NICE guidelines, you couldn’t focus on another criterion for any other risk here, and I mean there are implications for the wider... investigations, referrals... , it has to be very much a more repeated secondary approach” (Practitioner 11 [GP]: FG 1).

3.1.6 High risk symptoms need referral at any risk

Participants also felt that symptoms suggesting the presence of cancer needed to be referred for further investigation, regardless of any quantified risk using the tool:

“It doesn’t really matter about percentages; I know 1% is less risk. But the fact is the symptom is there, the coughing out of blood, which is quite worrying” (Service User 13: individual interview).

“Regardless of what the tool said I will refer them for investigation with the symptoms. So, it doesn’t matter 1% or 0%, I will always do one thing, investigation if the symptoms are suggestive of cancer ” (Practitioner 11 [GP]: FG 1).

3.1.7 Need for training on how to use the tools

Another barrier identified by practitioners was their lack of understanding on how to use the tool during a consultation, including using these correctly to calculate risk, understanding what the predicted risk meant and communicating the results to patients. They felt that training on how to use the tool in patient consultations was needed:

“We don’t quite understand how to use that tool. I think we need to have proper education or training on using these tools. The other day I met a lady from the Macmillan Cancer Support, and I asked her to see if they could come and give us a training session or talk on how to use the cancer risk assessment tools in patient consultations. I think we need to follow that up because the tools look good to use” (Practitioner 2 [GP]: FG 3).

3.1.8 Establishing effectiveness of the tools

Service users felt that the use of QCancer in patient consultations should be evaluated for effectiveness before allowing all practitioners to use them:

“But I think if you are going to roll something out rather than going to everybody I would start with the doctors, see how the doctors do with it after evaluation and then move on to the practice nurses” (Service User 12: individual interview).

Practitioners also felt that evaluating the tools would help them to compare the effectiveness of the tools with current practice:

“We have to make sure that it is better than what we are already doing” (Practitioner 13 [GP]: FG 2).

3.1.9 Need to integrate the tool into general practice IT system

Practitioners were concerned about the lack of integration of the tool in their practice systems. They felt the tool needed to be integrated into practice information technology (IT) systems to avoid the difficult task of searching for a tool from the internet for each patient being assessed for cancer risk:

“It will not be easy downloading or Googling the tool during patient consultation. So, the tool needs to be integrated into our practice IT systems” (Practitioner 2 [GP]: FGD 3).

The facilitators to implementation of QCancer which related to the CFIR construct of relative advantage¹⁰ were: supporting clinical decision making; modifying patient health behaviours; improving processes and speed of cancer assessment and treatment and personalising patient care.

3.2 Facilitators to implementation

3.2.1 Supporting clinical decision-making

Service users and practitioners expressed the view that, the tool could help them to make more appropriate decisions on cancer investigations and referrals. One service user felt the tool will help to, *“make decisions appropriately”* (Service User 1: individual interview).

A practitioner also said:

“I think one of the ways I can use this tool is when you have got a differential in your mind, how can you put the cancer which may be at the lower end of the spectrum to come on top?” (Practitioner 10 [GP]: FG 1).

Another practitioner said:

“I think the tool will help to guide the clinician to see the broad level of differential diagnosis. It will also facilitate referral of patients by presenting a quantitative risk value to help explain risk and make a decision” (Practitioner 2 [GP]: FG 3).

3.2.2 Modifying patient health behaviours

Although designed as a risk assessment tool for symptomatic individuals, participants felt that use of the tool could also help to identify and raise awareness about modifying health behaviours:

“I think it might be just raising awareness, so people realise what’s happening, and what can go wrong with them and where the risks are and may be, they can reinforce them where someone else like the young person who has given up smoking it might be used to reinforce by saying well, you’ve got a very low risk, so if you’ve given up smoking carry on with that. Rather than saying you’ve got a very high risk later” (Service User 5: individual interview).

“I’m not sure what is happening with people who are refusing lifestyle changes. They don’t understand the risks, you know what I mean? I mean like someone who is a smoker, he is smoking, smoking. You can use this tool to help them modify their life style. People who are refusing referral, you can use the tool to estimate their risk to show and explain to them” (Practitioner 2 [GP]: individual interview).

Other practitioners also suggested that the tool could be modified or redesigned for other conditions or asymptomatic individuals:

“I think there is a potential for using the tool for screening in other health categories. The tool could be modified or redesigned to suit other conditions in primary care. It could also be modified for asymptomatic patients, for example the QCancer 10 years’ risk tool, I understand can be used to predict cancer in asymptomatic individuals”(Practitioner 3 [GP]: FG 3).

“I also feel the tool will help in terms of using the risk generated to advise patients who need behavioural changes. If their risk was small I would tell them to maintain healthier life styles by exercising, eating a healthy diet, less alcohol and to stop smoking if they were smoking. Yes, as I said, this tool can help to empower patients to take control of their risk factors and live healthier life styles” (Practitioner 2 [GP]: FG 3).

3.2.3 Improving processes and speed of cancer assessment and treatment

Service users and practitioners felt the tool could facilitate earlier cancer diagnosis by improving the processes and speed of assessment and treatment:

“I do think it will be a useful idea, yeah. I think my first worry is that I may have cancer and most of us will like to know early so they can get it sorted. But a lot of things can be picked up, can’t they, if they spot check risk if you like” (Service User 4: individual interview).

“With everyone on board because we need more investigations, we need more tests quickly. So, there is more and more drive to get tests done quickly” (Practitioner 11 [GP]: FG 1).

“I think when the tool is fully integrated in our IT systems and every practitioner gets familiar with using it, it will be time saving in the long term, as the consultation, the assessments, investigations and referral processes will be faster” (Practitioner 1 [GP]: FG 3).

3.2.4 Personalising patient care

Participants felt that use of the tool would help to provide patient-centred care based on the patient’s specific cancer risks enabling a personalised rather than a more generalised plan of care:

“I think it will make the care more patient-centred because you’re presenting them with their own risk not a general risk, it’s personal to them and it will just make the consultation more patient focused, and I think it will make patients feel more involved in the consultation and just feel more cared for” (Service User 12: individual interview).

“Patients will go away with a lot more targeted information about their personalised risk of cancer rather than a vague statement” (Practitioner 1 [GP]: individual interview).

4 DISCUSSION

4.1 Summary of main findings

We found a range of barriers and facilitators to implementing QCancer. The barriers identified were: the need for more consultation time; the possibility of unnecessary worry and anxiety generated by cancer investigations; over-referral and over-burdening of services; practitioner scepticism about the usefulness and effectiveness of the tool; lack of integration of the tool into general practice IT systems; lack of training for practitioners on the use of the tool; and the need to establish effectiveness of the tool before rolling it out in clinical practice. The facilitators included perceptions that the cancer risk assessment tool would: support decision-making, speed up the process of assessment and treatment, help to identify and modify health risk behaviours, and personalise care. These barriers and facilitators need to be considered when planning to implement the tool in primary care consultations.

4.2 Strengths and limitations

This study is one of the first studies, to elicit and compare perspectives of both service users and practitioners on QCancer, a cancer risk assessment tool designed for symptomatic individuals in general practice. Individual interviews provided information from service users and practitioners, while the focus groups facilitated discussion between practitioners in their respective general practices and provided rich data through the interactions and prompting of ideas. Another strength of this study is that, data saturation was realised in terms of code (no new ideas expressed) and meaning (ideas expressed were understood).¹²

Although the study was widely publicised, all the service user participants were of White British ethnicity. People from ethnic minority groups may not have participated because of lack of awareness of the study, language problems affecting their ability to understand the advertisement, or a lack of interest in participating. People from minority ethnic groups have been shown to be less likely to participate in research studies if they lack confidence in their language abilities or lack understanding of the topic being researched,¹³⁻¹⁵ whereas they are more likely to participate when approached with sensitivity and when they believe the study will be beneficial.¹³⁻¹⁶

4.3 Comparison with existing literature

The need for extra time to conduct a risk calculation and communicate this effectively, listening, informing, explaining and discussing further investigations with the patient, as found in this study, are known to add complexity and costs to the patient consultation.¹⁰ Additional time is a scarce resource in the face of increasing practitioner workload, which will affect implementation of innovations like this. Integration of the risk assessment tool within the general practice IT system, with links to existing patient data, and training on how to use the tool were seen as essential to addressing issues of time and complexity of use.

Patients feeling worried or anxious about being referred for cancer investigations was perceived as another barrier to the use of the tool, although this does not correspond with a recent systematic review of randomised controlled trials of cancer risk assessment tools in primary care, which found no increase in cancer worry.¹⁷ This contradiction in the evidence could be due to the fact that, the current study is qualitative and based on the views of participants, particularly service users who had not yet experienced the process of using the tool with a clinician but were expressing what they felt could happen, if the cancer risk information including referral, is not properly communicated to them.^{9,18} On the other hand, the participants in studies included in the systematic review of trials might have benefited from interventions including clinician input, which could have reduced their anxiety levels. Nevertheless, the fact that these views were expressed in this study suggests that some patients could indeed experience worry and anxiety, if the patient care, from investigations through to diagnosis and treatment of cancer is not properly planned and carried out to meet the needs of individual patients.

Another barrier identified by participants was over-referral, although some practitioners felt this was unlikely to be a problem because they felt they could use risk assessment tools alongside their professional judgement, only referring patients who needed this. This is supported by current guidance that Cancer Decision Support tools should prompt primary care practitioners to think about the possibility of cancer, and then decide on

referral based on their clinical judgment.¹⁹ Despite this, the potential for increased rates of referral of people without cancer (false positives) remains a concern, with potential costs needing to be weighed against late referral.

Practitioners in a simulation study conducted in Australia appeared not to trust some risk outputs of the QCancer tool,²⁰ and this accords with scepticism expressed by some clinicians in this study. Practitioners might be sceptical because they perceive the evidence that QCancer or other cancer risk assessment tools improve outcomes is limited. Intervention characteristics can be an important potential facilitator or barrier,¹⁰ particularly when evidence of effectiveness in practice is lacking.²¹

Previous studies have found barriers that needed to be considered for successful implementation of cancer risk assessment tools in primary care including: lack of trust on the part of some GPs in the risk calculation, especially when it conflicted with clinical judgement; variable interpretation of symptoms leading to variations in risk assessment, and the difficulty experienced by some GPs in communicating numerical risk to patients.²⁰ Participants in this study felt that the tools might conflict with existing guidelines, a finding in line with the construct of compatibility,¹⁰ i.e. whether an intervention fits with existing workflows.

Dikomitis and colleagues found that training and guidance were needed in using cancer risk assessment tools in routine practice²² because of difficulties experienced by practitioners in employing the tools. Similarly, practitioners in this study expressed concerns relating to difficulties in understanding, accessing and using the cancer risk assessment tool, and called for integration of the tool in general practice IT systems and training of practitioners on accessing and using the tool. Hence, lack of integration of the tools in the practice IT system and lack of or inadequate training were perceived as barriers to implementation of the tool. Indeed, to meet the needs of patients, clinicians need to be supported with their learning needs such as sources of information,^{23,24} about decision aids like cancer risk assessment tools.

Another barrier identified was the perception that patients with symptoms suggestive of cancer would need to be referred for further investigations irrespective of their quantified risk. Indeed, it has been suggested that when using Cancer Decision Support tools, practitioners who suspect a possible cancer diagnosis can refer a patient even if their quantified risk is low or does not meet the referral NICE guidelines.¹⁹ Furthermore, Macmillan Cancer Support who have integrated the QCancer and Risk Assessment Tool (RAT) and have called them the electronic Cancer Decision Support (eCDS) tools, have suggested that these tools can complement existing NICE guidelines by flagging an alert on the computer screen about the possibility of cancer. Following this flagging on the computer, the clinician can then decide whether to refer a patient, based on NICE guidelines.¹⁹

With reference to facilitators, participants in this study felt that the use of the cancer risk assessment tool could support decision-making especially with patients whose cancer symptoms were unclear, or when cancer was a differential diagnosis, helping to speed up the assessment, diagnosis and treatment of cancer. The findings from this study support findings from a previous study on GPs' experiences of using diagnostic tools, which found that the RAT helped GPs with lung and colorectal cancer symptom recognition and confirmed their decision about whether to refer.²⁵ In another study, embedding electronic decision-support tools was found to have educational benefits, with GPs reportedly learning about cancer symptoms when using cancer risk assessment tools.^{22,25} Green and colleagues also found that embedding clinical decision support tools in clinical practice was more likely to be achieved when they were used to support, rather than supersede, the clinical judgement of practitioners,²⁵ corresponding with the views expressed by practitioners in this current study.

Another facilitator to the use of the tools found in this study, that the use of the cancer risk assessment tool could help to identify, raise awareness of and promote positive health behaviours in patients, supports findings from recent systematic review of randomised controlled trials of cancer risk assessment tools in primary care, which suggested that health promotion messages within tools may have positive effects on behaviour change.¹⁷

The cancer risk assessment tools meant for people presenting with symptoms are based on an individual

patient's risk factors and symptoms; this helps to personalise care. Since the risk generated is for an individual patient, the referral and further investigations as well as the subsequent diagnosis and treatment or cancer care will be specific to that individual, taking into consideration their individual attributes and symptoms. Personalised or person-centred care is about taking into consideration the desires or values, social circumstances and lifestyles of people, while working with people as individuals to develop appropriate solutions.^{13,26}

4.4 Implications for practice and further research

For a successful implementation, barriers to the use of the cancer risk assessment tool need to be addressed. This will include ensuring that the tool is integrated in the general practice IT systems and training practitioners on how to access and use the tool during the patient consultations. It is of note that Macmillan Cancer Support and Cancer Research UK have worked with the major primary care IT providers (EMIS, SystmOne and Vision+) in integrating the eCDS tools in general practice systems, although this integration will need to be enforced as expressed by participants in this study.

Practitioners are likely to refer patients with symptoms suggestive of cancer whatever their quantified risk if these fall within NICE cancer referral guidelines, suggesting that risk assessment tools should be used flexibly to fit with clinical practice.

Quantitative research is needed to examine the effects of the use of the cancer risk assessment tool (QCancer) on rates of referral, investigations and diagnoses, whether positive or negative for cancer. Further research is also needed to quantitatively evaluate whether the cancer risk assessment tool improves patient outcomes compared with current practice.

5 CONCLUSION

This study found a range of barriers and facilitators to implementation of QCancer, a cancer risk assessment tool. While the facilitators should be used to encourage the use of the tool, the barriers to implementation should be considered and addressed while implementing these tool in primary care.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the University of Lincoln School of Health and Social Care Ethics Committee. All interviewees gave informed consent to participate. The study was performed in accordance with the Declaration of Helsinki.

AVAILABILITY OF DATA AND MATERIALS

The anonymised qualitative datasets will be available on request through the University of Lincoln repository.

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHORS' CONTRIBUTIONS

ANS had the original idea for the study. The study was designed by JA and ANS, supported by SO and SB. Fieldwork and analysis was conducted by JA supported by SO and SB. JA wrote the first draft of the paper and all the authors edited and approved the final paper.

REFERENCES

References

1. Cancer Research UK. *Bowel cancer incidence statistics* 2013, Cancer Research UK.

2. Al-Azri MH. *Delay in cancer diagnosis: causes and possible solutions*. . Oman Medical Journal 2016 **31** (5).
3. Bowen EF, Rayner CF. *Patient and GP led delays in the recognition of symptoms suggestive of lung cancer*. *Lung Cancer* 2002; 37(2):227-8. *Lung Cancer* 2002. **37** (2): p. 227.
4. Koyi H, Hillerdal G, Branden E. *Patients' and doctors' delays in the diagnosis of chest tumours*. *Lung Cancer*, 2002. **35** : p. 53.
5. Hamilton W. *The CAPER studies: five case-control studies aimed at identifying and quantifying the risk of cancer in symptomatic primary care patients*. *Br J Cancer*, 2009. **101 Suppl 2** : p. S80-6.
6. Hippisley-Cox J, Coupland C. *Symptoms and risk factors to identify men with suspected cancer in primary care: derivation and validation of an algorithm*. *Br J Gen Pract*, 2013. **63** (606): p. e1-10.
7. Collins GS, Althman DG. *Identifying patients with undetected colorectal cancer: an independent validation of QCaner (Colorectal)*. *British Journal of Cancer*, 2012. **107** (2): p. 260-265.
8. Collins GS, Althman DG. *Identifying patients with undetected gastroesophageal cancer in primary care: External validation of QCaner (Gastro-Oesophageal)*. *Eur J Cancer*, 2013. **49** (5): p. 1040-8.
9. Akanuwe JNA, Black S, Owen S, Siriwardena AN. *Communicating cancer risk in the primary care consultation when using a cancer risk assessment tool: Qualitative study with service users and practitioners*. *Health Expect* . 2019; 00: 1– 10.
10. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. *Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science*. *Implement Sci*, 2009. **4** : p. 50.
11. Ritchie J, Spencer E. *Qualitative data analysis for applied policy research*. In: Bryman, A. and Burgess, R.G. , in *Analysing Qualitative Data* , A.B. Bryman, R.G., Editor. 1994, Routledge: London.
12. Hennink MM, Kaiser BN, Marconi VC. *Code Saturation Versus Meaning Saturation: How Many Interviews Are Enough?* . *Qual Health Res*, 2016.
13. Gill PS, Plumridge G, Khunti K, Greenfield S. *Under-representation of minority ethnic groups in cardiovascular research: a semi-structured interview study*. *Fam Pract* 2013.**30** (2): p. 233-41.
14. Lo B, Garan N. *Research with ethnic and minority populations* . 2008, New York: Oxford University Press.
15. Redwood S, Gill PS. *Under-representation of minority ethnic groups in research - call for action*. *Br J Gen Pract* 2013.**63** (612): p. 342-3.
16. Ejioogu N, Norbeck JH, Mason MA, Cromwell BC, Zonderman AB, Evans MK. *Recruitment and retention strategies for minority or poor clinical research participants: lessons from the Healthy Aging in Neighbourhoods of Diversity across the Life Span study*. *Gerontologist* 2011.**51**‘ (1).
17. Walker J, Licqurish S, Chiang P, Pirotta M, Emery J. *Cancer risk assessment tools in primary care: A systematic review of randomised controlled trials*. *Ann Fam Med*, 2015. **13** : p. 480-489.
18. Kim GY, Walker J, Bickerstaffe A, Hewabandu N, Pirotta M, Flander L, Jenkins M, Emery JD. *The CRISP-Q study: communicating the risks and benefits of colorectal cancer screening* *Aust J Gen Pract*, 2018.**47** (3): p. 139–45.
19. Macmillan Cancer Support. *Macmillan Cancer Decision Support (CDS) tool* . 2015, Macmillan Cancer Support. https://www.macmillan.org.uk/_images/cds-faqs-tcm9-295413.
20. Chiang PPC, Glance D, Walker J, Walter FM, Emery JD. *Implementing a QCaner risk tool into general practice consultations: an exploratory study using simulated consultations with Australian general*

practitioners British Journal of Cancer 2015.**112** : p. 77.

21. Emery JD, Gray V, Walter FM, Cheetham S, Croager EJ, Slevin T, Saunders, Threlfall CT, Aret K, Nowak AK, Geelhoed E, Bulsara M, Holman CDH. *The Improving Rural Cancer Outcomes Trial: a cluster-randomised controlled trial of a complex intervention to reduce time to diagnosis in rural cancer patients in Western Australia*. British journal of cancer, 2017. **117** (10): p. 1459-1469.
22. Dikomitis L, Green T, Macleod U. *Embedding electronic decision-support tools for suspected cancer in primary care: A qualitative study of GPs' experiences*. Primary Health Care Research and Development 2015. **16** : p. 548-555.
23. Jones R, Tweddle S, Hampshire M, et al . *Patient-led learning for the clinical professions. Fulfilling the needs of patients* . 2000, Bristol: NHS Information Authority. National Education Training and Development Programme: Bristol.
24. Sowden AJ, Forbes C, Entwistle V, Watt I. *Informing, communicating and sharing decisions with people who have cancer*. BMJ Quality & Safety, 2001. **10** (3): p. 193-196.
25. Green T, Martins T, Hamilton W, Rubin G, Elliot K, Macleod U. *Exploring GPs' experiences of using diagnostic tools for cancer: a qualitative study in primary care*. Family practice, 2015.**32** (1): p. 101-05.
26. Sepucha KR, Levin CA, Uzogara EE, Barry MJ, O'Connor AM, Mulley AG. *Developing instruments to measure the quality of decisions: Early results for a set of symptom-driven decisions*. Patient Educ Counsel, 2008. **73** (3): p. 504-510.

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