European Journal of General Practice, 2011; 17: 221–228

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healthcare

SYSTEMATIC REVIEW

The role of physician reminders in faecal occult blood testing for colorectal cancer screening

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Abstract

Background: Colorectal cancer screening in the form of faecal occult blood (FOB) testing can significantly reduce the burden of this disease and has been used as early as the 1970s. Effective involvement of GPs along with reminding physicians prior to seeing a patient may improve uptake. *Objective:* This article is a systematic review of published literature examining the uptake of FOB testing after physician reminders as part of the colorectal cancer screening process. *Methods:* Electronic databases were searched from January 1975 to October 2010. All studies comparing physician reminders (Rem) with controls (NRem) were identified. A meta-analysis was performed to obtain a summary outcome. *Results:* Five comparative studies involving 25 287 patients were analyzed. There were 12 641 patients were in the Rem and 12 646 in the NRem group. All five studies obtained a higher percentage uptake when physician reminders were given. However, in only two of the studies were the percentage uptake significantly higher. There was significant heterogeneity among trials ($I2 = 95\%$). The combined increase in FOB test uptake was not statistically significant (random effects model: risk difference = 6.6%, 95% CI: −2–14.7%; $z = 1.59$, $P = 0.112$).

Conclusion: Reminding physicians about those patients due for FOB testing may not improve the effectiveness of a colorectal cancer screening programme. Further studies are required and should focus on areas where there is a lower baseline uptake and areas with high levels of deprivation.

Key words: *Screening, colorectal cancer, faecal occult blood, physician reminders*

Introduction

Colorectal cancer is the second leading cause of cancer mortality in the UK with over 35 000 cases and 16 000 deaths in 2004 (1). Colorectal cancer screening in the form of faecal occult blood (FOB) testing can significantly reduce the burden of this disease and has been used as early as the 1970s (2,3). FOB testing has demonstrated reduction in mortality by detecting colorectal cancer at an early stage. It is acceptable and consistent with established screening principles (4). Despite this important public health impact, uptake of FOB tests during the second pilot phase in England was only 52% and dropped to under 40% in people from areas of high deprivation (5).

Many reasons exist for low uptake, from patient-specific barriers to physician perception and lack of communication (6). Patients often suggest poor motivation, lack of awareness or recommendation from professionals as key factors for deciding not to undertake screening (7). Currently general practitioners (GPs) are not directly involved in the colorectal screening programme in the UK. Some reports suggest that due to time pressures, physician-reminding systems may improve screening (8). GPs are the first point of call for patients and have access to most of patients in the UK including the older population, which means that they must be an integral part of a screening programme. GPs are also the primary source of information regarding screening processes (9–11). Furthermore, we know that the uptake is higher amongst patients when a physician recommends screening as seen in other settings (12–15). GPs already have an intrinsic role in prompt diagnosis and investigation along with

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(Received 13 January 2011; accepted 17 June 2011)

ISSN 1381-4788 print/ISSN 1751-1402 online © 2011 Informa Healthcare
DOI: 10.3109/13814788.2011.601412

counselling patients on benefits and pitfalls of a particular screening program (16,17). Effective involvement of GPs along with reminding physicians prior to seeing a patient may improve uptake (18).

There are various ways of delivering reminders to physicians and we focused on any mechanism (e.g. electronic or memorandum) that would highlight or 'flag-up' to a doctor that a patient was due for screening. Primary care tools such as a coordinated reminding system to undertake this may require careful national cooperation but benefits have been seen in other settings (19). The focus of UK screening programmes has been reliant on FOB especially since the ScHARR report, which demonstrated effectiveness of FOBT for reducing mortality as well as being the least expensive and safest modality available (20–22). If implemented appropriately, this intervention may reduce mortality by approximately 16% for those participating in screening at least once and detect cancers at an earlier stage (23).

The objective of this systematic review is to examine whether the use of reminders to physicians increases the uptake of FOB testing.

Methods

Searching and selection

All studies comparing reminders to physicians (Rem) with controls (NRem) between January 1970 and October 2010 were identified. We searched the MEDLINE, EMBASE and CINAHL databases available through the NHS National Library of Health website, the Cochrane library and PubMed available online. The text words 'faecal occult blood,' 'screening,' 'reminders,' 'physician reminders,' 'physician role,' 'colon cancer' and 'rectal cancer' were used in combination with the medical subject heading 'mass screening' and 'colorectal cancer.' Two authors excluded irrelevant articles, reviews and meta-analyses evident from the titles and abstracts (MRSS and KK). Relevant articles referenced in these publications were obtained and the references of identified studies were searched to identify any further studies. No language restriction was applied. A third researcher (MSS) confirmed study selection. Only comparative studies looking at Rem versus NRem relating to the uptake of colorectal cancer screening were included. We excluded studies not fulfilling our inclusion criteria, those that did not focus on FOB uptake and those that did not give specific data or individual patient data.

Data extraction

Each included article according to our selection criteria (comparative studies examining FOB testing for colorectal cancer screening in any language involving patients of any age and sex—Table I) was critically reviewed by two researchers using a double extraction method for eligibility. This was performed independently and if any conflict arose resolution was through discussion with the authors prior to analysis.

Table I. Inclusion criteria.

- All studies comparing physician reminders with no reminders
- All studies related to colorectal cancer screening
- All studies looking at FOB or endoscopic surveillance
- Trials on patients of any age and sex eligible for colorectal cancer screening
- Trials in all languages

Our outcome variable was the uptake of FOB after introducing reminders to doctors seeing patients in a hospital clinic or in a primary care setting.

Quality assessment

The methodological quality of included trials is explained comprehensively in Table II. Assessment was based on a combined system using Chalmers et al. and Jadad et al. criteria, and was performed by two authors independently (MRSS & MSS) (24–27).

Data synthesis

A senior statistician using Microsoft Excel 2003 performed statistical analysis. We reported our outcome as risk differences and combined studies using the Mantel-Haenszel method under the fixed effects model and the DerSimonian and Laird method under the random effects model (28). A forest plot was used for the graphical display. A *P*-value less than 0.05 was deemed to indicate a statistically significant difference. Heterogeneity of the studies was assessed according to Q and I2. If the heterogeneity was significant a random effects method was used otherwise a fixed effects method was utilized. The decision to use a random effects model if heterogeneity existed, and continue with a quantitative analysis rather than a qualitative one, was that we expected a degree of heterogeneity due to different reminding techniques. However, the agreement amongst the authors was that any reminding mechanism should give the same direction effect but that the effect size may differ. Pooling of the studies was thus still considered valid.

Results

Search results

A flow chart of the literature search is shown in Figure 1. Twelve trials comparing Rem with NRem

Table II. Modified quality score for randomized controlled trials, Jadad et al. (27) Chalmers et al. (26).

Quality variables	Sequist et al. (38)	Vinker et al. (37)	Ornstein et al. (40)	Becker et al. (36)	Weingarten et al. (39)
Was the study described as randomized such as using the words randomly, random, and randomization? (0,1)	1	1	1	1	1
Was randomization described and appropriate? (–1,0,1)	1	0	0	0	1
Was the study described as double blind? (0,1)	1	0	0	1	0
Was method of blinding appropriate? (–1,0,1)	1	0	0	1	0
Was there a description of withdrawals and dropouts? (0,1)	0	0	0	0	0
Inclusion criteria	1	1	1	1	1
Exclusion criteria	1	0	1	1	0
Study period given	1	0	1	1	1
Appropriate statistical analysis	1	1	1	1	0
Hard end points	1	1	1	1	1
Sample size calculation	0	0	0	0	0
Baseline comparable	1	0	0	1	1
Any missing post intervention data	0	0	0	0	0
Allocation concealment	0	0	0	0	0
Analysis by intention to treat	1	1	0	0	0

Papers with higher scores were considered to be of higher quality.

were retrieved from the electronic databases (29–40). Five prospective randomized studies on 25 287 patients met the inclusion criteria and qualified for the review (Table I) (36–40). Seven trials were excluded due to unusable data or if they investigated individual primary care practices and physicians (29–35). Some data was given as a proportion increase in uptake but gave no baseline,

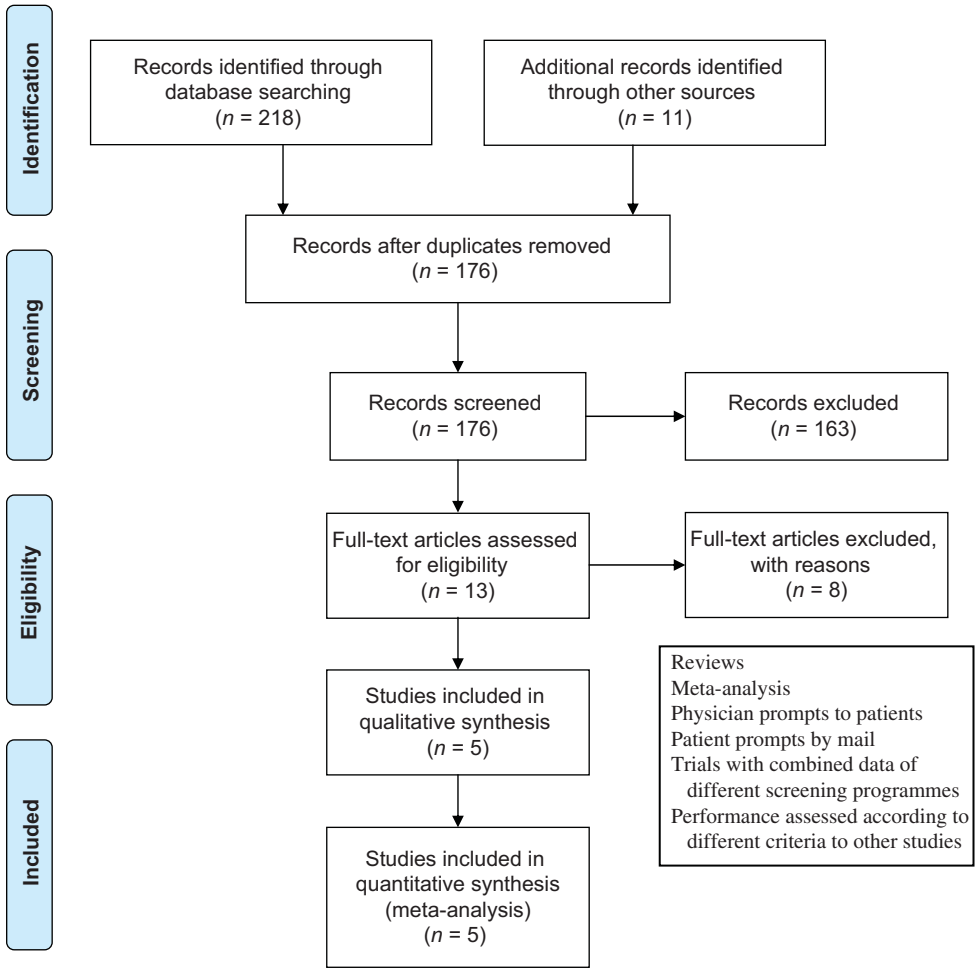

Figure 1. Flow chart of literature search.

and hence data could not be used for meta-analysis (32,34) (Table III). The studies we included incorporated both hospital clinic and primary care visits by adult patients.

Characteristics of included trials

Table IV outlines the individual characteristics for each trial. Sequist et al., used electronic reminders to physicians during office visits with their patients who were overdue for screening (38). Physicians were able to view the reminder at any time (passive) and were actively reminded when attempting to place an electronic order (active). The study by Vinker et al., used a note placed in the patient file to remind physicians of the need to suggest screening, in addition patients were also reminded using a letter or phone call (37). Ornstein et al., and Becker et al., used memorandums, which may be attached to the patient's file to remind physicians (36,40). Weingarten et al., used a computerized system where a list was displayed on screen to highlight the need for screening (39).

Results of quality assessment

The results of quality assessment can be found in Table II. Generally the articles available in the literature were not of excellent quality. Sequist et al. had the most robust methodology describing a double blind randomized trial with inclusion and exclusion criteria (38). The methodology was weakened by lack of sample size calculation and no mention of whether there was any missing post intervention data or not. Three studies all stated their inclusion criteria, study period and had obvious quantitative endpoints (36,39,40). Furthermore, Becker et al., described their study as double blind and gave exclusion criteria (36). Vinker et al. was the weakest paper and only stated inclusion criteria, statistical analyses performed and that it was a randomized trial (37). The methodological strength of this paper was that it performed an analysis according to the intention to treat basis, which was missing in three of the other studies.

Table III. Excluded trials.

Trial (Ref.)	Reason for exclusion
Williams 1998 (29)	No specific data on number of patients undergoing FOB testing
Frame et al., 1994 (34)	No individual data available
McPhee et al., 1991 (32)	Use of combined performance scores for each physician and not individual patients, unclear whether the same data as previous study
Fordham et al., 1990 (35)	Data on practices rather than individual patient uptake
McPhee et al., 1989 (31)	Use of combined performance scores for each physician and not individual patients
Turner et al., 1989 (30)	No individual data given on FOB testing
McDonald 1984 (33)	No individual data. Physician randomization

Uptake of FOB testing

There were 12 641 patients in the Rem group and 12 646 in the NRem group. Data on FOB testing was extracted and tabulated as shown in Table V. All five studies included in the meta-analysis obtained a higher percentage uptake when physician reminders were given. However, in only two of the studies (Vinker et al. and Ornstein et al.) were the percentage uptake significantly higher (37, 40). Using the Mantel-Haenszel method, there was significant heterogeneity among trials ($Q = 104.5$, $df = 4$, $P < 0.001$, $I2 = 0.007$, $I2 = 95\%$) and, therefore, the fixed effects model was inappropriate (36–40). Using the DerSimonian and Laird method, the combined increase was not statistically significant (random effects model: risk difference = 6.6%, 95% CI: −2–14.7%; $z = 1.59$, $P = 0.112$; Figure 2).

Discussion

The focus of UK screening programmes has been reliant on FOB especially since the ScHARR report, which demonstrated effectiveness of FOBT for reducing mortality as well as being the least expensive and safest modality available (20–22). If implemented appropriately, this intervention may reduce mortality by approximately 16% for those participating in screening at least once and detect cancers at an earlier stage (23).

Main findings

This systematic review suggests that prompting physicians does not lead to improvement to the uptake of FOB testing. These reminders to physicians were in the form of a computerized message or memorandum placed on the front of the case notes. Our finding is contrary to some reports suggesting that physicians pay more attention to adherence of colorectal screening guidelines as a result of reminders (18). Our results are supported by the most recent study (38). However, Sequist et al. suggest that the number of patient visits has a role to play in whether reminders to physicians increase FOB uptake (38).

Table IV. Reminder protocols for trials.

Trial	Year (ref.)	Intervention	*n*	Randomization type	Age (mean)	Gender	Setting	Reminder type	Method of uptake measurement	F/Up (months)
Sequist et al.	2009 (38)	Reminder No reminder	10912 10948	Cluster	50–80 (60)	57% women	Primary care	Electronic	Electronic & medical record	15 15
Vinker et al.	2002 (37)	Reminder No reminder	753 913	Cluster	50–75 (61)	52.2% women	Primary care	Note in patient file	Not stated	12 12
Ornstein et al.	1991 (40)	Reminder No reminder	818 618	Cluster	22–57 (40)	62% women	Primary care	Memo. in patient file	Not stated	12 12
Becker et al.	1989 (36)	Reminder No reminder	103 117	Individual Individual	40–60 (53)	64.1% women	Hospital and primary care	Memo. attached to patient notes	Chart/notes review	12 12
Weingarten et al.	1989 (39)	Reminder No reminder	55 50		Adults	Not stated	Community health centre	Electronic list	Data recorded in notes	30 30

F/Up, average time after the intervention before reviewing the notes to see what the uptake had been for FOB testing.

Table V. Outcome variables.

Trial	Year (ref.)	Type	*n*	FOB	% Uptake
Sequist et al.	2009 (38)	Reminder No reminder	10912 10948	2505 2499	23.0 22.8
Vinker et al.	2002 (37)	Reminder No reminder	753 913	124 12	16.5 1.3
Ornstein et al.	1991 (40)	Reminder No reminder	818 618	190 116	23.2 18.8
Becker et al.	1989 (36)	Reminder No reminder	103 117	12 7	11.7 6.0
Weingarten et al.	1989 (39)	Reminder No reminder	55 50	31 24	56.4 48.0

Strengths of review

The main strength of this review is its systematic approach and inclusion of the study by Sequist et al. It highlights the paucity of literature on this intervention and the move towards a multi-intervention approach to increase the uptake in screening.

Limitations

At study level and outcome level. Different insurance levels and health care systems may lead to varying uptakes because of presence or lack of incentives for doctors (37). Some patients due for screening did not attend their primary care practitioner and the 'reminding mechanism' did not take place.

The main source of heterogeneity was the paper by Vinker et al., displaying a significantly favourable outcome in the Rem group and may relate to the age group analyzed, the use of a memorandum attached to the patients file as a reminder or a population in

Figure 2. FOB uptake (Risk difference in %).

which the baseline uptake of FOB testing was low (37). Baseline uptake in the Vinker study was <2% (increasing to 16% uptake with intervention) whilst baseline for studies such as Ornstein et al., was 18% and the intervention group had an increase of 5% uptake (40). The proportional increase in uptake suggests that a lower baseline rate may result in greater uptake. This hypothesis has been observed in other screening settings such as breast screening (41). Furthermore, earlier studies had a lower baseline-screening rate, which may impact on overall increase in uptake (32,42,43). These trials may not be applicable to societies where screening rates are reasonably high (38).

The mean age ranged between 40 and 60 with one study just commenting on the comparable nature between control and intervention (36–40). Vinker et al. showed that the greater the age the higher the compliance and this may contribute to heterogeneity (37). Race may affect susceptibility of any proposed intervention (40). Vinker et al. found a different uptake rate amongst older as compared to younger patients (37). Another difference was that they followed up patients with a telephone call effectively introducing another intervention (patient reminder) and this may also contribute to the large increase in uptake.

The studies included in this meta-analysis displayed significant heterogeneity and may result from different reminder techniques (computerized versus non-computerized). Sequist et al. and Weingarten et al. used computerized systems, whereas the other three studies did not (38,39). Furthermore Weingarten et al. used the computer system as a method of documentation rather than an active reminder system whereas Sequist et al. used computers actively and passively to remind physicians for the test. Physicians were also educated prior to the intervention in 2 studies and this may affect the motivation and outcome of FOB uptake by patients (38, 40). Sequist et al. identified that patient education had a greater impact on increased screening rates (38). Time pressures during brief clinic visits may pose a challenge as well as different physician choices of first line screening tests (colonoscopy versus FOB testing) (38).

At review level. The weaknesses of this systematic review are the limited number of studies, heterogeneity and exclusion of some studies, which showed an increase in FOB uptake after reminders but could not be included due to lack of data. These studies showed uptake increased by 11–14% with use of reminders (32,34). Furthermore, there were differences in quality between studies and a re-meta-analysis should be performed when better quality trials are available.

Other limitations to our study include the use of assessments of papers according to set criteria. Whilst this may give an indication to study strength it may not highlight other potential weaknesses such as detailed inter-study differences. Although all were randomized, there were significant weaknesses in all but Sequist et al. (38). Vinker et al. showed a markedly positive result despite being the weakest study (37). However, with inclusion of this paper, the risk difference does not achieve significance. This is in contrasts with Sequist et al. (38) (highest quality score), which showed no difference. This interstudy difference may be because of the quality differences. Other reasons could be due to the higher baseline screening levels and the fact that about a third of patients in the trial by Sequist et al. did not attend their primary care practice (38).

Interpretation in the context of other literature

Some non-comparative studies contradict our findings (12% uptake in one study) whilst other articles suggest increased uptake using different types of physician prompts such as checklists or flow-sheets (30–32, 44,45). Two meta-analyses conducted on computer-based reminders and FOB combined with other screening tests other than FOB testing suggest a positive role of reminding physicians (42,43) and is consistent with other individual studies excluded from this meta-analysis reporting 11–14% uptake after incorporation of a computer reminder system (32,34). One review looked at computerized reminders to physicians only and indicated an increased uptake of 20% in FOB testing (46). However, most of these studies were conducted before well-established screening programmes and further trials need to be conducted within this context.

Implications for further studies and primary healthcare

Our results may be supportive of the idea that a multi-intervention process is required to improve the uptake of screening and also suggests work is required to examine the impact of reminding physicians, who see specific patient sub-sets evident from the individual studies. These trials should focus on people from areas of high deprivation, age, sex and populations, in which there is a lower baseline uptake to establish a threshold where reminders may no longer be needed.

In the UK, the baseline uptake is 40% in people from areas of high deprivation. Therefore, using reminders may improve this situation. The role of these reminders and subsequent uptake of screening may also be affected by the type of health care

provision (National or Private) (40). In the UK, increasing screening rates to 60% or 80% may lead to 13–17% and 12–15% reduction in mortality in men and women respectively (47). A Cochrane review is currently underway exploring all potential interventions leading to improved screening rates (48). Other ways of improving uptake may include patient reminders, public health campaigns and physician reminders to patients.

Summary

All the analysed trials were randomized and the summative outcome suggests the use of prompts does not increase FOB test uptake. Further randomized trials, are required to identify clearly whether there is a benefit of reminders in certain population groups.

Conclusion

Reminding physicians about those patients due for FOB testing may not improve the effectiveness of a colorectal cancer screening programme however, further studies focusing on people from areas of high deprivation, age, sex and populations, in which there is a lower baseline uptake are required.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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