Evaluating the impact of an integrated clinical decision support tool intended to support earlier cancer diagnosis in primary care in Ipswich and East Suffolk CCG

Final Report to the EAHSN

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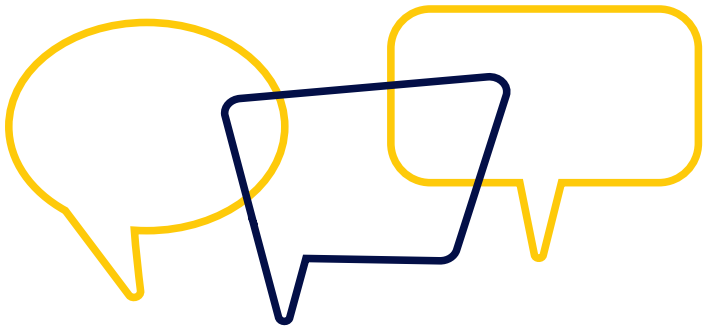
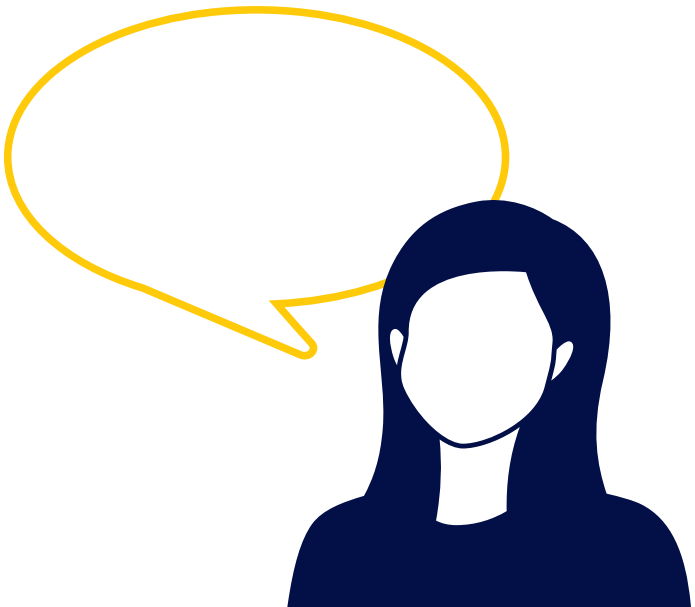
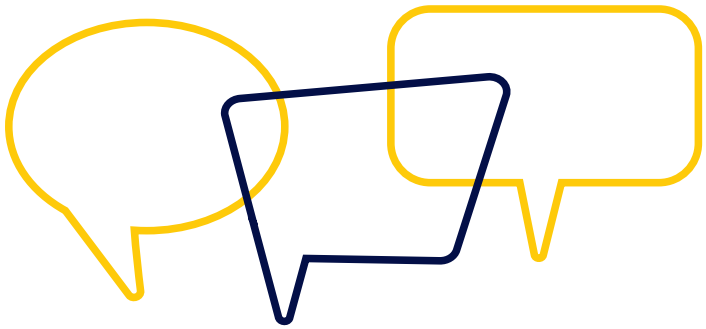




2 Introduction



This report details findings of a qualitative evaluation assessing the impact of C the Signs, the newly introduced clinical decision support tool intended to improve the recognition and early referral rates of cancer in the Suffolk and Northeast Essex (SNEE) CCG and Primary Care Network (PCN). This was an independent evaluation of C the Signs, commissioned by the Eastern Academic Health Science Network (EAHSN) in 2021, and carried out by Pamela Knight-Davidson and Sara Spear at Anglia Ruskin University between 2021-2023. The evaluation was informed by an initial quantitative survey designed in collaboration with the researchers and undertaken by Ipswich and East Suffolk CCG. Findings of this initial survey are also detailed in this report.

The reported findings are based on factors known to support or hinder uptake and use of technological innovations and services in healthcare settings, including: perceived usefulness and benefits; perceived effort (ease of use); and, social (peer) influence.[1] We also provide findings related to the actual usage of C the Signs, as reported by clinicians.

2.1 Summary of findings

The findings are summarised below, and in the main report, as factors supporting adoption, and factors limiting adoption, of C the Signs. We also provide findings relating to our insights about practice procedures for 2WW (two week wait) referrals and safety netting procedures, which we anticipate will be useful for clinicians, the PCN and for the further development of C the Signs.

2.1.1 Factors supporting adoption of C the Signs

- C the Signs is rated as a highly effective and reliable clinical decision support tool for its intended purpose, by most clinicians. It is also viewed as easy-to-use, with an improved user interface and user experience (compared to the previous system).
- C the Signs is useful for supporting clinical decisions through prompts and suggestions. This is especially useful for making decisions regarding the lesser-known cancers.
- The robustness of C the Signs, compared to the previous system, may mitigate potential errors in 2WW referrals.
- Useful features of C the Signs were highlighted:
  - a dashboard showing all referrals, facilitating better in-house tracking of referrals, in-house auditing and PCN auditing;
  - automatic population of patient information from SystmOne;
  - automatic sending of follow-up information to patients, viewed as a useful safety netting feature.

2.1.2 Factors limiting adoption of C the Signs

- Clinicians reported having high familiarity and confidence in referral pathways and in recognising cancer signs and symptoms. This had implications for the ways in which they evaluated and used C the Signs. For example, some predictive and auto-population features were viewed as 'irrelevant' or surplus, 'getting in the way', or 'taking longer', (although in other instances auto population of patient information might be considered to be useful), where this was the case, it resulted in clinicians and:
  - cutting corners, by going straight to the referral proforma for speed; (reverting to clinical judgement)
  - using SystemB's referral form to check some referral criteria;
  - using C the Signs interchangeably with SystemB.
- Some, clinicians reported that they were not using C the Signs to its full potential due to unfamiliarity and lack of understanding of some features. As well as the reported greater reliance and confidence in clinical acumen than on clinical decision tools, indicated above, motivation to become more familiar with C the Signs might also have been affected by:
  - time constraints;
  - (potentially) reduced confidence/familiarity with technology.
- The added value of C the Signs (compared to SystemB) was not obvious to some clinicians and impacted upon its usage.
- Some challenges encountered when using C the Signs, were reported. These suggested reduced workflow and were reported as risks to adoption in the PCN. For example:
  - 'duplication' of information between the clinical system (SystmOne) and C the Signs; a need for 'integration into SystmOne'.
  - reliance on good internet connection and speed, (although this was also noted to be a challenge when using SystemB)
- Peer adoption (how colleagues use C the Signs) might be implicated in low usage. Some clinicians reported that they were not using C the Signs at all, as it was not embraced in some practices or not used by colleagues.

2.1.3 Other insights

- Some steps in the 2WW referral and safety netting processes can potentially lead to delays in sending referrals and/or diagnosis. It is not clear whether these issues are addressed by C the Signs.
- Safety netting procedures are not standardised across the PCN, presenting opportunity to promote and further develop the safety netting capabilities of C the Signs.

2.2 Key conclusions and recommendations

Our findings suggest that, overall, C the Signs is viewed as an effective, reliable and useful tool, which has potential to improve upon the procedures and support offered to clinicians for making 2WW referrals and for safety netting. It is also viewed as easy to use and, as having an improved user interface compared to previous systems. Our findings also point to several factors limiting the adoption of C the Signs, however. These relate to users (e.g., reduced motivation to familiarise with it); to the device itself (e.g., perception that some features take longer) and to system limitations (e.g., time constraints limiting familiarisation and adaption) and result in reticence to use C the signs consistently, or in some cases not at all. These limitations could be addressed through strategies that support clinicians to adapt and this is reflected in recommendations 1, 2 and 3 below. Although not specific to C the Signs, other insights gathered whilst carrying out this study, point to a potential for delays in the 2WW referral and limitations to effective safety netting, which might be addressed at PCN level. Recommendations, 4 and 5 address these.

2.2.1 Recommendations

1. More support is required for clinicians to adapt and become more acquainted with C the Signs. Utilising 'innovation champions' to work alongside clinicians and offer trouble-shooting support might be useful within a period of transition and adjustment (ability to use both systems), followed by a period of implementation (ability to use C the Signs only).
2. During the transition period to using C the Signs, clinicians could be allocated protected time after 2WW consultations, to enable them to familiarise themselves with the new system and consult with colleagues and 'innovation champions' on its use, as required.
3. Peer endorsement (trusted peers who are first adopters) might be utilised to demonstrate the added value of C the Signs: i.e., how it complements clinical acumen and workflow, and how it enhances the 2WW referral process.
4. Uncertainties in the process of sending a 2WW referral could be addressed through focused training and, for example, a 'task to admin' confirmation receipt, and confirmation of receipt of referrals from the referral site.
5. Safety netting procedures should be standardised across the PCN, and unsecured safety netting procedures should be phased out. The introduction of C the Signs presents opportunity for the PCN to maximise the potential for monitoring results and referrals outside consultations, towards more standardised safety netting. The PCN might also encourage a culture whereby direct responsibility for safety netting is the norm for all practice staff.

3 Background

3.1 The importance of early cancer diagnosis and timely referral

It is estimated that earlier cancer diagnosis could improve the survival chances of 52,000 patients[2] per year in the UK. However, many people are diagnosed late, with advanced stages of cancer, reducing the potential of treatment success and the chances of survival (See Figure 1). Urgent referral to specialist services is recognised as key to achieving early-stage cancer diagnosis, where treatment efficacy and survival outcomes are improved,[2,3] and this is encouraged through clinical standards and guidelines.

However, there is potential for inconsistent outcomes for patients in different parts of the country as referral rates are noted to vary substantially, across England and across different clinical commissioning groups.[2] Notably, there are factors which can make recognition and referral of cancer challenging, including:

- Complexity - large number of cancer types (over 200) with most having different presenting features[4]
- 'non-specific' or vague symptom presentations.[4,5,6]

Figure 1:
Chances of surviving cancer at different stages of diagnosis in the UK, for the eight most common cancers

Of patients diagnosed at early stages (stages 1 & 2)

80% will survive for 10 years or longer

Of patients diagnosed at late stages (stages 3 & 4)

only 25% will survive for 10 years or longer

SOURCE: Cancer UK 2014

3.2 Clinical standards and guidelines

In 2015, NICE issued new guidance[4] on cancer recognition and referral, in a bid to save more lives. The new guidance considered, more appropriately, epidemiological evidence from primary care as opposed to reliance on evidence from secondary care.[7] They proposed:

- lowering the threshold for diagnosis from 5% positive predictive value (PPV) to 3% PPV (where the positive predictive value is a probability indicator, based on the proportion of people displaying similar signs, symptoms, or test results who go on to develop cancer);
- guidance on recognition by site of suspected cancer as well as by signs, symptoms
- provision of direct access to diagnostic tests and investigations that can be carried out in primary care;
- recommendations about communication with patients to improve safety netting.

NB, guidelines related to specific pathways are updated, periodically, when new evidence becomes available. The comprehensive restructuring of the guidance that took place in 2015, remains unchanged.

3.3 Improving cancer referral rates in SNEE

In 2021, the Ipswich and East Suffolk CCG (IES), (which later became part of Suffolk and North East Essex Integrated Care Board, SNEE) proposed an ambition to impact the cancer survival rates in its localities through implementing a recommended two week wait (2WW) urgent referral pathway in its Primary Care Network (PCN), consisting of approximately 35 practices of varying patient populations in both urban (major and minor conurbations; towns merging with suburbs of central cities) and rural (rural towns; villages; hamlets; single dwellings) settings (see Table 1).

Table 1:
Study settings: Primary Care Networks

PNC/Practice	PNC/Practice population size (approx.)	Rurality
PCN 1	32,901	Urban
Practice1	9,045	Rural
PCN 3	37,485	Urban
Practice(s)2	29,584	Urban
PCN 4	35,545	Urban
PCN 5	125,333	Rural
PCN6	28,573	Rural
PCN 7	39,576	Urban
PCN8	27,883	Urban
PCN 9	55,748	Rural
Total	**421,853**	

3.4 C the Signs

C the Signs is a novel medical technological development that has the potential to impact better patient outcomes through improving cancer recognition and referral processes in GP practices. It is a digital application (app) that can be incorporated into existing clinical systems and offers clinicians a tool for supporting clinical decisions using the most up-to-date guidance from NICE. It signposts clinicians to site and symptoms specific information, appropriate diagnostic tests, appropriate referral pathways, local services, and automatic safety netting. It also has auditing potential through the provision of PCN cancer data. C the Signs is registered as a Class 1 medical device and is UKCA marked. It is fully compliant with the Data Protection Act 2018 (UK GDPR) and is Cyber Essentials Plus certified, ISO 27001 certified, and undergoes regular external penetration testing. It is also compliant with NHS Digital frameworks. NHS Data Security and Protection (DSP) Toolkit; DCB0129 - Clinical Risk Management: its Application in the Manufacture of Health IT Systems and IM1 Pairing integration (Foundation Capabilities on the Digital Care Services Framework). Development of C the Signs was initially funded through the SBRI innovation funding programme. Previous independent assessment[8] demonstrates that in GP practices where C the signs is utilised, there are increased cancer detection rates and decreased emergency presentation, than in practices not using C the Signs.

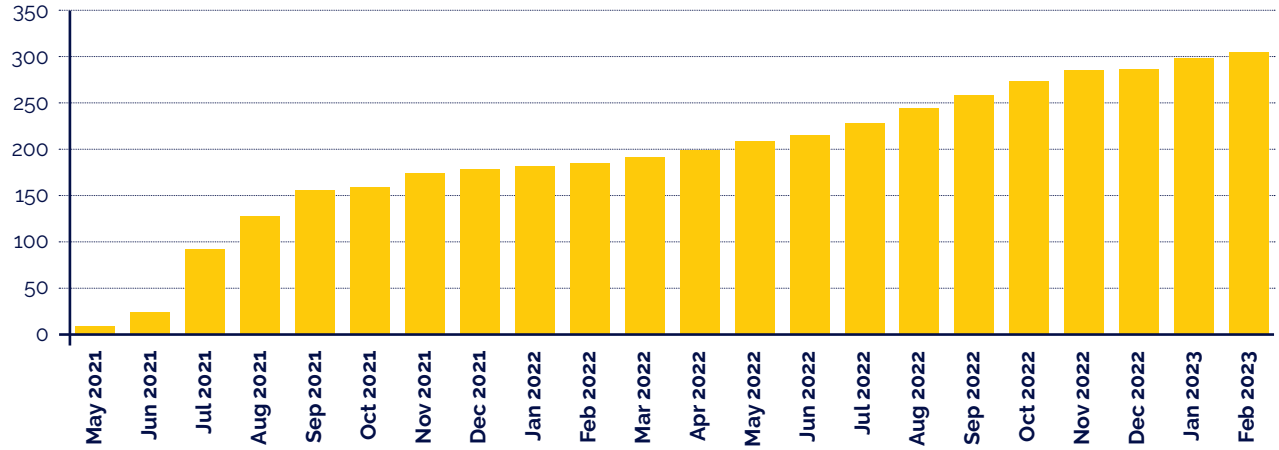
The CCG proposed to pilot C the Signs as an integrated tool (into the clinical system) to support clinicians (GPs, advanced nurse practitioners) and practice administrative staff to improve recognition of cancer signs and symptoms and to make timely and appropriate referrals to specialist services. C the Signs was introduced in all practices in the Primary Care Network (PCN) in June 2021, when it was deployed to all computer terminals in primary care. The system was not mandatory and alternative methods of referral were still available. Implementation was supported by a series of awareness building exercises and training events.

3.5 Measured usage in the IES Primary Care Network (PCN)

As of December 2022, C the Signs was used in 13 practices in the PCN. Uptake has gradually increased since introduction, with 290 registered users: 61% of users are clinical staff (GPs, GP registrars, other doctors; nurse practitioners and other nurses; other clinical staff e.g., pharmacists and physician assistants) and 37% are administrative staff (practice managers and administrators).

Figure 2:

Use of C the Signs in IES Primary Care Network (by number of users) May 2021-Feb 2023



There have been 2,229 risk assessments performed through the C the Signs system, 2,714 urgent suspected cancer referrals completed, and 2,819 patients appropriately safety- netted. One hundred and eighty-two patients were safely excluded from cancer pathways.

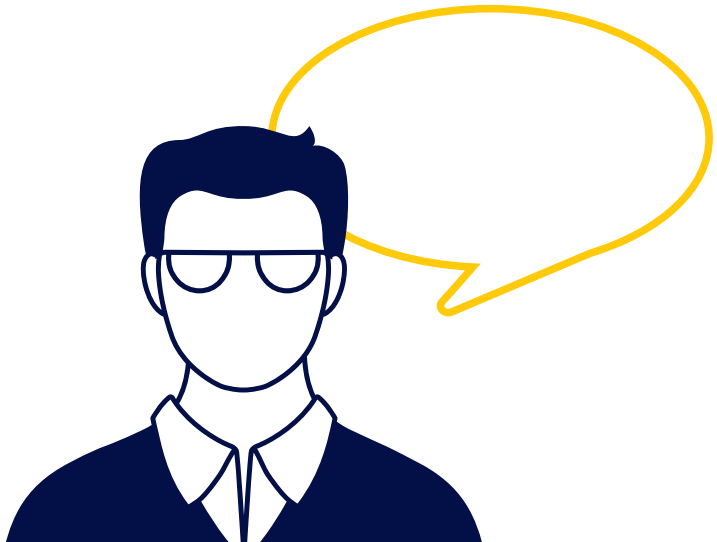
Closer examination of usage data (see Table 2) suggest a pattern of low, mid and high using practices: the lowest being 0 patients risk assessed in the reporting period using C the Signs, in the lowest using practices, to 31 people risk assessed in the reporting period, in the highest using practice. Figures have been consistent in each reporting period among the mid and high users and, as of February 2023, the figures have increased slightly among the lower using practices.

Table 2:

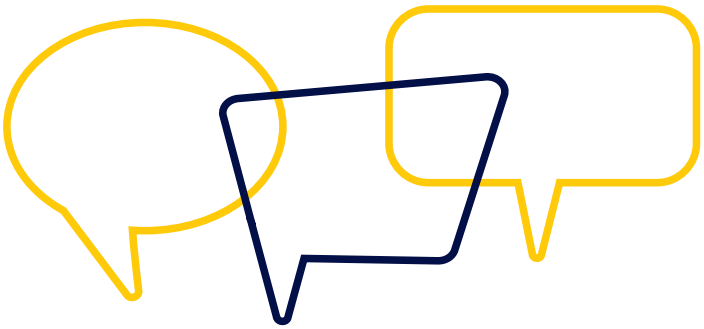
Usage of C the SIgns in IES PNC practices (by low, mid and high using practices)*

Usage classification by range of referrals in reporting period	*Number of Risk Assessments made using C the Signs (range / no. of practices)
Low (0-10)	0-4 (28)
Mid (10-30)	13-18 (7)
High (30-50)	31 (1)

* Reported between Nov 2022-Feb 2023



4 Methodology



4.1 Study Aims

4.1.1 Aim

To assess the system impact of C the Signs in GP surgeries, secondary care cancer hubs, and among patients and/or patient representatives.

4.1.2 Objectives

1. To evaluate the impact of C the Signs though exploration of:
    - usefulness
    - perceived effectiveness
    - acceptability
    - ease of use, and
2. To evaluate barriers to adoption/implementation

The study objectives were based on our existing understanding of factors that impact on the adoption of health and care technologies by professionals (e.g., the influence of work cultures, regulatory barriers, systems integrations, ethical concerns, and data protection) as well as the academic literature concerning technology acceptance and use. In particular, the study draws on concepts from the Technology Acceptance Model[9] and the Unified Theory of Acceptance and Use of Technology.[1] These identify factors that have been shown to influence behavioural intention to use, and actual use of, technology in organisational contexts, including perceived ease of use (effort expectancy) and perceived usefulness (performance expectancy), alongside other factors that facilitate use, such as adoption by peers.

4.2 Study Design

4.2.1 Initial study design: Qualitative interviews

We initially planned to undertake a qualitative study using semi-structured interviews with primary care and secondary care professionals and administrative staff (all staff responsible for patient consultations and/or safety netting), and patients and/or patient representatives. However, the study was adapted mid-way and we amended the study design to include an online questionnaire.

4.2.2 Amended study design: Online questionnaire

An online qualitative questionnaire was developed to provide sufficient in-depth insight into the participants' views and experiences of using C the Signs.

4.3 Ethical approval

We secured ethical approval for the study in October 2021 from the Health Research Authority and Health and Care Research Wales, the South Yorkshire Research Ethics Committee (REC reference: 21/YH/0167), and the Norfolk and Suffolk Primary and Community Care Research Office (Ref. 2021GP29; IRAS ID 302429). These bodies gave further approval of the amendments to the study design in December 2022.

4.4 Recruitment

4.4.1 Initial survey

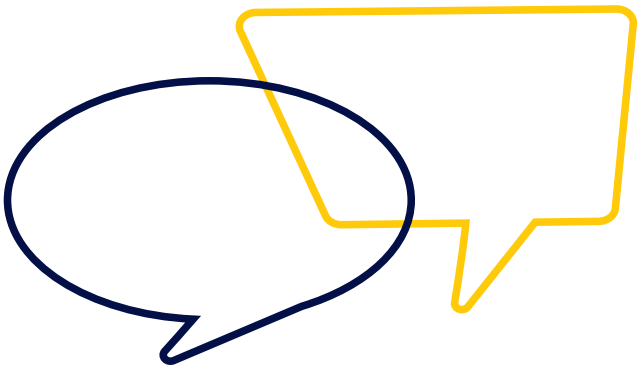
A pre-implementation quantitative survey devised in collaboration with C the Signs and the project clinical director was conducted to inform the development of the qualitative interview. This included items relating to: length of time practicing; length of time to make a cancer referral; confidence in making cancer referrals and investigations; confidence in keeping up with the suspected cancer pathways (NICE); knowledge of investigations available to the surgery; success in making 2WW referrals; safety netting procedures used by the surgery; suboptimal consequences of inadequate safety netting; and, 2WW referrals. It was made available to all users of C the Signs upon deployment.

4.4.2 Interviews

A purposive method was used to select participants in one participating surgery based on usage data (i.e., the selected practice had sustained use of C the Signs), and the Practice Manager and selected staff were invited via email to participate in the study. Attempts to engage a further two practices were not successful (thus we amended the research design -as above).

4.4.3 Online questionnaire

Upon ethical approval of the study amendments, a qualitative questionnaire was made available to all clinicians in the CCG through a link in C the Signs. The questionnaire was hosted on the JISC Online Surveys platform, which enabled data to be collected anonymously. Clinicians were given information about the study at the start of the questionnaire and were able to withdraw from the study at any point before they submitted the questionnaire.



4.5 Qualitative interview procedures

The initial questions guiding the qualitative interviews were tailored to the three different participant populations; GP surgery clinicians and practice administrative staff; patient participants/and or patients' representatives; secondary care professionals. A semi-structured interview schedule was used to guide the discussions and enable participants to speak on clustered topics. Questions were mostly open-ended, (questions requesting roles and responsibilities, for example, were closed) allowing flexibility for spontaneous and in-depth responses. Main questions were also supported by prompts to invite participants to elaborate on their answers. Examples of the interview topics are detailed in Table 3.

Table 3:
Example interview questions

Question cluster name	Main question and examples of sub-questions
Professional background information	Please could you describe your role in the surgery? • Do you make regular cancer referrals…? • Are you responsible for safety-netting in your surgery?
Cancer referral processes	Can you please describe the current (before C the Signs) procedures for referring patients for suspected cancer on any Pathway? • How familiar are you with the different cancer referal pathways?
Safety-netting	Can you describe the safety netting processes in your surgery? • Are you aware of any sub-optimal consequences as a result of the current referrral procedures or safety-netting procedures?
C the Signs specific questions	Performance Expectancy (usefulness) Overall, how did you find C the Signs • Were there any particularly useful features? • Was there anything unhelpful? • Please tell us how useful/or not you found C the Signs • Can you rate its usefulness? Effort Expectancy (ease of use) How do you find the procedure of making a cancer referral using C the Signs in terms of effort, efficiency, effectiveness? • Could you rate how easy/or not you found C the Signs? • Compared to previous procedures do you see any benefits for the adoption of C the Signs in your surgery?

Interviews were conducted virtually and recorded, using MS Teams. Transcripts were produced immediately following the interviews, checked for accuracy, and downloaded for data coding and analysis.

4.6 Online qualitative questionnaire procedures

The online qualitative questionnaire consisted of 28 questions covering the full range of questions in the qualitative interview schedule and included a mixture of closed questions, rating scales, and free text options, as shown in Table 4.

Table 4:
Online qualitative questionnaire: example questions

Ease of use questions	Response options
Pre-C the Signs, could you please outline the procedures in your surgery for referring patients with suspected cancer (any pathway).	Free text
Please rate ease of use of procedures for making referrals for suspected cancer using C the Signs.	Rating scale C the Signs is easy to use ☐ 1. Strongly disagree ☐ 2. Disagree ☐ 3. Neither agree nor disagree ☐ 4. Agree ☐ 5. Strongly agree

Safety-netting questions	Response options
In your own words, could you please describe the safety netting processes in your surgery?	Free text
How efficient do you find the safety netting procedures in your surgery? How much time, effort and/or organisation is required to ensure adequate safety-netting?	Rating scale I find safety netting procedures in my surgery... ☐ 1. Very inefficient ☐ 2. Inefficient ☐ 3. Not sure ☐ 4. Efficient ☐ 5. Very efficient

4.7 Data analysis

4.7.1 Initial survey

The initial survey was analysed by C the Signs staff. Data were analysed using frequency of responses and percentages.

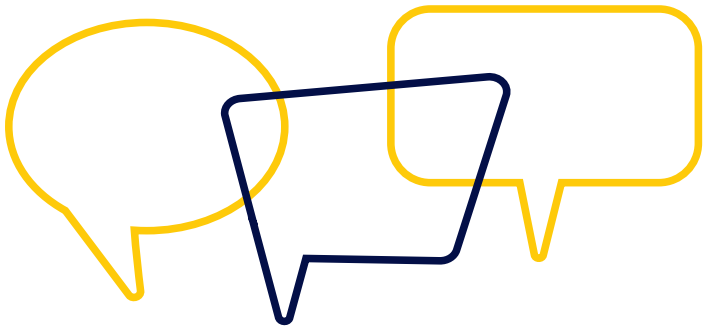
4.7.2 Qualitative interview

Interview data were coded and ordered into categories using a Framework method.[10] A coding matrix was created in Excel into which the data were summarised by question clusters. Although the categories were predefined, the semi-structured format also allowed participants to speak flexibility about their experiences outside the main pre-defined categories, enabling unexpected themes to emerge. Therefore, inductive coding was also required. Following the Framework analytic method[10] coding, categorisation, and themes of the data were cross-checked by PKD and SS for internal validity, and there was high consistency of interpretation between researchers.

4.7.3 Online qualitative questionnaire

Data were analysed descriptively (for categorical data such as the scaled responses) and thematically (for free text responses) according to the procedures outlined above for interview data. Again, coding and interpretations were cross-checked by PKD and SS.

5 Findings: Initial survey and measured usage



5.1 Initial survey findings

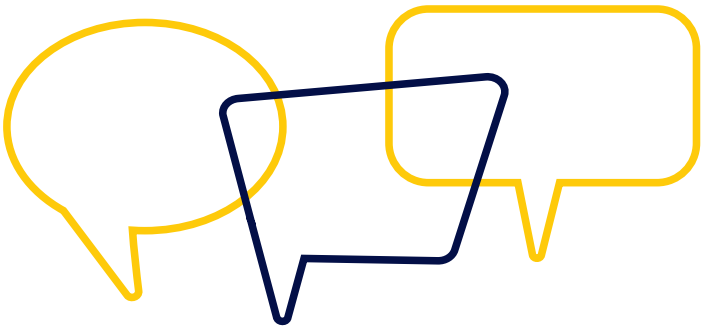
Key findings from the initial survey are presented in Figure 3 (reporting period June 2021- October 2022)

Figure 3:
Initial survey responses

73% felt confident in knowing when a patient is at risk of cancer	**79%** had a 2WW referral questioned or refused in previous 12 months
55% felt confident in knowing when pathways updated	**31%** of clinical staff were unaware of the safety-netting process for 2WW in their practice
14% Knew which direct access investigations are available in IES ICS	**8%** were aware of a specific case where safety-netting failures led to a delayed diagnosis in the last 12 months

The majority of clinicians (73%) reported confidence in assessing whether a patient is at risk of cancer, and just over half (55%) indicated that they keep abreast of changes in the referral pathways produced by NICE. However, a significant percentage of clinicians may be using out-of-date knowledge when making decisions about cancer referral, as they are not able to keep abreast of guidance produced by NICE. These findings may contribute to the high percentage of clinicians (79%) reporting having had a 2WW referral refused or in the previous twelve months. These findings point to need for support with 2WW referrals. With regards to safety netting, a significant percentage (31%) of clinicians (and other users) were unaware or uncertain of the safety netting procedures in their practices, Again, these findings indicate the need for support for safety-meeting. Some of these findings are further replicated in the qualitative study (see Section 6) and have implications for the adoption and future development of C the Signs.

6 Findings: Interviews and online questionnaire



NB Findings are reported for all participants, except where we have indicated findings pertain to clinicians only. Findings for the interview and questionnaire are combined, unless otherwise stated. Quotes are labelled, as CL for clinicians and PA for Practice Admin staff (including practice managers), for interview quotes clinicians are also given a number (e.g., CL1)

6.1 Sample characteristics

Due to difficulties in recruitment, in part due to disruptions caused by the Covid-19 pandemic, the actual sample for the interviews was smaller than the initial targets (see 4.2.1). It was therefore necessary to adapt the interview questions to form an online qualitative questionnaire to send out to a larger number of GP sites. (Additionally, due to the difficulties described above, the final study cohort involved clinicians and administrative staff in GP surgeries only). Table 5 (see 6.1.1) details the final sample characteristics, settings, and numbers of participants for both the interviews and online questionnaire.

6.1.1 Staff groups

Five people (three GPs, one practice nurse and one member of the practice admin staff) from one GP practice, were interviewed. Ten people (six GP partners, one locum GP, one paramedic and two practice admin staff) responded to the questionnaire. There were no practice nurse/advanced nurse practitioner responses for the online questionnaire (see Table 5).

Table 5:
Online qualitative questionnaire: example questions

Staff group	Interviews	Online questionnaire	Total
GPs	3	6	9
Practice nurses	1	0	1
Practice admin	1	2	3
Other	–	2*	2*
Total	**5**	**10**	**15**

* 1 locum GP, 1 paramedic

6.2 General practice experience

The participants had between 1.5–38 years' experience in general practice. Most (n=10, 67%) had been in general practice for twenty years or longer (mean = 29 years). Five (33%) participants had less than ten years' general practice experience. Most participants (n=14, 93%) indicated that they make, or were responsible for, 2WW referrals (either as decision making for a 2WW referral, ensuring the timely relaying of referrals to the appropriate hospital department, or adequate follow up of referrals as part of safety netting procedures). Only one GP indicated that they did not make regular referrals (defined as once per week on average).

6.3 C the Signs: Factors supporting adoption

Five main factors supporting the adoption of C the Signs were identified:

- C the Signs is easy to use and effective, with improved user experience;
- C the Signs is reliable in supporting clinical decision making;
- C the Signs has useful features, such as the referral process, auto-population, automatic notification to patients, and the dashboard;
- C the Signs is perceived to be useful and beneficial;
- C the Signs is useful for supporting clinical decisions through prompts and suggestions.

These factors identified benefits of C the Signs with regards to its perceived and actual usefulness and effectiveness, particularly in comparison to previous systems and regarding clinical decision making. Each of these factors are described in detail below.

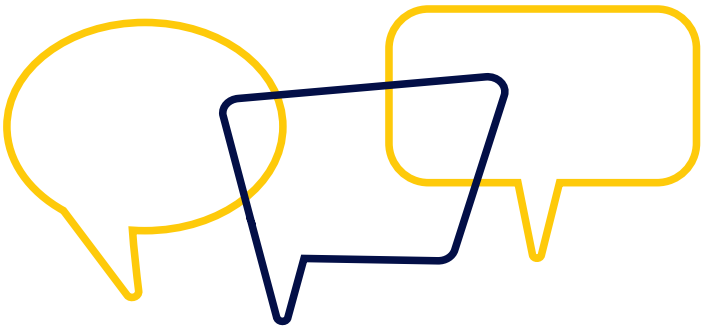
6.3.1 Easy to use and effective, with improved user experience

Although it was not our intention to compare C the Signs with other decision support tools, clinicians naturally made these comparisons during the initial interviews. These comparisons with previous systems were further addressed in the online questionnaires. Ease of use, effectiveness and user experience of C the Signs were explored in both the interviews and online questionnaire. In the interviews, we asked these questions of clinicians only, whilst in the online questionnaire we had responses from both clinicians and practice administrative staff.

Notably, ease of use, user experience and the user interface of C the Signs were noted as an improvement on the previous SystemB by some clinicians. Clinicians referred to C the Signs as being intuitive and having a cleaner and friendlier user interface than SystemB and providing an improved user experience overall.

It wasn't bad before. … You get so used to your system, don't you? But I like how it's very easy, you click and you get the tick rather than having to go into a box to check it. … I like how it's displayed. … I would rate it is good, and I think it has potential to be even more really good. I like the layout. (CL3)

It's very simple. … It [System B] just looked so much wordier and I think that then can overwhelm you because we need such clarity with these two weeks. … C the Signs has got good clarity. … I like the layout. I think it's a nice and it's an easy click. (CL3)



From a referral point of view, it's very easy, very straightforward. … It is very, very simple and easy to do [compared to previous system]. (CL3)

C the Signs seems clearer set out. It's just nicer to look at … and user wise, it's friendlier. … I think it's very clean to look at, it's straightforward, it's less fussy than the other systems and easy to navigate, very easy to navigate. I think the auto population of the two week wait referral form's helpful. … In kind of interface and user wise, it's friendlier and there's not a lag or delay which there is with System B. … It seems a bit more robust and simplistic in terms of its use. (CL4).

Clinicians also suggested that it was highly effective in its purpose, i.e., for making a 2WW referral. This is indicated in the assessments of effectiveness provided by participants across the data (questionnaire and interviews). Notably of the eight clinicians in the online survey, Six (75% of clinicians in the online questionnaire) regarded C the signs as either *effective* (4, 50%) or *very effective* (2, 25%). One (12.5%) clinician in the online questionnaire indicated, *neither effective or ineffective* to this question and one clinician (12.5%) did not provide a response to this question. One member of the practice admin team indicated *effective* whilst another indicated *very effective* to this question. In the interviews, one clinician provided a rating of 8-9 out of 10, whilst other provide positive assessment in their qualitative statements indicating for example:

I think C the Signs is really intuitive. (CL3)

it is efficient and effective, yeah. (CL2)

In particular, participants identified the robustness of C the Signs compared to SystemB, noting that it is not as clunky or prone to crashing, and suggesting that this might minimise the potential for errors in the 2WW referral which had been problematic with SystemB, as illustrated below:

Interviewer: ***And how did you find that [System B]***

There have been issues as it's quite clunky, it's quite slow. … One of the major problems with it recently has been when you load it up, when you've got patient note opened, it very often has a previous patient loaded in the details, even if it's something you looked on, looked up a while – like an hour ago or something like that. … And you, you go ahead and like, fill it, all your forms, and then it just says this is another patient … and then you realise and then it all gets deleted and stuff. … We've had referrals going, are you sure it's this person? … You know, women going for … prostate things and stuff like that. … It keeps happening even if you correct it … it still loads up that historic patient and you have to waste it. … A few referrals have gone off to the referrals team. (CL4)

I haven't had problems with C the Signs, so I think in terms of it hasn't crashed, hasn't lost my work, hasn't done anything like that. It's not delayed. It seems a bit more robust and simplistic terms of its use. … It seems to work well, I think. (CL4).

6.3.2 Reliable support for clinical decisions (clinicians only)

Across the data sources, interviews and online questionnaire, 10 out of 12 clinicians (83%) assessed C the Signs as reliable. In the online questionnaire, participants were asked about the reliability of C the Signs in helping them to make a clinical decision. They were given a free text option to respond to. All clinicians (n=8, 100%) responded and the majority (n=6, 75%) gave a positive qualitative assessment (see Table 6). Two clinicians (25%) indicated that 1) they were unsure about reliability or 2) they were not using 'that part' of C the Signs.

Table 6:
Reliability of C the Signs in supporting a clinical decision

How reliable is C the Signs in helping you to make a clinical decision?	Free text responses
	I don't use this part Good Very reliable Not sure Succinct list It is good Very useful if needed Very

In the interview, all the clinicians (n=4 80%), asked about the reliability of C the Signs also gave a positive assessment. One (25%) provided a rating of 8 and another (25%) provided a rating of between 8 and 9. The other two clinicians in the interviews, simply indicated qualitatively (e.g., by responding yes) when prompted about reliability. One GP indicated reluctance to give a perfect ten score on the grounds that nothing is perfectly reliable:

Interviewer: ***How reliable do you think it is? In terms of helping, you in recognising cancer signs.***

I'd give it an eight again - nothing is 100% reliable. (CL2)

Similarly, in both the interviews and questionnaire, participants assessed C the Signs as performing according to their expectations. In the questionnaire, five (62.5%) clinicians indicated this expected level of performance. Two clinicians (25% of clinicians in the questionnaire) said it did not perform according to their expectations, but no explanation was given in the free text (as previously noted 1 clinician indicated that they were not using C the signs regularly). All seven clinicians who indicated using C the Signs regularly said there was nothing about C the Signs they did not understand. The majority (n=6, 75%) also indicated that they did not feel that there was anything in particular missing. However, one participant (who responded positively to this question) also providing the following freetext comment, which might be interpreted as a suggestion of how C the Signs might be further developed and to enhance current decision processes, perhaps adding to its offering:

As it is, nothing earth shattering offered but if it offered a screening tool for potentially high risk for cancer, but not referred patients, it would be useful.

6.3.3 Useful features: Referral process, auto-population, automativ notification to patient and dashboard (clinicians only)

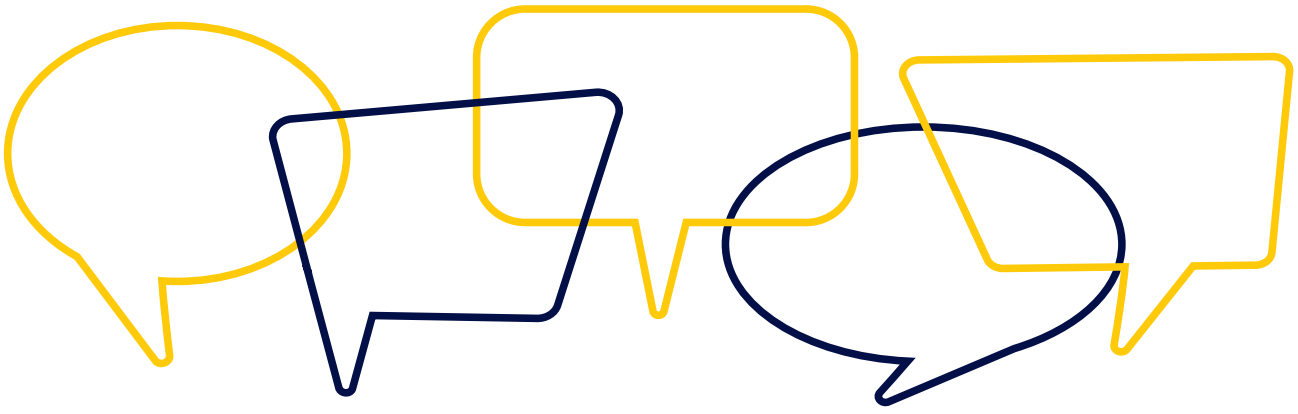
A number of useful features of C the signs were reported in both the interviews and online questionnaire. In the online questionnaire, two (25%) clinicians said that there were useful features, identifying these are the 'referral process' and 'ease of use' respectively. More elaborate answers were given in the interviews. Two (50% of clinicians in the interviews) clinicians spoke about the auto-population of information from previous consultations as a useful feature, preventing duplication. However, it should also be noted that one clinician spoke about this feature as an irregularity and potentially problematic for patient confidentiality, with duplication being seen as a risk to the adoption of C the Signs (See 6.3.4). One clinician spoke about the automatic send of follow-up information to patients as being useful, particularly as this task can be forgotten. This clinician also spoke about the dashboard of C the Signs and liked that this feature enables them to see all cancer referrals made in the practice. These features are clearly viewed by this clinician as facilitating effective safety netting and align with the definition of safety netting given in 2.1 of this report, that is, as enabling active monitoring [and communication with patients] of patients after consultations.

What I also really like [is that] C the Signs populates the last few consultations. Normally my consultation is the referral letter. It's got all the information there and I have to duplicate that on DXS. So that's some advantage. (CL3)

I think the auto population of the two week wait referral form's helpful. (CL4)

I like the fact that it sort of notifies the patient 'cause sometimes I used to forget to give the patient the literature about the two week wait so it does that automatically. I think that connects with their phone and sends that. (CL1)

I like that I can go in and see all the referrals that have been made where they're sitting on the dashboard as well. I like that feature. (CL1)



6.3.4 Perceived usefulness and benefits: Facilitates better safety netting and auditing; useful for supporting clinical decisions through prompts and suggestions

Perceived usefulness and benefits were also explored in both the interviews and online questionnaire. In response to a question regarding perceived benefits for adopting C the Signs in their practice compared to previous procedures, a mix of positive and negative responses were received from six (75%) of the eight clinicians in the questionnaire (see Figure 4).

Figure 4:
Comments about benefits of adopting C the Signs

Benefits to adoption	No benefit to adoption
Safety netting for patients DNA is better. Minimise the missing and referral of a patient with suspected cancer. Audit will become easier. Effective at monitoring those with confirmed CA	Great system. why change [reference to previous system] This has been extensively discussed in-house and clinicians do not see where the value-added proposition is.

As with the comments about useful features, discussed in 6.3.3, the positive responses about usefulness also suggest favourable assessment of C the Signs as enabling better safety netting of patients through monitoring, as well as facilitating auditing. (The negative responses, reported by two (25%) of clinicians in the questionnaire, suggest, that these clinicians [and others in one practice] did not appreciate the added value of C the Signs). In the interviews, auditing was also spoken about as an advantage of C the Signs compared to previous processes for auditing by one clinician:

I'm sure there are [advantages] in terms of monitoring the figures within the practice and that side of it, which I haven't looked at on the dashboard. … I'm sure there must be audits advantages. … I'm sure that must be useful. (CL2)

Others were non-specific about the usefulness of C the Signs, when asked this question explicitly, whilst at the same time expressing a favourable assessment or rating, in this latter regard, a lack of familiarity with C the Signs was expressed by two clinicians (50% of clinicians in the interviews) and was felt to be restricting them form discovering other benefits and usefulness:

Yeah, it [C the Signs] is very useful. … Then you're gonna say, well, what [would] make it more useful, but I don't know because I don't know what the technology can do, but it's fine. It's very fit for purpose. (CL3)

I'd say like eight or nine but like I say I wish I understood the features a bit more to utilize it even better because I think it really is a good system (CL1)

Some particularly relevant benefits of C the Signs were articulated when the participants were asked if they had anything else to add about the evaluation or about C the signs, in the interviews.

Three clinicians (75% of clinicians in the interviews) emphasised the usefulness of prompts and suggestions offered by C the Signs: for example, to request blood tests; to consider different pathways (in the case of less commonly seen cancers, for example); and, the usefulness of being able to 'ask' the technology for suggestions by simply indicating a sign the patient presents with. They spoke about these features as supporting their clinical decisions, as illustrated below:

When I was using the systems when it was coming up with the several different options, I know I've cut out using it that way. But sometimes that makes me think, oh yeah, I haven't requested a CA 125, I need to do that, so for example, a blood test that I hadn't thought of, that it was coming up with. So yeah, I'd say it is useful with its prompts. (CL1)

I particularly like how you can go into C the Signs and just pick out OK or if someone's just gotten low MCV. … I think that's a really useful tool. (CL3)

C the Signs definitely does sometimes suggest different pathways that you could go down, like haematology or gastro or nonspecific. And then I sometimes think oh, actually, you know – are they a bit more non-specific? Is that really gastro? I haven't thought about it – which you wouldn't have with SystemB because you're the person finding the form you want. (CL4)

Note, not all clinicians seem to be aware of the capabilities/functions, of C the Signs. CL1, (for example, in the below quote) discussed a 'missing' feature (e.g., they suggested that it would be useful to be able to indicate a 'non-specific' sign such as weight loss or tiredness and that the AI might then suggest a cancer pathway to explore further), as exemplified below, whereas these kind of prompts seem to be what CL4, in the above quote, indicated as a benefit of C the Signs:

Oh the vague symptom patients … that is where it would be really useful as well. You know, people who just come in who might have like a vague symptom and you're not really sure where to go with it. If I understood how to use that system approach a bit better, I'd probably picked up more with them. (CL1)

… put in maybe tiredness, the weight loss, something else and … then it would come up with options of like, you could look at the urological system or you could look at the lungs and these are the tests you can request. If I understood, you know, that would be helpful. (CL1)

It would therefore seem that further training to enhance knowledge and understanding of the full functions of C the Signs is warranted.

6.4 C the Signs: Factors limiting adoption

Five main factors limiting the adoption of C the Signs were identified:

- Clinicians' high familiarity and confidence with cancer signs and symptoms means that they sometimes bypass functions of C the Signs; revert to clinical judgment and sometimes use C the Signs interchangeably with SystemB
- The added value of C the Signs (compared to SystemB) was not obvious to some clinicians and impacted upon its usage.
- Clinicians reported that they were not using C the Signs to its full potential due to unfamiliarity and lack of understanding of some features
- Clinicians encountered some challenges when using C the Signs which, which can present risks to adoption;
- Reported risks to adoption by the PCN include; need for integration with the clinical system; of adopting C the Signs.

These limiting factors concerned the experiences and views of clinicians, particularly when comparing C the Signs to previous systems. Each of these factors are described in detail below.

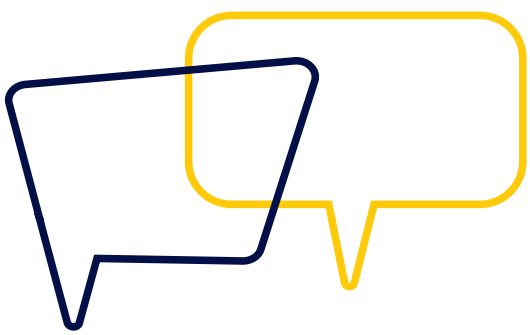
6.4.1 Clinicians confidence and familiarity with cancer signs and symptoms influenced how they used C the Signs

Cancer referrals are dependent on the decisions of clinicians, which can be complicated by several factors (see 2.1.1). As a way of understanding the utility of C the Signs in helping clinicians to recognise the signs and symptoms of cancer and make appropriate referrals, we aimed to get an insight into how these clinical decisions are made and the role of clinical decision tools.

We first asked clinicians to indicate how familiar they were with the different cancer referral pathways and investigations, with and without using a clinical decision tool (see Table 7).

Table 7:
Clinicians' reported familiarity with cancer referral pathways

	Familiar / very familiar n (%)
Without a clinical decision tool	8 (100%)
With a clinical decision tool	5 (63%)



We next asked them how confident they were in deciding if a patient meets the criteria for referral, with and without a clinical decision tool (see Table 8).

Table 8:
Clinicians' reported confidence in deciding if a patient meets the 2WW criteria with / without a clinical decision

	Confident / very confident n (%)
Without a clinical decision tool	6 (75%)
With a clinical decision tool	7 (88%)

Finally, clinicians were asked to indicate the extent to which they rely on clinical decision tools when making a cancer referral. The response options were: don't rely; rely a little; not sure and rely a lot (see Table 9).

Table 9:
Clinicians' reported reliance on clinical decision tools

Don't rely n (%)	**Rely a little n (%)**	**Not sure n (%)**	**Rely a lot n (%)**
2 (25%)	5 (62%)	1 (12.5%)	0 (0%)

These questions were conflated in the interviews. All clinicians gave a rating of between 7-10 out of 10 regarding their familiarity with the different cancer pathways and their confidence in deciding if a patient meets the criteria for a 2WW referral.

Probably like 8-9, and sometimes it's just absolutely obvious and you know, the kind of weight loss and bleeding from the bottom and you know that that's going to be a two week wait. Yeah, it's more of the rare occasions, you know, like haematological ones or head and neck things that might be a bit more, you know, I don't have those criteria [in my head]. (CL4)

I'd say probably eight there. I had a lady last week … who was in her 60s with a new onset dyspepsia. And I had a feeling that that was previously a, in itself, a two week wait criteria, but it bounced back out of C the Signs right, urgent community endoscopy referral … which presumably get done quite quickly but- so there are the occasional surprises - but then … I referred her for the investigation rather than for an opinion. (CL2)

These findings suggest that clinicians feel familiar or very familiar with the different cancer referral pathways, perhaps indicating trust in their ability to recognise or suspect cancer independently of using clinical decision tools to guide them. One GP partner indicated in the online questionnaire that their familiarity is supported through plenty of training on the NICE guidance; this participant also indicated that they are familiar with the pathways when both using, or not using, clinical decisions tools.

Similarly, another GP partner referenced their length of experience as relevant to the question of their familiarity and the extent to which they rely on clinical decision tools:

I am old. I trust clinical acumen over algorithms. (CL2)

These findings are upheld by the initial survey, where 55% of participants reported having confidence in the referral pathways and 73% of participants reported feeling confident in knowing when a patient is at risk of cancer (see 5.1).

However, the findings also suggest that some clinicians are less confident about making a referral decision and place some reliance on using a clinical decision tool to help guide them. This appears to be particularly true when deciding about rarer types of cancer.

Information gathered about clinical decision making through the interviews provide subjective accounts of how decision processes influence clinicians' use of C the Signs. Notably, clinicians report that they rely on their own acquired knowledge about cancer and knowledge of the different referral pathways when deciding to generate a 2WW referral. This knowledge enables them to bypass the predictive features of C the Signs, which might be more desirable, in order:

1. to save time considering the multiple referral options C the Signs might offer;

2. to avoid undesirable auto-population of irrelevant information.

In the case outlined below, this latter point may mean reverting to consulting SystemB for guidance when needed:

I'm probably mostly always already be thinking that it needs a 2 week wait referral. I don't tend to look at C the Signs to … actually go through clinical signs and then see is it a two week wait referral, I think I already know this is a two week wait referral so I need that form. Because I know I have the … most of the red flags in my head. … I wouldn't say I'm using it to decide whether I'm going to do a two week wait. (CL4)

I have to admit I'm still using sometimes when I'm thinking of a 2 week wait, or if a patient might meet the criteria like essentially like upper GI or lower GI with, you know, different anaemias or pains at certain different ages and things like that. I tend to go into [System B] just to have a look at the form and just see, oh you know - are they ticking that? Enough criteria or a criteria? 'Cause are they in between? Or based on their age or something like that - I'm still doing that. … I don't do it via C the Signs 'cause I don't want, I don't generate a form because it will populate with you. (CL4)

Interviewer: ***And what about the diagnostics and investigations?***

I normally by the time I'm generating the form, I've done those investigations, where I've already generated it or asked for them. … It's rarely C the Signs telling me, oh, you know, do this, do that, even for, like, things like fit tests. … Like even head and neck, you know, they want a chest X-ray as well … It tends to have already talked to the patient and you come up and then I'm just generating the form afterwards [so] they're the investigations I'm wanting. (CL4)

I tend to end up doing the direct referral so just putting the form on … I don't think I'm using it to its full potential. So the sort of artificial intelligence level where it tells you what you know when you've got three or four different systems you could be looking at, I know I'm not doing that. … I don't really understand what I'm doing with that… I know the NICE criteria, I know what I'm sort of thinking after examining the patient, I'm still doing it kind of in an old-fashioned way, still relying on what I think it is rather than the artificial intelligence side of it. (CL1)

So I think initially, it was time consuming 'cause I was trying to go in through searching the system, which was then coming up with lots of different referral options, so it could be urology … But then what I did was I did cut the corner and started doing the direct referral myself. (CL1)

6.4.2 Lack of familiarity restricted clinicians from using C the Signs to its full potential

By their own admission, clinicians had reduced familiarity and understanding of C the Signs. Furthermore, time constraints prevent them from becoming familiar with it and using it to its full potential. There was suggestion that, in addition to the training they received on the launch of the system, having protected time and face-to-face training would help them to familiarise with the system better. These thoughts are illustrated in the quotes below.

So I just saw her [my colleague] doing it and you know, just come out and just searching in the bar and C the Signs and she just brought up- and quite quickly and I was thinking, oh, actually I didn't do that. … I haven't sat there and played around with it too much. I've just used- it to actually generate forms when I needed them … But now I've seen- actually now seen my colleague … I might just see how that goes. (CL4)

[C the Signs] has massively more potential than what we're all using it for. And if we could have protected time to really navigate it and then have a, you know, a review on it, then I think that might be a way of getting, you know, colleagues to use it more. … I don't feel we use it optimally, but that's a time capacity issue. (CL3)

But actually having someone come and try out on a few test patients … I think that would have made it easier for all of us to use it to its full potential. I think we're all probably doing the basics … but because of the time pressures … I have cut corners to keep the time, 'cause you can't … run behind. … If you don't understand, you will avoid some features. … You tend to avoid using it to its full potential if you don't really understand it. (CL1)

These observations suggest that motivation to become more familiar with using C the Signs might be affected by time constraints, the clinicians having greater confidence and reliance on clinical acumen than on clinical decision tools (i.e., trusting their own judgement over C the Signs), and reduced confidence and familiarity with technology. This latter impression is supported by the following quote from the interviews:

I think sometimes the younger generation forget that we're not as computer savvy. … I know enough to get around and do my job properly and everything but it's not something that necessarily always comes naturally to old people, and you tend to avoid using it to its full potential if you don't really understand it. (CL1)

6.4.3 Comparable function to previous system: added value not obvious

Participants were asked to rate the following:

- Ease of use for making a cancer referral, using either C the Signs or SystemB;
- Effectiveness of making a referral, using either system.

In the questionnaire, they were prompted to respond on a 5-point scale to the statements:

1. C the Signs/the previous system was easy to use;
2. I consider C the Signs to be…

The response options, scoring and results are given in Table 10 below, with higher scores indicating a more positive assessment of either C the Signs or SystemB.

Table 10:
Ease of use and effectiveness of C the Signs and SystemB

	Ease of use		**Effectiveness**	
	C the Signs/the previous system was easy to use: ☐ 1. Strongly disagree ☐ 2. Disagree ☐ 3. Neither agree nor disagree ☐ 4. Agree ☐ 5. Strongly agree		I consider C the Signs to be… ☐ 1. Very ineffective ☐ 2. ineffective ☐ 3. Not sure ☐ 4. Effective ☐ 5. Very effective	
	C the Signs	**System B**	**C the Signs**	**SystemB**
Mean score	3.8*	4.1	4.2*	4.3
Range (min-max scores)	3-5	3-5	3-5	4-5

* One GP did not respond to this question.

These ratings and assessments are consistent with those given in the interviews regarding ease of use and effectiveness (see 6.2.1).

Notably, the findings indicate that both C the Signs and SystemB are regarded as effective clinical decision tools, with the mean scores for both systems being above 4. Likewise, both C the Signs and SystemB are regarded as easy to use, with the mean scores being close to, or above 4. Comparatively, C the Signs is rated slightly lower in terms of effectiveness, as indicated by the lower range and mean values for this questionnaire item, and also slightly lower in terms of ease of use.

The below quotes from the interviews further support these findings:

I think they [C the Signs and SystemB] are quite similar. … The general feeling is there's not a lot of difference with things you have to do. It does work very smoothly, C the Signs. (CL2)

It [System B] gets the job done. … It [C the Signs] would be similar and gets the job done. (CL4)

The implications for the adoption of C the Signs are relevant; as indicated by the two 'no benefit' responses to our question about perceived benefits for adoption of C the Signs, the added value is not obvious. NB one participant expressed a view that [SystemB] is a great system and therefore *'why change',* whilst another directly stated that discussion among colleagues had concluded that the value added proposition of C the Signs is not obvious to them (see 6.2.4). This presents a limitation for adoption which might be compounded by further reported challenges and risks, as presented below.

6.4.4 Difficulties and challenges encountered by clinicians

The uptake of C the Signs might also be impacted by difficulties and challenges experienced when using this system, which were explored in both the interviews and online questionnaire. We asked participants to detail any challenges they experienced when making referrals using SystemB. As with the exploration of ease of use and effectiveness, comparisons with previous systems were made. Nine of the 10 participants in the online questionnaire (90%) participants responded to the question about challenges with SystemB. Two areas of difficulty were reported by two participants (see Table 11) and seven (70%) of participants reported that they had no issues (i.e., typed none) with SystemB. Eight (80%) participants responded to the question about challenges they experienced when using C the Signs in the online questionnaire. Five areas of difficulty were reported by five (50%) of participants and two participants (20%) reported no issues (i.e, typed *none* or *nil*). Two (10%) participants did not respond to this question. One (10%) participant reiterated improvement in the referral process, as previously discussed. Table 11 details the difficulties and challenges (and one positive comment (italicised) clinicians reported for the two systems in response to this question.

Table 11:
Reported difficulties and challenges for SystemB and C the signs

SystemB	• No trace of a previously booked appointment on the system – 'patient could have slipped through the net' • SystemB crashed - uploaded wrong patient data
C the Signs	• Not integrated with clinical system so I don't use it • Takes longer and more information required • Nobody has embraced C the Signs in the practices I work in • We now audit two ways of doing it • C the Signs just gets in the way • This [C the Signs] has been a lot better for tracing referrals and attendance etc

In the interviews, significant problems were noted: (1) when making a referral through C the Signs; and, (2) with C the Signs not suggesting a particular test which the clinician felt was necessary.

Actually, I was doing a gynae referral … and I was trying to do it by a C the signs and because when you click on investigations and say raised CA125 … it doesn't take you to a gynae referral, any two week wait. Before it generates it says you should do an ultrasound and we've done the ultrasound but … we didn't have any information, so you can only tick CA 125 and that the ultrasound looks suspicious, which it didn't … they couldn't see the ovaries so I couldn't generate a two week wait gynae referral form because I couldn't tick both. I can't remember how I got round it. … I think I just ticked on something … and then unticked it when I got the referral form. … That's why I gave it an 8 or 9 because … that was just one of the issues I had recently. (CL4)

The same clinician noted an irregularity when asked about performance in terms of potentially breaching safeguarding and patient confidentiality:

Interviewer: ***How do you find how do you find it in terms of performance?***

There is one section where I think it lifts from the patient's journal entries and puts it into C the Signs. … And sometimes you have to edit those because they're irrelevant and you shouldn't be sending other information … because I've even had to take out things that are like safeguarding …and it's like mentioning the family and things … or even irrelevant things about other symptoms. … I have definitely had to delete it all and just put in the relevant stuff. I can see if people are in a rush or they're behind, they might just send that form and then all that information is going and it shouldn't. … If it's mental health stuff, then that's really bad. (CL4)

6.4.5 Reported risks to adoption in the PCN (clinicians only)

Whilst the majority (n=6, 75%) of clinicians in the online questionnaire did not foresee any risks for adoption of C the Signs in the PCN (i.e., typed no), one clinician (12.5% of clinicians in the questionnaire), referenced 'duplication', [i.e., between] the *clinical system [SystmOne] and C the Signs for consultations.* We are not certain that this refers to the same type of duplication posed by the auto-population feature of C the Signs, which we have previously discussed; however, integration with SystmOne was later referenced by this, and another clinician as a suggestion for improvement in the final part of the questionnaire. Thus, two clinicians (25% of clinicians in the questionnaire) referenced integration with SystmOne as suggestions for improvement of C the Signs. One clinician (12.5% of clinicians in the questionnaire) referred to the internet "being undeniably unreliable" in response to the question about risk to adoption in the PCN, presumably suggesting there is reliance on the internet when using C the Signs and that this is problematic. The same clinician referred to the internet speed in response to the question about suggestions for improvement (see figure 5).

Figure 5:
Suggestions for improving C the signs

Do you have any suggestions for improving C the Signs?
Please integrate with clinical system
Integration with S1 to reduce keystrokes for completing and filing form
Internet speed and too many new additions e.g., fit tests etc.

Notably, internet speed was also reported as a challenge for clinicians when using SystemB and is perhaps beyond the control of C the Signs. However, it being noted would suggest some particular relevance for the evaluation of C the Signs. Our inference from these reported risks to adoption in the PCN is that some clinicians were finding it challenging working with C the Signs as separate application outside the clinical system and would have preferred it to be fully integrated with the clinical system/ would appreciate better internet speed. Again, it is not clear if SystemB is a fully integrated into the clinical system, but it would seem that C the Signs is assessed, by some clinicians, as not enabling them to work as efficiently as they would like to or in the way that they have become accustomed to working with regard to integration with SystmOne and/or internet speed.

A particular risk was identified in the interviews relating to the sending of tasks between clinicians and the practice admin team. It was emphasised that vigilance is required to ensure that referrals are sent (for further discussion, see 6.4.2). Furthermore, as previously noted, one clinician assessed the auto-population feature of C the Signs as an irregularity and emphasised their concern that it has the potential to breach patient confidentiality. Notably, this resulted in this GP modifying the way they use C the Signs.

6.4.6 Peer adoption

In response to an invitation to comment on the evaluation overall, most participants indicated that they had nothing else to add. Two participants (20% of all participants- clinicians and practice admin.) in the questionnaire, put forward views regarding a lack of benefit to adopting C the Signs. One participant commented that C the Signs not helped their practice but that a full integration into SystmOne might be useful, involving more use of the AI capability, to analyse free text and coded entries (? Clinical Read codes) applied in SystmOne which could then alert clinicians [to suspect cancer]. Note, this was a different participant to the two others that previously indicated integration with SystmOne as desirable (please refer to figure 5)

Sorry I don't feel C the Signs has helped my practice, would be more useful if fully integrated into SystmOne. An AI program assessing our free text and code entries into the electronic record, then alert the user and the cancer team. (Clinician)

Another participant's comment was particularly insightful when in the context of usage data (see 5.2) suggesting a pattern of low, mid and high users. This participant implied that C the Signs has not received widespread peer adoption and from their understanding, use should be avoided. As below:

As far as I can see C the Signs has NOT been adopted by the practices I work in and I have been advised […] that I should continue using DXS 2WW referral letters. (Clinician)

This suggests that peer adoption might account for some of the measured usage patterns, i.e., low-using practices might influence others against using C the Signs. On the other hand, findings indicating that clinicians in high-using practices supported and learned from one another. Such peer influence is a general finding in the literature relating to technology acceptance and use,[1,9] as previously noted, and has been found to be useful in supporting adoption of change in the context of urgent GP referrals for cancer.[2]

In the final sections of this report, we provide further insights about the processes of making a 2WW referral and the processes of safety netting in GP practices. Whilst of relevance to C the Signs and the features it offers, these insights are most relevant for the strategies and policies at practices and the wider PCN level.

6.5 Insights: The 2WW referral

All participants were asked about procedures for making a 2WW referral before and after the introduction of C the Signs. As indicated throughout this report, overwhelmingly a SystemB proforma was used before the introduction of C the Signs. Some clinicians have started to use C the Signs alongside SystemB to a lesser or greater extent. Three (37.5% of clinicians in the questionnaire) indicated that they were not using C the Signs at all. These participants provided varying reasons: i.e., 1) they were awaiting integration of C the Signs into SystmOne; 2) C the Signs is not being used in surgeries they work in; and 3) they use SystmB because they find it easier. It is important to note that the questionnaire was distributed to all registered users of C-the Signs and was accessed through a link in C the Signs. Therefore, our interpretation is that these participants might have accessed C the Signs but were perhaps not using it for their consultations. Among the clinicians who reported current use of C the Signs (n=9, 75%, across the full dataset, interviews and online questionnaire), there was an indication that the procedures for making a 2WW referral was similar for both System B and C the Signs and involves a number of steps:

1. Using software that is integrated with their Clinical System, the clinician completes a specialism specific referral form.
2. This referral form is relayed to their internal referrals team (i.e., the admin team), through the admin IT system (eRS). Clinicians are required to generate 'a task' to alert the surgery referrals team that there is a 2WW referral pending.
3. The admin team pick up the task, and then send the 2WW referral to the relevant hospital department through the eRS system.
4. An additional step after sending a referral involved scheduled follow-up checks carried out periodically, either monthly (reported by two practice admin and one GP) or weekly (reported by one practice admin). This is to ensure that referrals have been actioned, as part of safety netting procedures.

6.5.1 Potential for errors

Whilst describing the procedures for making a referral as relatively straightforward, the potential for error in the 2WW referral process was highlighted, particularly involving steps 2 and 3 outlined above. In particular, two clinicians described potential and actual delays in sending referral forms, as discussed below:

A few times, I think it has been that someone forgot some to do the task from SystmOne as well, and then later on the referrals team see a form just sitting in [System B]... ..... I think then there was team have come back saying there's a two week wait, urology referral on the system, do you want to send it or is that supposed to be sent? I have come in the next day ... when ... either a locum or another GP isn't working, they have alerted like if I'm on the on-call doctor, another doctor, they just said this person has generated a form but they haven't sent it ... what do we do? ... We have to go and look at it and no, I think they meant to send it. (CL4)

The requirement to generate a 'task to admin' is a procedure which staff have become familiar with when using SystemB. Evidently, some clinicians have devised ways to moderate the potential for error in this step of the referral process by embedding double-checking procedures into their work. However, with the introduction of C the Signs, there was confusion as to whether or not there was a need to generate 'task to admin' or if the system automatically sends this task. During the interviews some months after the introduction of C the Signs, participants described being confused about this:

Interviewer: ***Are there any risks that you see from using it or any sort of problems in terms of sort of safety netting or the other referral process?***

The only thing I don't understand which I'd like to know a bit more about it, when I actually do the referral I send it, but then I think I have to task the medical secretary still 'cause they send it on a different system. I can't remember what they call it, ERS or something. ... So I never know. So for example, last week we had an unusual situation where both the medical secretaries were off, one was unwell and one was on annual leave, and I was the only person in the building who was using C the Signs, and the manager came and asked me, do you know if it's gone? So I could check the dashboard and say, well I can see referrals in there but I don't know whether they've been sent on the ERS system. (CL1)

But for C the Signs, I don't know how that's working. I don't know what they're checking 'cause it ... when I do generate a C the Signs referral, I still send a task in SystmOne team saying send a two week wait. And I'm not sure what they do with that or how they check it. (CL4)

In the quote below, the CL4 notes that clinicians have been historically requesting a feature for their clinical referral systems that would automatically alert their internal teams of a pending referral.

We always were saying why isn't just an automatic task that is generated. So you've done [a] two week wait referral. Do you want to alert the referrals team? And that never came into all when it was just [SystemA] and when it changed to [SystemB], and even C the Signs, we're still, I think, we still quite aware we have to send a task ... to say can you send that two week wait referral and it doesn't seem to be this automatic, you know, pop up that just says send the task referral. ...That would be so much easier. (CL4)

6.5.2 The importance of vigilance

These clinicians describe that vigilance is required to ensure the 'task to admin' (step 2 above) and referral from eRS (step 3 above) are sent. They also describe practices they and their team have adopted to double check themselves.

I think people are very conscientious of making sure that they alert the referrals team that they've done it two week wait. (CL4).

[I've] probably got that extra layer of safety. I used to always task myself to check where is the patient, what's going on afterwards. (CL1)

In terms of generating referrals and the referral team will, even if they don't get a task or anything like that, I think they're always every day at the end of the day, they search for any forms that have been generated and see if there's any urgents or two week waits, you know, that the clinicians have forgotten to do a task about or alert them to. So I think they do that every day at the end of each day or every week at least. (CL4)

It is reasonable to expect that with perseverance and 'trial and error' clinicians would acquire better understanding of how C the Signs works, and the issue of whether 'task to admin' has been sent would be resolved overtime. For initial users, however, such uncertainty could lead to reduced confidence in C the Signs and discourage use and adoption. The potential for error might be addressed through confirmatory notification when referrals are actioned (either through C the Signs or from the practice admin team) so that clinicians can be confident of their 2WW referral. It might be valuable for this or similar strategies to be considered by individual practices and for the wider PCN.

Potential errors in the follow-up safety netting process (step 4) are described as being minimised by using C the Signs by one practice admin as it is "a lot better for tracing referrals and attendance" compared to SystemB, where there was potential for patients to "slip through the net" as the system could lose traces of booked appointments.

6.6 Insights: Safety netting

All participants were also asked to identify the safety netting procedures in their surgeries, to rate the effectiveness and efficiency of these procedures and to indicate their responsibility for safety netting. Although recommended in clinical guidelines, safety netting definitions are numerous and there is no consensus on when safety netting should be used nor on what advice or actions should be taken.[11] Through a literature review, Jones and colleagues[11] set out to identify and collate a number of procedures and processes, towards providing conceptual clarity and to propose a common approach to safety netting. Their review resulted in the following definition, which is useful for categorising the questionnaire and interview responses of this evaluation:

Safety netting is an essential process to help manage uncertainty in the diagnosis and management of patients by providing information for patients and organising follow-up after contact with a health professional. This aims to empower patients and protect healthcare professionals. Safety netting may be performed at the time of the contact between health professional and patient or may happen after the contact through active monitoring and administrative systems to manage results and referrals.

6.6.1 Reported safety netting proceedures

A range of safety netting procedures/processes were reported, according to the individuals' understanding of safety netting: involving: use of clinical systems; recording information on paper; recording information on a spreadsheet; asking patients to call surgery/referral point if they have not had an appointment; personal reminders to review follow-up letters; and, periodical auditing. According to the definition above, we have categorised as either,1) procedures/processes that aim to manage uncertainty in the consultation (e.g., providing information and organising follow-up at the time of contact with health professionals), and 2) procedures and processes that aim for active monitoring and administrative systems to manage results and referrals, after the consultation. Boxes 1 and 2 detail the responses.

Box 1:
Safety netting processes/procedures reported (online questionnaire)

Questionnaire responses
Management of uncertainty in the consultation (providing information and organising follow-up) • Ask patients to contact the surgery within a specified time if they have not received communication from referral point. (Clinician) • Ask patients to contact referral point if they have not received communication. (Clinician)
Active monitoring of results and referrals (after consultations) • Manual search of surgery clinical system to check if patients have been seen at the referral point. (PA) • Secretaries keep lists of referrals and monitor patient attendances with task to GP to review again, after 4 weeks. (Clinician) • Audit of referrals and discussions of new diagnosis to see if they have slipped up. (Clinician) • C the Signs leaflets, internal safety-net letters to patients; scheduled task to GP to follow up after 2 weeks and again after 4 weeks. (Clinician)

Box 2:

Safety netting processes/procedures reported (interviews)

Interview responses

Management of uncertainty in the consultation (providing information and organising follow-up)

- And I have this short type that says review RV in b if no better/worse, and that's my safety netting. I always say if you've not heard anything in two weeks, you must call us back. I don't know that we've got a process to double check that those two weeks are being picked up. (CL3)

Active monitoring of results and referrals (after consultations)

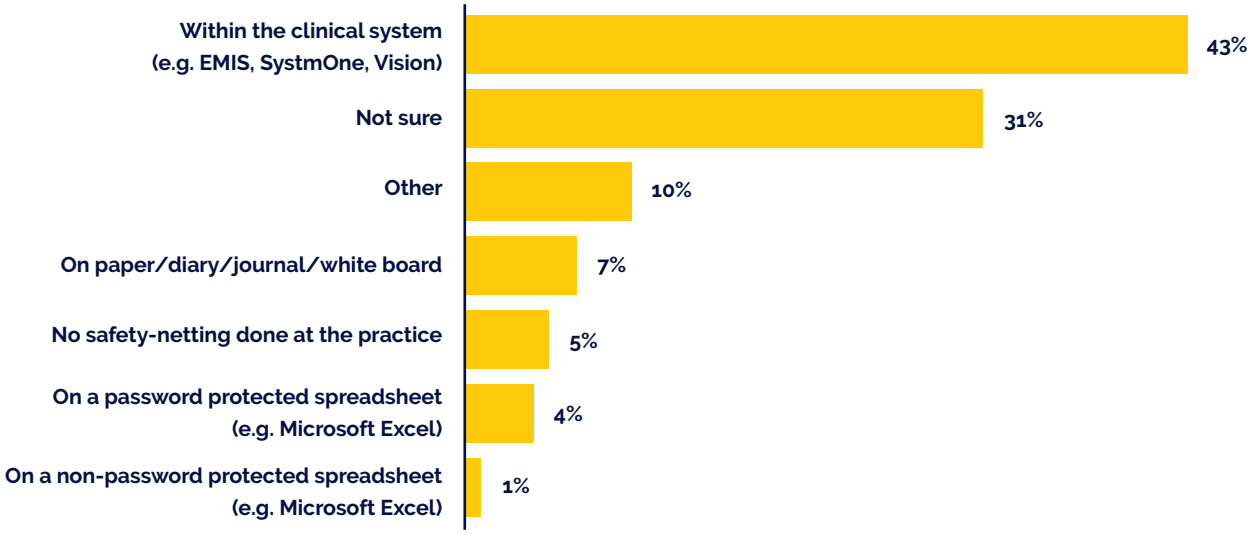
- Keep spreadsheet with dates of referrals and where it was sent to. Work through the spreadsheet periodically to ensure a clinic letter has been received. (PA)
- 'Task' the medical secretary to send electronic referral on their system. Medical secretaries keep a list where they keep an eye on all the two week waits: any information that comes back would come back to on-call clinicians. Personal additional safety layer - task own self on SystmOne to keep an eye on that person's record and look for follow up letters from clinic. (CL1)
- We [clinicians] always back up with task to the referrals team (in-surgery), apart from ensuring that the referral actually leaves the practice, that's probably all the safety netting we do. … Patients are well aware that they are going to be contacted and they would let us know if there was a failure on that. (CL2)
- We have like monthly clinical meetings and where we generally review any near misses or significant events, and it's very much, you know, our practice, it's very much not blame it (CL4)

Note: It is likely that practices use a combination of several processes/procedures, some of which may not have been identified by participants here.

Responses to the initial survey (see figure 6) also confirm that across the PCN practices use a range of clinical system and manual (spreadsheet) monitoring procedures for active monitoring after consultations and that procedures may vary by individual clinicians and at practice level too, with more emphasis on active processes/procedures to manage active monitoring after consultations.

Figure 6:

Reported procedures/processes for safety netting (initial survey, collated by C the Signs)



Interestingly, 5% of participants that took part in the initial survey (for the reporting period) reported that no safety netting procedures were carried out at their practice and a significant, 31% of respondents reported that they were *not sure* about the safety netting processes/procedures used in their practices. Despite this, all participants in the interviews, and (9, 90%) of participants in the online questionnaire, indicated that they have either shared or direct responsibility for safety netting, with just two (20%) participants (both clinicians) indicating that they were not responsible for safety netting (in the online questionnaire). In addition, the effectiveness and efficiency of safety netting procedures were rated highly overall (in both interviews and online questionnaire – see Table 12.

Table 12:

Perceived efficiency, effectiveness and confidence in safety netting procedures (all participants)

Efficient / very efficient n (%)	Effective / very effective n (%)	I am confident that patients with suspected cancer are adequately safety netted n (%)
13 (87%)	13 (87%)	13 (87%)

Thirteen participants (87%) across the data (interviews and online questionnaire) reported procedures to be efficient or very efficient. That is, seven participant (70% of participants in the online questionnaire), indicated procedures as efficient and a further two participants (20% of participants in the online questionnaire) indicated procedures as very efficient, whilst four, 80% of participants, in the interviews rated efficiency above eight out of ten. Two participants (13%), across the data, one in the interview and one in the online questionnaire, did not provide a response to this question. Similarly, 13 (87% of participants across the data) reported procedures to be effective. That is, six participants (60% of participants in the online questionnaire) indicated procedures to be effective and three participants (30% of participants in the online questionnaire) indicated procedures to be very effective, whilst four (80% of participants) in the interviews rated effectiveness procedures above eight out of 10.

One GP (20% of participants in the interviews) commented that procedures "seem to work okay" in the interviews. Participants were also highly confident that patients are adequately safety netted in their practices. Again, thirteen (87%) participants responded strongly agree (n=4) or agree (n=4) to the statement, 'I am confident that patients with suspected cancer are adequately safety netted', in the online questionnaire, and all (n, 5, 100%) participants in the interviews gave a rating of eight/above eight when asked to rate their confidence (these latter qualitative ratings are analysed and included as indicating high confidence in safety netting procedures in table 12)

Yet, the potential for errors and delays is also indicated. In the online questionnaire one practice admin made the following comment:

It's quite a lot of effort involved in that it's more a chasing game. … Sometimes we can't get through … leaving voicemails and sometimes we don't always get an answer. It can be like several weeks before we get a reply. …It's not very efficient … if we have to keep chasing information. (PA)

Three clinicians indicated the following sub-optimal consequences related to current referral procedures or safety netting procedures, including one potentially late stage, hospital diagnosis:

Cancer diagnosed in an OP clinic, yet patient not referred onto 2WW/cancer pathway.

No one checking patient attends their appointment.

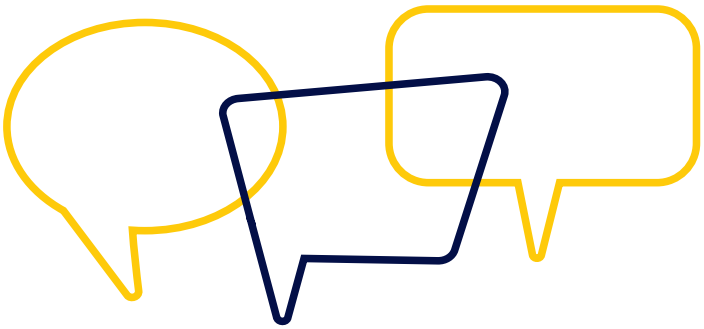
Over COVID, some red flags missed.

Further, a finding of the initial survey (see figure 2) was that 8% of participants were aware of safety netting failures that led to delayed diagnostics.

It appears that some clinicians have greater trust and reliance in the surgery processes and other members of the team, and a sense of shared, as opposed to direct, responsibility, whilst other clinicians have a heightened sense of responsibility for safety netting: e.g., by putting in extra layers of protection. Although intended to mitigate against errors, overreliance on other members of the team has the potential to lead to errors; i.e., there is potential for falsely assuming that tasks have been actioned or followed up by other members of the team, which can lead to delayed referrals. Furthermore, in some cases, 'task to admin' confirmation is not obtained, and this leaves clinicians uncertain whether tasks have been received and/or actioned, both in their practices and/or at the referral site.

These observations suggest that it might be beneficial to standardise safety netting procedures in the PCN, and for the PCN to adopt and encourage a culture of assuming direct responsibility for the safety netting of patients among all staff and particularly within-consultation information and follow-up advice. Notably, C the Signs aims to address some of the issues, by improving on the ability to trace referrals and attendance and by automatically sending follow-up information to patients after their consultation (representing management of uncertainty in the consultation, according to the categorisation and definition outlined above). More widespread adoption of C the Signs can facilitate standardisation of safety netting across the PCN. Thus, the introduction of C the Signs presents opportunity for the PCN to maximise the potential for monitoring results and referrals outside consultations, towards more standardised safety netting.

7 Summary and discussion



This study was designed to understand the value of C the Signs for supporting better recognition of cancer signs and symptoms, timely and appropriate 2WW referrals, and for improving safety netting processes in GP practices across the Ipswich and East Suffolk Primary Care Network. Findings relating to the perceived usefulness of C the Signs are consistent with clinicians' goals of improving outcomes for patients with suspected cancer. Notably, it is viewed as an effective, reliable and useful tool for supporting the decisions of clinicians with regards to making a 2WW referral. This is particularly true when clinicians are presented with signs and symptoms that might be vague or which could indicate lesser-known cancers. The user interface and user experience of C the Signs is also reported to be better than previous systems by some clinicians, and it is therefore viewed as easy to use. This is beneficial for limiting potential errors and assisting the overall process of making a 2WW referral. It is also reported to have some enhanced features when compared to previous systems, which have the potential to improve on in-house tracking of 2WW referrals, safety netting of patients, and PCN auditing. Such perceived usefulness has consistently predicted adoption and use of technological innovations among healthcare professionals.[12]

The perceived usefulness of C the Signs are … viewed as an effective, reliable and useful tool for supporting the decisions of clinicians with regards to making a 2WW referral.

Implementation of new technologies into healthcare systems is often met with 'resistance to change'.[13] More than simply implementing a technical change, the process requires consideration of how to facilitate people to adapt to change.[13] This requires understanding not only the device or innovation itself and how it impacts upon the organisation/system, but also factors related to individuals which might further influence intention to use and actual use. We have identified factors across these domains that limited intention to use and actual use of C the Signs.

When introducing new technologies, it is desirable for them to integrate with existing IT systems to enhance workflow and productivity.[13] This appears to have been given careful consideration in the development of C the Signs. However, in our study, there was an indication that some features of C the Signs might limit workflow. For example, an auto-population feature of C the Signs where patient information is pulled across from the clinical system into the 2WW referral form was viewed as useful by some clinicians; however, others viewed the same feature as potentially breaching safeguarding and patient confidentiality. As such, more work is required to edit out unnecessary pre-populated information. Clinicians reported avoiding use of the pre-population feature, opting to go straight to the referral form or to use the referral form of their previous system, thereby using C the Signs and SystemB interchangeably.

Likewise, some predictive features of C the Signs are reportedly not fully understood and are perceived as stemming workflow. This, alongside reported confidence in clinical acumen when making referrals, affects how C the Signs is used. This is not to say that clinical acumen is praised as superior or makes the use of clinical decision tools redundant. On the contrary, although familiar with the cancer referral pathways and highly confident in their ability to recognise if someone meets the criteria for referral, clinicians also value clinical decision tools to guide the 2WW referral process and support their decision making. However, when using C the Signs, some clinicians reported reverting to their existing knowledge and experience of cancer signs and symptoms and of making 2WW referrals in order to speed up the process; in doing so, they might ignore or bypass predictive features and go straight to the referral form.

Notably, clinicians reported that they do not feel they are using C the Signs to its full potential, and motivation to become more familiar with this system is affected by time constraints and reduced confidence with technology, more generally. Given that clinicians also had the option of using the more familiar SystemB alongside C the Signs, and that the two systems were rated as comparable in terms of 'getting the job done', it is perhaps unsurprising that many clinicians opt for familiarity; in this sense, sticking with SystemB requires less effort and assists in completing tasks more quickly. Therefore, there is a need for clinicians to become more acquainted with C the Signs to make better use of it. It is likely that a longer period of transition and adjustment to change is needed for clinicians to grasp the full potential of the system and realise the value-added proposition (e.g., how it enhances/complements clinical acumen more than SystemB). Additionally, more focused training and clearer guidance on how best to use the auto-population and predictive features of C the Signs might be areas to focus attention on.

It is likely that a longer period of transition and adjustment to change is needed for clinicians to grasp the full potential of the system and realise the value-added proposition (e.g., how it enhances/complements clinical acumen more than SystemB).

Initial reported usage, measured by number of referrals across the PCN, shows a pattern of low, mid and high usage. Although we did not assess patterns of cancer referrals before implementation of C the Signs, there is an indication that some practices are not using C the Signs at all whilst others are using it consistently, and it is evident that uptake and usage has been slower than expected so far. Our findings suggest that peer influence might be implicated in the patterns of use of C the Signs. For example, among the clinicians interviewed in the high usage practice, there was reported support and learning amongst colleagues for discovering and understanding features of C the Signs. On the other hand, where clinicians and practices are not using C the Signs, there is an indication that they might also influence others against usage. This information might be useful for future implementation strategies. First adopters and influential people might be instrumental in mitigating 'resistance to change' by promoting the benefits and added value of C the Signs to others and 'encourage[ing] them to reimagine the work itself.[13] A strategy of reinforcing social norms might also be useful; for example, a recent social norms strategy implemented in GP practices in Greater Manchester CCG reported by[2] resulted in a sizeable improvement in the performance of low referring practices (for cancer referrals

across practices in Greater Manchester). These practices made 17% more urgent referrals than before implementation of the strategy (ibid).

Our findings suggest that there is scope to improve upon 2WW referral processes and safety netting of patients with suspected cancer; i.e., both clinician error (inappropriate referrals) and steps in the referral procedures outside the clinical decision might result in delays. Notably, a significant percentage of 2WW referrals were reportedly returned or questioned. These anomalies might be addressed at PCN level, and also present opportunities for C the Signs. A further unexpected finding was that safety netting was not standardised across the practices that took part in the study, with potential for error in some of the safety netting processes used. For example, although having good intentions, a perceived shared responsibility for safety netting could contribute to safety netting tasks being overlooked. These might also be addressed at PCN level: for example, it might be beneficial for the PCN to adopt or encourage a culture of assuming direct responsibility for safety netting of patients amongst all staff.

There is scope to improve upon 2WW referral processes and safety netting of patients with suspected cancer.

7.1 Limitations

There are some limitations to report. Firstly, due to problems we encountered in recruitment, we had fewer participants than initially proposed and we did not speak to a representative sample of C the Signs users (e.g., we did not survey or speak to cancer hub specialists or patients/patient representatives). Secondly, also due to recruitment issues, we made amendments to the design of the study after our initial interviews with staff in one practice. We are confident that the amended questionnaire, combined with the qualitative interviews in one practice, captured the subjective views and experiences of the main users in accordance with the qualitative inquiry we intended. However, when reading and interpreting the findings, it should be borne in mind that the online questionnaire was anonymous and therefore we cannot categorically say that some participants who reported in the interviews did not also report in the questionnaire.

8 Recommendations

The following recommendations are offered regarding: 1) factors limiting adoption of C the Signs; and, 2) our insights about 2WW referrals and safety netting in the PCN.

- There is need for clinicians to become more acquainted with C the Signs. This might be achieved by utilising an innovation champion to work alongside clinicians and who can offer trouble-shooting support through a period of transition and adjustment (facilitating use of both systems), followed by a period of implementation with support (facilitating use of C the Signs only).
- During the transition period to using C the Signs, clinicians could be allocated protected time after 2WW consultations, to enable them to familiarise themselves with the new system and consult with colleagues and 'innovation champions' on its use, as required.
- Peer endorsement might improve uptake and use of C the Signs. It might be useful to utilise the experience of first adopters (high users) of C the Signs to demonstrate the added value; i.e., how it complements clinical acumen and workflow, and how it enhances the 2WW referral process.
- When a clinician sends a 2WW referral, they are not always clear if a 'task to admin' is required to action a 2WW referral or if the referral automatically goes to the referral site. Furthermore, without individualised reminders to follow up, they are uncertain whether tasks have been received and/or actioned at the referral site. These uncertainties should be addressed through: focused training; a 'task to admin' confirmation receipt; and, confirmation of receipt of referral from the referral site.
- Safety netting procedures should be standardised across the PCN, and unsecured safety netting procedures should be phased out. The introduction of C the Signs presents opportunity for the PCN to maximise the potential for monitoring results and referrals outside consultations, towards more standardised safety netting. The PCN might also encourage a culture whereby direct responsibility for safety netting is the norm for all practice staff.

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