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Perinatal mental health and psychosocial risk screening in a community maternal and child health setting: evaluation of a digital platform

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Abstract

Background: Screening women for depression and psychosocial risk during the perinatal period is recognised best practice. Screening by current pen and paper methods can be time consuming, and prone to scorer error. The lack of readily available translated versions of screening tools also excludes many women from different cultures. *Aim:* To evaluate a perinatal mental health digital screening platform, iCOPE. The trial was conducted in a community maternal and child health setting in Melbourne, Australia. *Method:* A descriptive, cohort design was used. All women attending the urban clinic were invited to complete their routine perinatal screening on the digital platform, designed to automate score calculations and produce instant clinical and client reports whilst collecting data in real time. Screening included the Edinburgh Postnatal Depression Scale (EPDS) and psychosocial risk questions in line with current national clinical guidelines. Functionality of iCOPE was assessed according to duration of screening, completion rates, accuracy of reporting and level of engagement by women. *Results:* During the trial, 144 screens were performed. The mean screening time was 6.7 min (SD = 3.78). Most (65.7% $n = 94$) women took between 3 and 6 min. Mean EPDS score was 7.2 with 16% ($n = 23$) scoring 13 or more. The accuracy of reports was 100% and screening completion rate was 99.3%. Many women (81.3%) requested a copy of their personal report. *Discussion:* The iCOPE platform was efficient in terms of screening time, scoring accuracy, and engagement of women. The automated production of tailored client and clinical reports enabled screening outcomes to be instantly communicated to women and health professionals. The collection of data in real time facilitated the monitoring of screening rates and evaluation of outcomes by clinicians and service managers.

Introduction

Currently one in seven women (16%) experience depression in the first 12 months following birth, and rates of anxiety are significantly higher (Gavin *et al.*, 2005; Miller *et al.*, 2006; Buist *et al.*, 2008). Often signs and symptoms are not identified early, or misattributed to hormonal, other physical and social factors (Dennis and Ross, 2005; Highet *et al.*, 2014). In addition, stigma surrounding perinatal depression often leads to denial of symptoms by women and fears around disclosure (Highet *et al.*, 2014). One Australian study found that 74% of women with symptoms of perinatal depression did not seek help until they reached the point of no longer coping, thereby hindering opportunities for early detection and intervention (Highet, 2016). Such results have prompted the introduction of universal screening of women during pregnancy and postpartum. Routine antenatal and postnatal mental health screening is now recommended in countries such as the United Kingdom (NICE, 2014), Australia (Austin *et al.*, 2017), and the United States (O'Connor *et al.*, 2016). Although universal depression screening has been controversial for several reasons (Gemmill *et al.*, 2006), an Australian study with over 12 000 women identified that most believed screening was acceptable when delivered as part of routine maternity care (Buist *et al.*, 2008). Women participating in a regional perinatal screening program in the United States have also reported their acceptance of screening (Byatt *et al.*, 2016).

Currently, most screening in Australia is undertaken using pen-and-paper approaches within the consultation with a health professional. Scores are manually calculated, entered into the data record system and discussed with the woman. Women usually do not have access to tailored written information relative to their own screening scores and outcomes. At best, generic and costly information brochures may be provided. There is a great deal we do not know about the assessment and monitoring of maternal perinatal mental well-being and risk. The use of online platforms for depression and psychosocial risk screening warrants further exploration and evaluation.

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Background

Perinatal mental health screening

The risks associated with perinatal mental health conditions, particularly depression and anxiety, are significantly elevated amongst vulnerable women. Risks include having a past history of mental health problems, drug and alcohol misuse, and experience of abuse (Matthey *et al*., 2005; Buist *et al*., 2008; Siu *et al*., 2016). Women experiencing intimate partner violence are more likely to be depressed (On *et al*., 2016) highlighting the need for routine, universal screening of psychosocial risk factors and mental health status for all childbearing women (Commonwealth of Australia, 2011; Austin *et al*., 2013).

The mental health and psychosocial needs of Indigenous and culturally and linguistically diverse (CALD) women are often overlooked in current practice due to an absence of translated versions of screening tools. Screening of CALD women incurs expense to services due to the need for translators, extended consultation time, and high probability of invalid and unreliable results (Highet and Bilbao, 2014). A recent evaluation of the Perinatal Emotional Health Program in Victoria found that only 4% of CALD women received screening (Highet and Bilbao, 2014). There was also a lack of translated information for these women about their emotional health status and available resources (Highet and Bilbao, 2014). Widespread gaps were revealed in regards to clinicians' knowledge, referral pathways, and policies (Highet and Bilbao, 2014).

The Edinburgh Postnatal Depression Scale (EPDS) (Cox *et al*., 1987) is commonly used in screening and has been found to be appropriate and superior to alternatives (Austin *et al*., 2017). Buist *et al*. (2008) reported that when screening was combined with information and discussion with a health professional, there was a significant increase in maternal awareness of depression and the help women sought.

Screening procedures and acceptability

Current approaches to screening and assessment are inefficient and unsustainable (Highet and Bilbao, 2014). Usual pen-and-paper screening approaches are time-consuming, whilst manual scoring of tools (eg, EPDS) is prone to scorer error of up to 29% (Matthey *et al*., 2013) and potential inappropriate referral (Highet and Bilbao, 2014). In busy clinic environments where appointments are time managed and considerable information and advice is obtained from, and provided to women, efficient approaches to screening are needed.

Drake *et al*. (2014) conducted a small mixed methods study to ascertain the acceptability of online screening to women two to three months after birth. A total of 10 women completed online screening containing the EPDS, and participated in a gold standard clinical interview based on Diagnostic and Statistical Manual depression criteria (American Psychiatric Association, 2013). There was no difference in depression rates according to method and participants reported the online depression screening process was 'easy, straightforward and personalized'. This is similar to findings of other researchers who reported that e-screening was acceptable to women. In a large survey of pregnant women ($n = 460$) Kingston *et al*. (2015) reported that the majority (86%) of women were 'very or somewhat comfortable' completing computer-based screening. Furthermore, over 97% of these pregnant women were comfortable with clinicians initiating screening (Kingston *et al*., 2015).

Screening technology

Mobile and other e-health technology provide innovative approaches for conducting mental and psychosocial risk screening for pregnant women and new mothers. Past studies with clinicians and women show that the use of technology can minimise barriers such as poor literacy, language challenges, concerns about privacy, lack of access/transportation, as well as reliability of scoring and interpretation (Pineros-Leano *et al*., 2015; Gordon *et al*., 2016).

The use of screening technology has also been used predominantly in research studies. For example, Le *et al*. (2009) compared a direct mail out to internet recruitment strategies in the United States. Around 185 women responded and 148 women completed online screening. They found that more Hispanic and Asian women participated on the internet compared with in-person recruitment options. However, women completing internet screening reported more risk for postnatal depression compared with the community sample (23% versus 12%). Conversely, a recent internet-based study in the United States with 480 women reported that the 16% rate of probable depression was no different to rates published elsewhere (Teaford *et al*., 2015). These results suggest that using a digital platform to assess symptoms of depression does not inflate rates of depression, and encourages CALD women to participate.

Cultural and health service obstacles often affect the quality of screening that perinatal women receive, particularly those women from vulnerable populations. Manual approaches to screening also prevent the automated collection of screening data. Despite significant investment into national screening in the Australian context, screening rates and outcomes remain unknown.

Digital platform: iCOPE features

The iCOPE platform is web-based and can be set up for use anywhere in the world. The digital platform is built to enable screening and versions of client reports in multiple languages. The iCOPE platform is designed to replicate current best practice but increase efficiencies and accuracy surrounding screening. The screening program requests some personal details such as date of birth, whether the woman is of Aboriginal or Torres Strait Islander background, and age of the baby at the time of screening. Women are requested to complete a disclaimer, acknowledging that the digital screening is not a replacement for a full mental health assessment. Women are also asked at the outset of the screening process if they would like to receive a (free) personal report detailing their screening outcomes, which they can nominate to receive via e-mail or SMS.

On completion of the screen, results are automatically calculated in real time. Two reports are instantly generated and sent to the woman's nominated SMS or e-mail if previously requested; and a clinician report is sent to the staff member's password-protected desktop computer to access the iCOPE system. iCOPE data security meets all legislative regulatory frameworks for health-related data in Australia.

Content of screening

In line with best practice outlined in the Perinatal Clinical Guidelines for Depression and Mood Disorders (Austin *et al*., 2017), all women were asked a series of questions to detect the presence of psychosocial risk as well as the EPDS. If mental health and/or drug and alcohol factors were present, the iCOPE system introduced additional questions about these risks. Through the creation of algorithms, further questions enquired about a personal history of mental health problems. For example, if a woman acknowledged a previous mental health history, additional questions determined the type of condition, whether

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treatment was sought, and if so what type of treatment, by whom (professional) and for how long ago. Similarly, if drug and alcohol problems were acknowledged by a woman and/or experienced by her partner, additional questions were asked to determine the type(s) of drugs used, and whether help was wanted for drug and alcohol issues specifically.

Factors that may impact on referral and service access and uptake were also asked, namely; if the woman wanted help for issues identified in the screening process; and if they had private health insurance or were a healthcare card holder (as this may affect service access and referral pathways provided). Four options were presented with respect to requesting help for either symptoms or risk factors that may have been identified from screening. This provided an opportunity for clients to reflect upon their desire to access help, whilst informing the health professional of their willingness and/or readiness to seek help. Descriptive data on women's mental health and psychosocial risk as presented in the results.

The generated report is provided in PDF format, which allows for format standardisation and upload into clinical records. Total scores on the EPDS together with anxiety and self-harm sub-scores are detailed together clinical advice to guide the clinician in relation to screening scores in line with best practice and the National Guidelines. The number and nature of all identified risk factors are also detailed on the clinical report.

Alternatively, the client/patient reports do not provide actual scores, but rather a descriptive summary about the presence of indicated risk factors and the woman's likelihood of depression and or anxiety. A brief description of the meaning of these results is designed to provide the woman with insight into her risk profile and the likelihood of experiencing anxiety, depression and self-harm at the time of screening. Links to further information on the COPE website (www.cope.org.au) about identified risk factors and in line with EPDS scores is embedded throughout the patient report to provide further information as needed.

Aim

This paper reports on an evaluation of a digital screening platform called iCOPE in a maternal and child health community setting in Melbourne, Australia.

Methods

Design

A descriptive cohort design was used.

Participants

All women attending the clinic for the four to six-week postnatal check during a 12-month period (from September 2015).

Setting

The study was conducted at a Maternal and Child Health clinic in suburban Melbourne. The developer of the iCOPE Platform had already established a relationship with the Centre Co-ordinator through a previous project. This previous work highlighted the need to develop more inclusive and sustainable approaches to implementing best practice in perinatal mental health screening. The Centre staff requested to be a pilot site for the new platform. Compared with other Centres in the municipality, this site had a higher proportion of English-speaking clients which enabled the trial to be conducted in English.

Performance evaluation

Performance of iCOPE was evaluated according to: reach/accessibility – number of women screened; timeliness – duration of screening; feasibility – proportion of women completing screening (no drop-offs or incomplete screens); engagement – proportion of women requesting their own personal report; and acceptability – proportion of women who completed all items.

Procedure

The introduction of the digital platform involved brief training sessions (45 min) with the Maternal Child Health nurses (in a group setting) to demonstrate how the iCOPE Platform worked, and how to log into the system to access the generated reports. Information included how clients could access screening on an iPad and how they could access their reports upon request. After training, the digital screening process replaced pen-and-paper methods, and became the standard approach to undertaking the routine mental health screening and assessment process at women's four-week consultation. The researcher was available to problem-solve, support staff during the implementation, and obtain informal staff feedback on implementation of the iCOPE platform.

The introduction of iCOPE required only a minor change to practice by participating midwives and nurses. Women were provided with the digital screen (on an iPad) and completed the questions in the waiting room instead of completing forms during the consultation. In other instances (where a women requested help), the screen was completed on the iPad during the consultation.

At the outset of the screen, before collecting any clinical information, a disclaimer was presented, indicating that this was a confidential screen to assess aspects of emotional health and well-being. The disclaimer also stated that the following questions are no substitute for a full assessment by a health professional, and if the woman was concerned about any of the issues raised she was encouraged to talk to a health professional. The client was then required to 'agree' or 'disagree' to this disclaimer before progressing the screen. In addition, as part of the consent process, women were asked (on the screening Platform) whether they consented for their de-identified data to be used for reporting and evaluation purposes, and if they would be willing to be contacted for future research. This was a yes/no response, and any clients indicating a 'no' response were removed from the final data set before analysis of results.

On completion of the screen, results were automatically calculated and the two separate reports were instantly generated. The clinician's report was accessed via their desktop personal computer and the client version sent to the respondent via their e-mail or SMS (as requested in the screening process). The clinician also had access to the client report and could print this out or go through the results with the woman. If the woman had not requested a clinical report this process gave the client another opportunity to receive this information. Data on performance of the system (time taken to screen, screening results) were collected automatically.

Ethical considerations

The research protocol was submitted to the Griffith University Human Research Ethics Committee. As the study aimed to assess the efficacy of the digital platform as part of routine care delivery

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and anonymised data were provided by the service to the researchers, the study was exempt from full ethics review. Only data from participants who accepted the disclaimer statement, approved of their de-identified data being used for research purposes and completed the screen were analysed. Three women did not consent to having their data used for evaluation purposes and one did not respond to this question, so these four cases were not included in the analysis. As with other health data, de-identified project data was housed on a secure network.

Approach to analysis

De-identified data was downloaded into SPSS, cleaned, and descriptive statistics generated. Performance indicators of iCOPE (such as completion rates, report requests) were calculated automatically. EPDS scores were calculated. Level of psychosocial risk was determined by summing 13 risk factors. Analysis of variance were used to compare EPDS scores and psychosocial risk variables and request for help. Correlations amongst continuous variables was assessed with Pearson's correlation.

Results

Participant characteristics

The average age of participants was 30.7 years (SD 4.68, range 20-42). A total of 32 (22.2%) respondents received Centrelink support (government-funded social security) which reflects the low socio-economic profile of the community in which the study was conducted. All participants were around four weeks postpartum. This timeframe for screening was in line with State protocols. Characteristics of participants and screening responses are presented in Table 1.

Performance of iCOPE

The overall screening completion rate was 99.3%. All but one woman who commenced screening completed it in its entirety. A total of 144 screens were performed. The average screening time was 6.7 min (SD = 3.78). Most (65.7% $n = 94$) women took between 3 and 6 min and 84% screened in <8 min. Two women discussed issues related to the screening items, and attended to their baby, thereby increasing screening time to 27 and 28 min, respectively. When asked if they would like to receive a free copy of their results around 84% ($n = 120$) of women requested their results to be sent to them via e-mail or SMS.

Rates of depression and anxiety

The EPDS was used to assess the likelihood of probable depression. The EPDS showed good internal consistency when administered digitally (Cronbach's $\alpha = 0.89$). For many women (62%) there was low probability of depression but over one-third (37.7% $n = 54$) had a moderate (score of 9–12) to very high (score >12) probability of depression at the time of screening (see Table 1). While most women (90%) 'never' had thoughts of harming themselves (item 10), a small proportion said they 'hardly ever' (5.6%) or 'sometimes' (4.2%) had such thoughts.

Anxiety items on the EPDS indicated that over forty percent of women (42.7%) 'sometimes' *blamed themselves unnecessarily when things went wrong*; a similar proportion of women *had been anxious or worried for no good reason* ('sometimes' 38.5%, or 'very often' 6.3%). Around one-third also indicated that they had *felt scared or panicky for no good reason* either 'sometimes' (28%) or 'quite a lot' (4%) over the past seven days.

Table 1. Participant characteristics and psychosocial risk

Variable	$n = 144$ (100%)
Age (years)	Mean 30.68 years SD 4.69
20–25	21 (14.9)
26–30	44 (31.2)
31–35	53 (37.6)
36–42	23 (16.3)
Missing	3 (2.1)
Centre-link benefits (social security)	
Yes	32 (22.2)
No	110 (76.4)
Missing	2 (1.4)
EPDS	Mean 7.2 SD 5.25
⩽12	120 (83.9)
⩾13	23 (16.1)
Missing	1 (0.7)
Feeling low or down	
Yes	24 (16.7)
No	119 (82.6)
Missing	1 (0.7)
Mother supportive	
Yes	120 (83.3)
No	23 (16.0)
Missing	1 (0.7)
Have adequate practical support	
Yes	137 (95.1)
No	6 (4.2)
Missing	1 (0.7)
Have adequate emotional support	
Yes	136 (94.4)
No	7 (4.9)
Missing	1 (0.7)
Worry	
Yes	27 (18.8)
No	116 (80.6)
Missing	1 (0.7)
Previous mental health treatment/care	
Yes	16 (11.1)
No	127 (88.2)
Missing	1 (0.7)

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Table 1. (*Continued*)

Variable	$n = 144$ (100%)
Previous anxiety disorder	
Yes	11 (7.6)
No	133 (92.4)
Previous depressive disorder	
Yes	14 (9.7)
No	130 (90.3)
Previous panic attacks	
Yes	11 (7.6)
No	133 (92.4)
Family history of mental illness	
Yes	33 (22.9)
No	110 (76.4)
Missing	1 (0.7)
Felt cared for as a child	
Yes	114 (79.2)
No	29 (20.1)
Missing	1 (0.7)
Afraid of partner	
Yes	3 (2.1)
No	140 (97.2)
Missing	1 (0.7)
Drug/alcohol misuse by self or partner	
Yes	–
No	144 (100)
High stress past 12 months	
Yes	52 (36.1)
No	91 (63.2)
Missing	1 (0.7)
Level of psychosocial risk	Mean 3.58, range 0–13, SD 2.58
0 risk	4 (2.8)
2–3 factors	95 (67.0)
4–5 factors	25 (17.3)
6–9 factors	13 (9.1)
11–13 factors	7 (4.9)

Presence of psychosocial risk factors

Thirteen psychosocial risk factors were considered and described below. In this analysis the presence of each risk factor was summed to give a psychosocial risk score. The mean number of risk factors was 3.58 (SD 2.6, range 0–13).

Mental health history

Twenty per cent of women did not always feel cared for and protected when growing up. One-fifth (23%) indicated that a member of their immediate family had experienced mental health problems. Approximately one in five (16.7%) women reported having times when they felt sad or down and worried to the point of interfering with daily life (18.9%). In all, 16 women (11%) reported having a current/previous mental health condition (predominantly anxiety and depression, including panic attacks). Treatment involved counselling, while half (56%) had used medication.

Drug and alcohol misuse

None of the respondents indicated they or their partner had a problem with drugs and/or alcohol. Hence, no further questioning was performed on the system.

Current life stress and access to support (past and present)

Three women (2.1%) indicated they did not feel safe with their current partner. Reports of current stress were high, with over one-third (36.4%) indicating they had *experienced stress, change or loss in the past twelve months*. Overall, the majority of women reported high levels of access to support (protective factor), with 95% reporting available access to both *practical support* and *emotional support* if needed.

Request for help

In line with healthy screening outcomes for the majority of women, many women (59% $n = 85$) indicated 'No Help' was required, however, 25% ($n = 36$) indicated that while they *did not need or want help right now, they might want/need help in the future*. Ten per cent of women ($n = 14$) were *unsure about wanting help* and five women (7.2%) wanted help now. An analysis of mental health and psychosocial risk levels and help seeking found that women who reported needing help had high EPDS scores (mean 17.4) as did women who were unsure they needed help (mean = 13.35). Furthermore, women requesting help identified on average 7.8 psychosocial risk factors.

Discussion

The introduction of iCOPE required only a minor change to practice but was time efficient, enabled a high proportion of women to be screened, and produced quality reports. Our approach to digital screening is strongly aligned with national health priorities in Australia for the prevention of mental illness, the implementation of routine, universal screening and psychosocial assessment, the provision of consumer information and early interventions (Queensland Government, 2008; Commonwealth of Australia: 2009; Austin *et al.*, 2017). Prevention and early intervention priorities aim to identify and support mothers at risk and reduce the potential of future mental health problems for themselves and their children (Austin *et al.*, 2017). iCOPE was developed in response to recommendations by the beyondblue National Perinatal Depression Initiative Synopsis Report (Highet and Purtell, 2012) which outlined approaches to sustainability surrounding best practice implementation. This included the need to make screening efficient through technology (Austin *et al.*, 2017). Furthermore, iCOPE is aligned with the strategic intent of health services across most states of Australia to move towards paperless platforms, and the focus of the federal government to use technology to generate electronic patient records.

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Unlike other e-screening platforms reported in the literature (Le *et al*., 2009; Pineros-Leano *et al*., 2015; Gordon *et al*., 2016), iCOPE is unique in the generation of real time personalised reports for women and clinicians. Requests for reports from the majority of women indicate a high level of acceptance and interest in screening outcomes. Real-time reporting has important implications for women and clinicians. Women can receive feedback on their screening responses, reflect upon this, and formulate questions before the consultation with a health professional. Similarly, having individually tailored reports also means that women have access to screening information beyond the consultation, giving them an opportunity to review and reflect upon their screening outcomes and access further information relative to their outcomes from the COPE website. Clinician time can be better spent in meaningful discussions with women based on need and risk. For example, if a woman indicated high levels of anxiety, the clinician could offer further information about anxiety in the postnatal period and information about recommended treatments and how these can be accessed.

There are substantial barriers to identifying and treating postnatal depression. The hesitancy of women to disclose mental health symptoms and psychosocial risks may be minimised through the use of e-screening. While the current study revealed that over a third of women were at risk of postnatal depression, some psychosocial risk factors were not endorsed. In particular, no woman acknowledged alcohol or drug misuse for themselves or their partners. This finding is in contrast to the outcomes of a systematic review of 23 studies by Chapman and Wu (2013) who reported the prevalence of problem drinking to be 1.5–8.4% in postpartum women with around 4% using marijuana or a combination of drugs. Furthermore, alcohol and drug use was associated with postnatal depression (Chapman and Wu, 2013). It could be that clinicians need to develop a trusting relationship with women to encourage frank disclosure of possible risk.

Women often lack knowledge about postnatal depression and the provision of real-time client reports may assist to improve women's health literacy. Following this trial, future work involves translating the screening questions in different languages and in an audio-delivered format for those who are not literate, and client reports generated into different languages. The provision of free, automated, tailored reports of risk, health information and available services (delivered via SMS or e-mail) in a respective language will enable women to better understand their own risk profile and possible consequences. Future research needs to evaluate women's satisfaction of the information provided and monitor engagement by the number of women requesting their personal report. Regularly educating women and their families about postnatal depression, will help them identify symptoms, seek help, and aim to destigmatise the condition.

iCOPE generates clinical reports (based on automated scoring and algorithms) to inform health professionals of a woman's screening outcomes and guides best practice. Future research could evaluate the utility of digital screening in changing practice, clinicians' satisfaction with the implementation, as well as their use of the platform. Clinical reports could be sent to the GP/referrer and can currently be printed for the woman to give to another health professional so that re-screening is not required and a full mental health assessment could be conducted.

The automated system can quickly inform managers and policy makers about screening outcomes and service need across jurisdictions. Being a digital platform, data is collected automatically and in real time. Service managers can now access generated reports as often as required to assess service performance and enables screening outcomes to be made available in a timely way and inform service need.

Limitations

This preliminary evaluation of an e-screening platform needs to be considered in light of limitations. While the convenience sample was adequate, a larger sample and collection of data over a longer time and across more settings could better inform any difficulties in implementation. Our evaluation would have been strengthened by a comparison with clinic practices before the introduction of iCOPE. The trial occurred at one site, therefore it was highly likely that staff were motivated and regular phone discussions with the research team identified any problems early and ensured that clinicians remained motivated to focus on mental health screening. These limitations are currently being addressed through the broader implementation of iCOPE across a range of maternity, primary care and specialist settings (including maternity hospitals, fertility treatment settings and mental/community health providers). Future research will involve making available the tools in different languages, developing an audio version, and assessment of user experience (MCH nurses and consumers).

Conclusions

This evaluation of the iCOPE revealed a high level of acceptability of the digital screening platform. Women reported the screening process was simple and intuitive. The average time taken to perform the screen was 6–7 min. The iCOPE platform effectively allows additional data items for select individuals. There was close to 100% completion rate with respect to risk status questions. Nearly 85% of women requested a free copy of their results. From a clinical perspective, almost a third of women had moderate to very high probability of depression (higher than the national average); 9% of women had thoughts of self-harm. Around one-third of clients indicated symptoms of anxiety. Nearly 40% of women wanted or were open to accessing help either now or in the future. The trial results suggest that expansion into other clinical and research settings is feasible and will include the ongoing adaption of screening questions and patient reports into audio format and other languages together with the integration of e-referral pathways via postcode data in reports.

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