A three-year audit of the effectiveness of family physician reminders on cervical screening uptake amongst non-responders in a UK family medicine setting

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Abstract

Background: Cervical cancer screening is offered to all women in the United Kingdom (UK) between the ages of 24.5 and 64 years of age. The majority of screening is performed in primary care settings and the coverage rate remains stubbornly below 80%, despite an automated national invitation system.

Objective: To audit the effectiveness of physician reminders during patient-booked telephone or face-to-face family medicine appointments upon non-responders to automated invitations.

Methods: One physician in a primary healthcare centre opportunistically administered a three-step verbal invitation to all individuals identified as non-responders during their appointments with him. Patients seen face-to-face were also given a fourth invitation, a written slip to give to the receptionist to help them book an appointment. A code was entered into the patient's notes to indicate that this patient had received the invitation. The invitation was continued for three years. The rate of screening uptake in the invitation arm was then compared to the rest of the non-responder population who received other non-structured reminders.

Results: 122 patients in the invitation arm and 602 in the control arm met the inclusion criteria. Cervical screening uptake was 11.1% greater in the invitation arm than the control arm ($p < 0.0001$; RR 1.188: CI 1.04 to 1.36). Patients receiving the fourth invitation in face-to-face appointments booked screening appointments 60 days earlier (mean = 110.8 days, n = 66) than those who received the verbal invitation only (mean = 170.4 days, n = 19, $p = 0.08$).

Conclusion: There is evidence to support the use of both a verbal invitation followed by a written invitation by physicians in a family medicine setting in the UK for patients who are non-responders to cervical screening to increase uptake. The cost per extra cervical screening accepted in this non-responder population is £14.35. Both of these factors support the use of physician invitations to increase screening rates.

Keywords
cervical cancer screening, primary health care, non-responder, increasing uptake, invitations

Introduction

General Practitioners (GPs) are primary care family medicine consultant physicians in the United Kingdom (UK). The majority work within the National Health Service (NHS) and have to prioritise healthcare messages to maximise patient wellbeing in a limited amount of time; normally 10 to 15 minutes. The list of their responsibilities to each patient include acute healthcare needs, chronic disease monitoring, medication concordance, physical, mental and emotional wellbeing, health promotion, screening tests, vaccinations, safeguarding, addictions and social concerns. Following a consultation, GPs then have to prescribe treatments, arrange referrals, organise tests, arrange follow-up, manage results and reports, respond to queries and contemporaneously document patient encounters. Maintaining cervical screening uptake above 80% is an Essential Service in their General Medical Services (GMS) contract with NHS Primary Care. An ineffective reminder system for non-responders to screening is a contractual failure, and would result in a "needs improvement" rating by the Care Quality Commission, the government regulator, and the risk of further monitoring and interventions.

The cervical screening test is offered to all women between the ages of 24.5 and 64 registered with a GP practice in the UK by a national automated system. Open Exeter is the web-based application that forms the data-management backbone of the NHS Cervical Screening Programme. It is a secure, online record of the full national cervical screening history of a patient, and integrates with the cytology laboratory, the sample taker and the patient's healthcare provider organisation (either specialist or primary care). Open Exeter relies upon searches of the General Practice medical records. Invitations to patients eligible for cervical screening are automatically generated by Open Exeter. A second "overdue" notice is sent when the lab has not received a result for the individual 126 days (18 weeks) beyond the date they should have had the cervical screening. When patients fail to book an appointment after these two reminders by Open Exeter, they are classed as "non-responders". A weekly upload from Open Exeter by the practice administrators results in a reminder letter being sent by the practice to all non-responders and a non-responder code is added to the patient's medical record. A second warning system is in place on the primary care patient management system. This alerts any member of staff who accesses an individual patient's record if they are overdue their follow-up cervical screen based on their age and the last coded screening test.

According to Cancer Research UK, cervical cancer is the 19th most common cause of female deaths from cancer with 860 deaths in 2018 (1). The screening test involves a small sample of cells taken from the cervix and tested for the human papilloma virus (HPV). If positive for HPV, samples are sent for further analysis to look for abnormal changes to the collected cells. Rates of cervical cancer have been decreasing since the roll out of the programme. Around 70 – 73% of eligible women attend their GP for a screening test; one of the highest uptakes for all screening programmes in the UK. Approximately 24% of cervical cancer cases are detected by this route and data shows that a 3-year survival rate for these patients is significantly higher than for those diagnosed by other methods. Positive cases are then monitored and treated accordingly. 83.9% of women referred with high-grade abnormalities had histological outcomes of CIN 2, 3 or adenocarcinoma in-situ leading to prompt referrals and treatment, of whom a large number are asymptomatic (2). It is estimated that between 800 and 2,000 deaths a year are now prevented due to the effectiveness of this programme and mortality rates have dropped by over 75% since the 1970s. These statistics corroborate the importance of the screening programme in reducing mortality from cervical cancer.

Diligent clinicians, proactive managers and effective recall systems are needed to ensure compliance with the contractual obligations that are designed to maximise screening coverage. There are some newly recognised groups who may not receive screening reminders. Some biological females recoded as being male, transgender or non-binary, may be missed from Open Exeter searches (3). There have also been widely-publicised cases of some women with sub-total hysterectomies being incorrectly coded as having total hysterectomies who have been excluded from screening. This error has been compounded by patients not knowing their cervical status, and declining screening on the incorrect assumption that they don't have a cervix (4). Women with a history of HIV are invited for annual screening, the performance of which is the responsibility of their HIV specialist team, but should not be overlooked by their GP.

Currently, an ad hoc system is in place in most primary healthcare settings, where patients who are non-responders may or may not receive verbal invitations when they consult their GP, practice nurse or other healthcare worker. This is often because the patient's agenda is addressed first, leaving little time for invitations and human error causes healthcare workers to overlook alerts. As many practices have automated systems that send reminder letters to non-responders, some clinicians consider their responsibility complete if they see that the reminder letter has been sent. When invitations are made by some clinicians, these are often unstructured. The national screening uptake highlights the flaws of this ad hoc system.

A Cochrane Review (5) (Everett et al., 2014) noted that the cervical screening rate in the UK remains stubbornly below 80% and interventions are needed to attract the 20% who are missing out on screening. This meta-analysis reviewed the different subgroups of interventions, namely: invitations, reminders, education, message framing, counselling, risk factor assessment, economic incentives and procedure access. They found one trial comparing face-to-face invitations versus control in an Australian Aboriginal urban population (Hunt, 1998), in which only 4 out of 121 individuals receiving the intervention attended for screening. There were no other high-quality studies reported which looked at a physician intervention in routine practice.

We therefore report the results of a three-year prospective audit to determine whether there is clinical equipoise for the following questions: What, if any, impact does a physician giving structured reminders during standard care have on the uptake of cervical screening amongst non-responders? Is it therefore, an effective invitation during time-critical consultations?

Methods

This audit was designed as a physician invitation in a standard healthcare environment, providing care to a heterogeneous patient population and a typical treatment environment to yield replicable real-world results. Undertaking a prospective observational audit was considered the most ethically appropriate way to investigate physician invitations. It would be harmful to patients and negligent of clinicians to withhold effective invitations from individuals (who would have otherwise been assigned to a control group of a randomised controlled trial) who are overdue their cervical screening or at high risk of cervical cancer due to lifestyle markers with clear causality to cervical cancer (e.g., a history of HPV infection, active HIV infection or smoking).

Statistically significant appropriate outcomes would either promote, make no change to or restrain GPs performing the invitations amongst this population. If the outcome invited no change or restrained GPs from making the invitations, researchers would need to develop more effective interventions. If the outcome promoted the invitations, GPs may be accused of negligence if patients subsequently developed cervical cancer and the invitations had not been documented during consultations. Results are statistically analysed using the data analysis package on Microsoft Excel. The report was prepared using Microsoft Word.

As per the Cochrane review (Everett et al., 2014) comparisons made to the control group of usual care with routine invitations is deemed appropriate. Bias is reduced by allocation concealment by centralised allocation – patients are free to book with a clinician of their choice when booking a routine appointment and when booking an emergency appointment, with the clinician on-call for that day. Selective reporting is avoided by the practice office manager running the search and the principal investigator adding the raw data into the Excel spreadsheet. All patient data of the invitation group will be analysed to reduce reporting bias. The principal investigator, who is also the audit clinician, will be analysing this data. This potential bias is minimised as the search data is available on EMIS Web (with a search date) and can be cross-referenced by patient number in the Excel spreadsheet. The data can be viewed and cross-referenced by the practice team and will be available for review to researchers for up to 10 years from the publication date. Randomisation and blinding will not reduce clinical or patient bias in this population – patients are free to book appointments with any GP, for any problem and those requesting review in an emergency clinic don't have a choice of clinician. Pure randomisation will lead to patients not being able to book appointments with a preferred GP for routine care, therefore creating barriers to routine care. Undertaking a questionnaire of patient attitudes to the invitation was considered and rejected as the invitation is standard patient care and measurement of the invitation would be judged by the outcome – booking of a cervical screening appointment.

A data cleansing pre-audit was performed and reported by the practice nurse to the clinical team in February, 2017. This was to identify anyone who may have been excluded from screening in error. A search was performed on the EMIS Web to find any biological female exempted from screening, followed by a review of their medical notes by nurses and doctors. Two patients were found with incorrect codes. Both of these women were now older than the screening age and had had negative results previously. One patient reported that she had had a hysterectomy overseas, but an ultrasound scan had revealed her to have a uterus in-situ. A specific search code indicating the presence of a cervix was added to her notes and also to the notes of those who had had gender-reassignment procedures and retained their cervices. In line with PHE guidance, an annual reminder code was added to those women who were HIV positive to ensure that these patients were being recalled. All other women were correctly coded as "absence of cervix" and removed from recall on Open Exeter.

A second analysis was undertaken to determine the numbers needed to achieve adequate power. From the Cochrane review (2014), there were no similar designs that could be used as a baseline to predict a percentage difference between an audit and control group. The nearest similar study of face-to-face interventions (Hunt, 1998) declared a relative risk of 9.15 (95% CI: 0.50 to 166.30), which was deemed unrealistic and with too broad a confidence interval. The trial of Robson (1989) comparing a health-promotion nurse versus control gives a relative risk of 1.18 (95% CI: 1.10 to 1.26). A meta-analysis of counselling versus control based on Rimer (1999) and Ward (1991) shows a significantly higher uptake of screening in those given counselling than those given no prompts with a relative risk of 1.23 (95% CI: 1.04 to 1.45). A meta-analysis of four studies (Binstock 1997; McDowell 1989; Stein 2005; Vogt 2003) assessing women who received a telephone invitation versus control found a significant improvement in uptake in the study groups with a relative risk of 2.16 (95% CI: 1.70 to 2.74). As this audit involves a physician giving an intervention including health promotion and prompting, face-to-face and via telephone, an increase in uptake of cervical screening compared to the control group in the range of between 18% and 216% is considered. Following discussion with the audit team, a 25% difference between the invitation and control groups was agreed to be a fair estimate. A calculation was completed to give a minimum number of subjects for 80% power and an alpha of 0.05: this gave a sample size of 134 patients. To determine the audit period, an approximation was made. As there were 367 non-responders out of 1,568 patients eligible for cervical screening on the 1st of December, 2016, and assuming

that each of the 6 clinicians will see one sixth of these patients at some point annually, this gave a figure of 61 patients per annum that the principal investigator might see. Therefore, an audit period of three years would yield an invitation group of approximately 180 patients. With a 10% exclusion rate and a 10% human error rate (where the clinician forgets to perform or document the invitation), this gave a predicted yield of 150 patients who could be recruited to the audit arm and 790 patients to the control arm.

The protocol for the audit was as follows: The principal investigator reviewed the medical notes of all individuals they consulted to check for the patient's cervical screening status. If they were coded as being non-responders (i.e., they have not booked an appointment following two Open Exeter reminders), they received a three-step verbal invitation:

1. "Your cervical cancer screening is now overdue."
2. "The test is easy to perform and saves thousands of lives from cervical cancer every year."
3. "Should we book an appointment for cervical screening now so that you make sure you have it done?"

Those who were seen face-to-face received a fourth invitation:

4. An appointment slip was given to the patient to hand to the receptionist. This included the patient's name and the comment, "Book an appointment with practice nurse for cervical screening".

The benefit of the fourth step was to save the patient from having to remember the name of the test and to minimise embarrassment from others overhearing them requesting the test at reception. As appointment booking requires the patient to confirm if they can attend at a particular time and date, it is considered a better use of time for the receptionist to book the appointment rather than the physician.

The invitation was planned to be brief, such that it can be completed in any practice setting. The primary outcome measure was to compare the response rate between the invitation group and the control group. The hypothesis was that there would be a 25% statistically insignificant improvement following the invitation. A secondary outcome measure was to determine if there was a difference between the type of appointment in which the invitation is given and the time taken to book an appointment. The second hypothesis was that face-to-face routine appointments would result in shorter times to book due to the fourth invitation.

A monthly reminder to the practice team of the audit and the importance of forwarding any patient concerns was agreed.

One year following the completion of the audit, the following data collection process was undertaken.

1. Office manager conducts a search for patients with EMIS code, "cervical smear verbal reminder", coded on or between 1/3/2017 – 29/2/2020 by the principal investigator.
2. Principal investigator uses the following protocol to review patients records and enter raw data into password protected Excel file:

a. Patient EMIS number
b. Patient DOB
c. Date of first GP invitation
d. Type of consultation
e. Date of non-responders for screening appointment
f. Date of any previous cervical screening
g. Date of any previous practice reminders
h. Date and type of last reminder
i. If no longer registered, date and cause of deregistration
j. Historical or current issues impeding screening uptake

3. Recognise exclusions:

a. Incorrectly reminded
i. Coding errors
ii. Human error
b. Temporary patients
i. Did not remain registered for minimum of 6 months following invitation
c. Screening refusal
d. Inappropriate to include
i. Terminal illness
ii. Prolonged hospitalisation
iii. Death due to non-cervical cancer attributable cause

4. Office manager conducts a search on EMIS Web for the control group and principal investigator enters raw data into Excel file:

i. Any registered patient overdue screening between 1/3/2017 – 29/2/2020 between the ages of 24.5 and 64 years old
ii. Received any of the following codes NOT by the principal investigator:
1. Cervical Smear Verbal Reminder
2. Cervical Smear Due
3. Any of the 4K4 code family (repeat smear / screening needed)
iii. No cervical screening code recorded up to 1 year after the search date indicating not attended for cervical screening
iv. Any cervical screening code indicating screening completed
v. Exclude any individual who were exempted (screening refusal, no longer registered, died or hysterectomy)

5. Download Open Access data from gov.uk cervical screening statistics for the Gill Medical Centre, based on data uploaded to Open Exeter.

Results

A search of the patients coded with the EMIS code "cervical smear verbal reminder" by the principal investigator on the EMIS Web patient management system between the audit dates of 1 March, 2017 and 29 February, 2020 was undertaken. This revealed 152 patients. Using the designed protocol, a detailed review of each of these patients' notes was undertaken by the principal investigator and raw data was entered into an Excel spreadsheet.

- 2 patients were excluded as the physician had not spoken to the patients directly. The physician had typed a letter to one of the patients and coded the invitation. The second patient was asked by a receptionist to book in for cervical screening after the patient had left the physician's room and the physician sent an electronic request to the receptionist to remind the patient to book for a screening appointment. These invitations did not adhere to the protocol.
- 16 patients were excluded as they were incorrectly reminded to book for a screening appointment by the physician when they were already up to date. These occurred because of the miscoding of reminders or where the patient's most recent cervical screening test had not yet been coded and the patient was unsure.
- 1 patient was excluded as they were correctly advised by the physician to book for a screening appointment but due to human error, they were incorrectly advised by the practice nurse that due to their age, screening was no longer needed. They were invited to rebook upon discovery of the error following the audit.
- 5 patients were excluded as they deregistered within 6 months of registering (one went overseas, one was a temporary resident and returned to their usual place of residence and three moved out of the area).
- 1 patient was excluded as they disagreed with both their medical records and the national screening records as to when their last cervical screening had occurred – stating that it had been conducted when they were under gynaecology care. They refused to sign an exemption form and requested to remain on routine cervical follow-up.
- 4 patients were excluded for making informed decisions to refuse cervical screening – 3 signed exemption forms and 1 was verbally exempted as they refused to sign an exemption form.
- 1 patient was excluded as they died within 3 months of a verbal reminder of an unascertainable cause on post-mortem. The case was discussed in a practice meeting and the invitation was agreed to be unrelated.

Following these exclusion, 122 patients were included in the audit.

A search for the standard practice control group was then conducted using the EMIS Web search application to find non-responders who had received a follow-up letter from the practice or any reminder from any clinician, excluding the principal investigator, including results up to 12 months following the invitation date. A total of 602 women, of whom 353 attended for screening, gave coverage of 58.6%. Finally, the practice level data from NHS Digital was analysed from 2016 – 2021. The results are summarised in Table 1.

The difference between the invitation and control groups of 11.1% (X^2 <2 $p < 0.0001$) was significant. This indicates that the structured invitations resulted in an 18.8% increase in screening uptake amongst non-responders. The relative risk was calculated as 1.188 with a 95% confidence interval of 1.038 and 1.360). This means that the results favoured the invitations.

There were six clinicians who could offer verbal reminders to patients in appointments (4 GPs, 1 nurse and 1 healthcare assistant). All of these clinicians worked full time during the audit period. The mean number of patients per clinician in the control group is 120 (602 patients ÷5 clinicians in control group), which is equivalent to that seen by the physician performing the invitation (n = 122). These figures are in keeping with the sample size calculations; 134 in the invitation arm and 670 in the control.

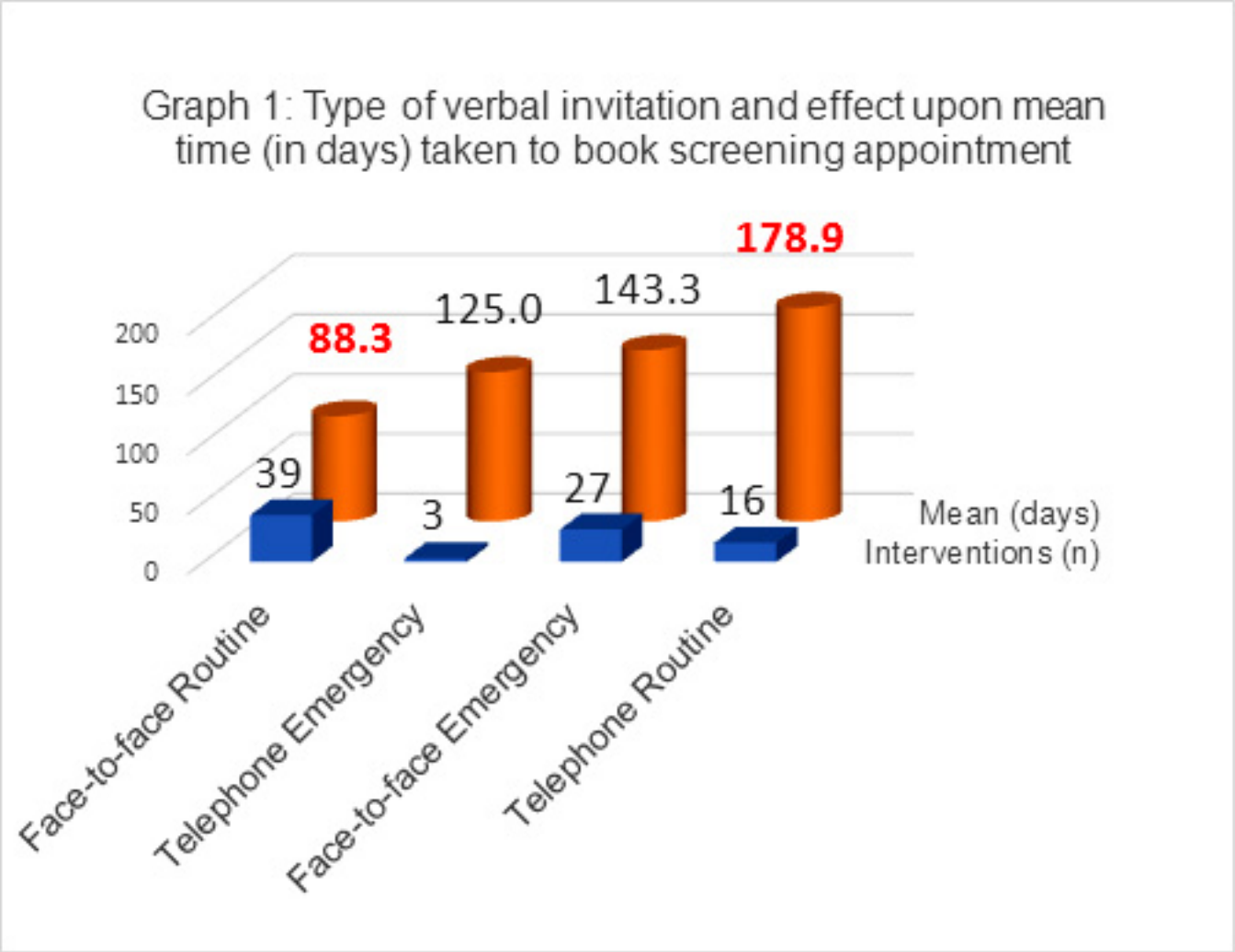
Of the 122 patients who received the invitations, this was made in four types of appointments; 39 were seen in face-to-face routine (F2FR) appointments, 27 in face-to-face emergency (F2FE) appointments, 16 were spoken to in routine telephone (RT) appointments and 3 in emergency telephone (ET) appointments. Of the 85 women who responded to the invitations, the mean time from the invitation to the time taken to book a screening appointment was F2FR 88.3 days, TE 125.0 days, F2FE 143.3 and TR 178.9 days – this is summarised in Graph 1.

The F2FR invitation led to the shortest mean time to undergo cervical screening. This is likely due to the combination of the verbal reminder and the booking slip. The TE group consisted of three patients and they had the next shortest mean time. As the number of invitations is small, the results cannot be considered significant. However, the difference between the times taken for the F2FR and TR groups was significant ($p = 0.0134$) and indicates that a physician booking slip improves the time taken to book by 90.6 days.

The maximum cost of the invitation is calculated as follows: a 2-minute review of the patient's records, a 2-minute invitation and 1 minute for documentation requires a total of 5 minutes of GP time at a rate of £120 per hour (including pension payments), which equates to £10.00 per invitation. Booking an appointment and having the screening done by a trained clinician are existing costs, so they are not included. As the invitation gives coverage of 69.7%, the cost to get one cervical screening test accepted by a non-responder is £14.35.

Table 1: Number of patients in the invitation arm, the control arm and total practice (data from 1/3/2017 to 1/3/2021):

p = <0.0001 One Sample Test	Invitation to non-responders	Standard Practice to non-responders (Control)	Total Practice; all eligible patients (NHS Digital data)
Population (n)	122	602	1775
Coverage (n)	85	353	1452
DNA (n)	37	249	323
Uptake (%)	69.7%	58.6%	81.8%



Discussion

The audit's main outcome was that, over a three-year period, one physician was able to increase cervical screening uptake amongst non-responders by 18.8% compared to a control group during usual care by following a four-step invitation. This indicates that verbal and written invitations given by GPs can improve uptake of cervical screening. The cost to increase screening uptake by one non-responder is estimated as being £14.35.

The strengths of the audit included that it was performed in a routine practice setting, required no additional training and compared usual reminders to a more structured invitation. As the invitation was embedded in routine practice, it achieved the expected recruitment levels across the patient population.

GP practices can ensure the best possible coverage by undertaking the following actions:

- All women who are HIV positive should have a code for annual cervical screening (although this should be monitored and arranged by their HIV medical team).
- Annual searches should be undertaken to manually check newly registered biologically female patients who have been coded as having a hysterectomy to cross-reference their history to confirm the cervix has not been retained. A read-code can be added to confirm that these patients' records have been reviewed to exclude them from future searches.
- New entrants to the UK should be informed of the national screening pathways and eligible patients added to Open Exeter as soon as possible. All adult new-entrants should also be offered a HIV test. An annual audit should be undertaken of achievement here.
- Add alerts to non-responder's electronic records to warn clinicians if they have never had a cervical screening test and are at high risk because of lifestyle factors such as previous history of sexually transmitted infections, alcohol or drug misuse or previous abnormal cells.
- Ensure administration errors that lead to patients not receiving follow-up practice invitations are eliminated.

Conclusion

The authors recognise the workload in primary care is already substantial, and to administer an additional invitation may be a barrier to its widespread use. It is clear, however, that the invitation significantly increases the uptake of cervical screening. Most GPs will require less than two minutes to administer and document the invitation. As cervical screening rates being maintained above 80% is now an essential service included in the GMS contract, this is a high impact and low-cost process that can also be used as an opportunity to exempt patients who make an informed decision to refuse screening.

The implications for research are vast. Measuring the effects of physician advice-giving upon uptake of other screening programmes is an example. Reviewing patient satisfaction and retention following physician reminders is another possible topic. Time taken to perform screening reminders versus physician satisfaction with the consultation is another. Over time, the wording of the invitations may change as HPV vaccinations become more prevalent and cervical cancer rates fall even further. Until then, these feasible, safe and standard invitations should be considered a part of every consultation with patients who are non-responders to cervical screening.

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Conflicts Of Interest
The authors both declare that they have no conflicts of interests.

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