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Manually-generated reminders delivered on paper: effects on professional practice and patient outcomes (Review)

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Pantoja T, Grimshaw JM, Colomer N, Castañon C, Leniz Martelli J.
Manually-generated reminders delivered on paper: effects on professional practice and patient outcomes.
Cochrane Database of Systematic Reviews 2019, Issue 12. Art. No.: CD001174.
DOI: 10.1002/14651858.CD001174.pub4.

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[Intervention Review]

Manually-generated reminders delivered on paper: effects on professional practice and patient outcomes

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Editorial group: Cochrane Effective Practice and Organisation of Care Group.
Publication status and date: New, published in Issue 12, 2019.

Citation: Pantoja T, Grimshaw JM, Colomer N, Castañon C, Leniz Martelli J. Manually-generated reminders delivered on paper: effects on professional practice and patient outcomes. *Cochrane Database of Systematic Reviews* 2019, Issue 12. Art. No.: CD001174. DOI: 10.1002/14651858.CD001174.pub4.

ABSTRACT

Background

Health professionals sometimes do not use the best evidence to treat their patients, in part due to unconscious acts of omission and information overload. Reminders help clinicians overcome these problems by prompting them to recall information that they already know, or by presenting information in a different and more accessible format. Manually-generated reminders delivered on paper are defined as information given to the health professional with each patient or encounter, provided on paper, in which no computer is involved in the production or delivery of the reminder. Manually-generated reminders delivered on paper are relatively cheap interventions, and are especially relevant in settings where electronic clinical records are not widely available and affordable. This review is one of three Cochrane Reviews focused on the effectiveness of reminders in health care.

Objectives

1. To determine the effectiveness of manually-generated reminders delivered on paper in changing professional practice and improving patient outcomes.
2. To explore whether a number of potential effect modifiers influence the effectiveness of manually-generated reminders delivered on paper.

Search methods

We searched CENTRAL, MEDLINE, Embase, CINAHL and two trials registers on 5 December 2018. We searched grey literature, screened individual journals, conference proceedings and relevant systematic reviews, and reviewed reference lists and cited references of included studies.

Selection criteria

We included randomised and non-randomised trials assessing the impact of manually-generated reminders delivered on paper as a single intervention (compared with usual care) or added to one or more co-interventions as a multicomponent intervention (compared with the co-intervention(s) without the reminder component) on professional practice or patients' outcomes. We also included randomised and non-randomised trials comparing manually-generated reminders with other quality improvement (QI) interventions.

Data collection and analysis

Two review authors screened studies for eligibility and abstracted data independently. We extracted the primary outcome as defined by the authors or calculated the median effect size across all reported outcomes in each study. We then calculated the median percentage

improvement and interquartile range across the included studies that reported improvement related outcomes, and assessed the certainty of the evidence using the GRADE approach.

Main results

We identified 63 studies (41 cluster-randomised trials, 18 individual randomised trials, and four non-randomised trials) that met all inclusion criteria. Fifty-seven studies reported usable data (64 comparisons). The studies were mainly located in North America (42 studies) and the UK (eight studies). Fifty-four studies took place in outpatient/ambulatory settings. The clinical areas most commonly targeted were cardiovascular disease management (11 studies), cancer screening (10 studies) and preventive care (10 studies), and most studies had physicians as their target population (57 studies). General management of a clinical condition (17 studies), test-ordering (14 studies) and prescription (10 studies) were the behaviours more commonly targeted by the intervention.

Forty-eight studies reported changes in professional practice measured as dichotomous process adherence outcomes (e.g. compliance with guidelines recommendations), 16 reported those changes measured as continuous process-of-care outcomes (e.g. number of days with catheters), eight reported dichotomous patient outcomes (e.g. mortality rates) and five reported continuous patient outcomes (e.g. mean systolic blood pressure).

Manually-generated reminders delivered on paper probably improve professional practice measured as dichotomous process adherence outcomes) compared with usual care (median improvement 8.45% (IQR 2.54% to 20.58%); 39 comparisons, 40,346 participants; moderate certainty of evidence) and may make little or no difference to continuous process-of-care outcomes (8 comparisons, 3263 participants; low certainty of evidence). Adding manually-generated paper reminders to one or more QI co-interventions may slightly improve professional practice measured as dichotomous process adherence outcomes (median improvement 4.24% (IQR −1.09% to 5.50%); 12 comparisons, 25,359 participants; low certainty of evidence) and probably slightly improve professional practice measured as continuous outcomes (median improvement 0.28 (IQR 0.04 to 0.51); 2 comparisons, 12,372 participants; moderate certainty of evidence). Compared with other QI interventions, manually-generated reminders may slightly decrease professional practice measured as process adherence outcomes (median decrease 7.9% (IQR −0.7% to 11%); 14 comparisons, 21,274 participants; low certainty of evidence).

We are uncertain whether manually-generated reminders delivered on paper, compared with usual care or with other QI intervention, lead to better or worse patient outcomes (dichotomous or continuous), as the certainty of the evidence is very low (10 studies, 13 comparisons). Reminders added to other QI interventions may make little or no difference to patient outcomes (dichotomous or continuous) compared with the QI alone (2 studies, 2 comparisons).

Regarding resource use, studies reported additional costs per additional point of effectiveness gained, but because of the different currencies and years used the relevance of those figures is uncertain.

None of the included studies reported outcomes related to harms or adverse effects.

Authors' conclusions

Manually-generated reminders delivered on paper as a single intervention probably lead to small to moderate increases in outcomes related to adherence to clinical recommendations, and they could be used as a single QI intervention. It is uncertain whether reminders should be added to other QI intervention already in place in the health system, although the effects may be positive. If other QI interventions, such as patient or computerised reminders, are available, they should be preferred over manually-generated reminders, but under close evaluation in order to decrease uncertainty about their potential effect.

PLAIN LANGUAGE SUMMARY

The effect of manually-generated reminders delivered to providers on paper on professional practice and patient outcomes

What is the aim of this review?

In this Cochrane Review we aimed to find out if health workers who are given reminders on paper give better health care. The reminders contained information about the patients, for instance recommendation to measure blood pressure. We collected and analysed all relevant studies and found 63 studies.

Key messages

It seems likely that providing reminders to health workers probably leads to small-to-moderate improvements in their practice measured as adherence to clinical recommendations. It is uncertain whether providing reminders has an effect on patient outcomes.

What was studied in the review?

Health workers do not always provide care that is recommended by clinical guidelines or standards, because of too much information or unconscious forgetfulness. One possible solution is to give them paper reminders that were not created by a computer. These are particularly important in countries where electronic records are not widely available. Reminders may help health workers overcome those problems by prompting them to follow clinical recommendations in guidelines or by providing information in a simple and timely way.

In this review we evaluated the effects of reminders generated manually and delivered on paper on professional practice and patient outcomes.

What are the main results of the review?

We identified 63 studies and included 57 in our analysis. The studies evaluated reminders aimed at ordering screening tests, providing vaccinations, prescribing specific medications, or discussing care with patients. The studies show that:

- reminders alone (single-component intervention) probably improve professional practice, measured as compliance with recommendations, compared with usual care;

- reminders added to one or more co-interventions (multicomponent intervention) may slightly improve professional practice, measured as compliance with recommendations, compared with the co-intervention(s) without the reminder component;

- reminders may lead to slightly worse professional practice than other interventions for quality improvement, such as patients reminders;

- it is uncertain whether reminders compared with usual care or other quality-improvement interventions improve patient outcomes;

- reminders added to other quality-improvement interventions may make little or no difference to patient outcomes compared with the quality intervention alone;

- there were additional costs to obtain the effects described above, but the relevance of the figures presented was uncertain;

- none of the included studies reported outcomes related to harms or adverse effects.

How up-to-date is this review?

The review authors searched for studies published up to December 2018.

SUMMARY OF FINDINGS

Summary of findings for the main comparison. Manual paper reminders compared with usual care

Manual paper reminders compared with usual care

Patient or population: Healthcare professionals (physicians, nurses and dentists)

Settings: Ambulatory and hospital care in USA, Canada, UK, France, Switzerland, Taiwan, Australia, Germany, Hong Kong, India, Israel, Spain and Thailand

Intervention: Manual paper reminders focused on improving compliance with preventive guidelines (e.g. cancer screening, vaccination) and disease management guidelines (e.g. annual follow-ups, test-ordering, medication adjustment, counselling)

Comparison: Control/usual care

Outcomes	Median improvement (IQR)	N° of studies (N° participants)	Certainty of the evidence (GRADE)	Comments
Changes in professional practice (measured as dichotomous process adherence outcomes)	8.45% (2.54% to 20.58%)	39 studies (40,346)	⊕⊕⊕⊖ **moderate**[a]	Studies assessed outcomes such as proportion of patients receiving colonoscopy or compliance with 13 preventive health manoeuvres
Changes in professional practice (continuous)	−0.002 (−0.02 to 0.01)	8 studies (3263)	⊕⊕⊖⊖ **low**[b]	The effect estimate is a median of the standardised mean differences in the studies assessing outcomes such as number of office visits, number of transfusion units or number of missed opportunities per patient per year
Patient outcomes (dichotomous)	3.24% (2.31% to 4.12%)	7 studies (8390)	⊕⊖⊖⊖ **very low**[c]	Studies assessed outcomes such as mortality rates, or smokers quitting rates
Patient outcomes (continuous)	0.001 (−0.002 to 0.11)	4 studies (1222)	⊕⊖⊖⊖ **very low**[c]	Studies assessed outcomes such as mean catheter days or systolic and diastolic blood pressure
Resource use	Additional health service costs of GBP 65 and between EUR 41 and EUR 59	2 studies (2570)	⊕⊕⊖⊖ **low**[d]	The additional costs are per additional point of effectiveness gained (additional attendance for breast cancer screening and additional point of Guideline Conformity Rate)
Adverse effects	Not reported	-	-	None of the included studies reported outcomes related to adverse effects of reminders

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[a]We downgraded the certainty of the evidence because of methodological limitations in the included studies (17 of them were rated at high risk of bias for this outcome).
[b]We downgraded the certainty of the evidence because of methodological limitations in the included studies, imprecision (very wide range of effects), and some inconsistency in the results.
[c]We downgraded the certainty of the evidence because of methodological limitations in the included studies and very serious inconsistency (very diverse clinical areas).
[d]We downgraded the certainty of the evidence because of inconsistency (very different health systems and currencies) and imprecision in the results.

Summary of findings 2. Manual paper reminders added to another QI intervention compared with the same QI intervention

Manual paper reminders added to another QI intervention compared with the same QI intervention without reminders

Patient or population: Healthcare professionals (physicians, nurses and dentists)

Settings: Ambulatory and hospital care in USA, Canada, UK, France, Switzerland, Taiwan, Australia, Germany, Hong Kong, India, Israel, Spain and Thailand

Intervention: Manual paper reminders added to another QI intervention (feedback, patient reminders, educational meetings, educational materials, test request forms)

Comparison: Another QI intervention (feedback, patient reminders, educational meetings, educational materials, test request forms)

Outcomes	Median improvement (IQR)	No of studies (N° participants)	Certainty of the evidence (GRADE)	Comments
Changes in professional practice (measured as dichotomous process adherence outcomes)	4.24% (−1.09% to 5.50%)	12 studies (25,359)	⊕⊕⊖⊖ **low**[a]	Studies assessed outcomes such as attendance for breast cancer screening or coverage of faecal occult blood test screening for colorectal cancer
Changes in professional practice (continuous)	0.28 (0.04 to 0.51)	2 studies (12,372)	⊕⊕⊕⊖ **moderate**[b]	The effect estimate is a median of the standardised mean differences in the studies assessing outcomes such as scores of compliance with guidelines and mean practice mammography referral and completion rates
Patient outcomes (dichotomous)	−3.16% (−8.51% to 2.18%)	2 studies (1883)	⊕⊕⊖⊖ **low**[c]	Studies assessed outcomes such as patient smoking quitting rates and proportion of patients with no periods Negative figures indicate a median decrease
Patient outcomes (continuous)	0.001 (−0.003 to 0.003)	1 study (946)	⊕⊕⊕⊖ **moderate**[d]	The effect estimate is a median of 10 outcomes (condition-specific outcomes and four domains of SF-36 in women with menorrhagia or urinary incontinence) assessed in a single study Negative figures indicate a median decrease
Resource use	Additional health service costs of GBP 30 and between EUR 16.5 and EUR 67	2 studies (2570)	⊕⊕⊖⊖ **low**[e]	The additional costs are per additional point of effectiveness gained (additional attendance for breast cancer screening and additional point of Guideline Conformity Rate)

Adverse effects	Not reported	-	-	None of the included studies reported outcomes related to adverse effects of reminders

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[a]We downgraded the certainty of the evidence because of methodological limitations in the included studies (two studies were at high risk of bias and seven were at unclear risk), inconsistency of the results and some imprecision in the effect estimates.
[b]We downgraded the certainty of the evidence because of important methodological limitations of the included studies (one at high risk of bias and in the other at unclear risk), imprecision of the effect estimates and inconsistency in the results.
[c]We downgraded the certainty of evidence because of inconsistency and imprecision in the results.
[d]We downgraded the certainty of evidence because of imprecision in the results for the different outcomes measured in the study.
[e]We downgraded the certainty of the evidence because of inconsistency (very different health systems and currencies) and imprecision in the results.

Summary of findings 3. Manual paper reminders compared with other quality-improvement (QI) interventions

Manual paper reminders compared with other quality-improvement (QI) interventions

Patient or population: Healthcare professionals (physicians, nurses and dentists)

Settings: Ambulatory and hospital care in USA, Canada, UK, France, Switzerland, Taiwan, Australia, Germany, Hong Kong, India, Israel, Spain and Thailand

Intervention: Manual paper reminders focused on improving compliance with preventive guidelines (e.g. cancer screening, vaccination) and disease management guidelines (e.g. annual follow-ups, test-ordering, medication adjustment, counselling)

Comparison: Other QI interventions (patient reminders, computerised reminders, educational meeting or multifaceted interventions)

Outcomes	Median improvement (IQR)	No of studies (N° participants)	Certainty of the evidence (GRADE)	Comments
Changes in professional practice (measured as dichotomous process adherence outcomes)	−7.89% (−10.98% to 0.70%)	14 studies (21,274)	⊕⊕⊖⊖ **low**[a]	Studies assessed outcomes such as compliance with post-partum screening of diabetes mellitus and adherence to guideline recommendations on cardiovascular prevention Negative figures indicate a median decrease
Changes in professional practice (continuous)	Not reported	-	-	None of the included studies reported changes in professional practice measured as continuous outcomes
Patient outcomes (dichotomous)	−2.08% (−17.95% to 2.28%)	3 studies (2305)	⊕⊖⊖⊖ **very low**[b]	Studies assessed outcomes such as stopping smoking or seizure-free rates in patients with epilepsy Negative figures indicate a median decrease

Patient outcomes (continuous)	Not reported	-	-	None of the included studies reported patient outcomes measured as continuous variables
Resource use	Additional health service costs of GBP 30 and between EUR 17 and EUR 55 euros. The additional costs of maintenance were 78 cents (USD 1991) per patient per year.	3 studies (4235)	⊕⊕⊖⊖ **low**	The additional costs are per additional point of effectiveness gained (additional attendance to breast cancer screening and additional point of Guideline Conformity Rate) or the additional costs of maintaining the computer system that generates the computer reminders
Adverse effects	Not reported	-	-	None of the included studies reported outcomes related to adverse effects of reminders

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[a]We downgraded the certainty of the evidence because of methodological limitations in the included studies (two studies were at high risk of bias and nine were at unclear risk), and imprecision in the effect estimates.
[b]We downgraded the certainty of the evidence because of methodological limitations of the included studies (one was at high risk of bias and two were at unclear risk), imprecision of the effect estimates and inconsistency in the results.

BACKGROUND

Description of the condition

Clinical practice does not always reflect best evidence, and high proportions of inappropriate care have been reported in different healthcare systems and settings (Grol 2003; McGlynn 2003; Mangione-Smith 2007). This has an impact on patient outcomes, and healthcare costs. Passive dissemination of the evidence is often not enough to promote uptake of research, so specific strategies to encourage implementation of research-based recommendations and to ensure changes in practice have been advocated (Bero 1998; CRD 1999; Grol 2003; Shojania 2004; Shojania 2005; Grimshaw 2012). These strategies fall into a number of different categories: educational interventions (directed at clinicians or at patients), audit and feedback of performance data, case management, financial incentives and reminders, to name a few (Grol 2005; Shojania 2005). However, none of them have consistently conferred large improvements in care, especially when evaluated rigorously. In fact, they have been shown to produce only small-to-moderate improvements in processes of care, and smaller improvements in patient outcomes (Grimshaw 2012; Johnson 2015).

Description of the intervention

Provider reminders are a common approach to help clinicians remember to perform specific clinical tasks such as prescribing drugs, reviewing blood test results, ordering investigations or recommending preventive services (e.g. vaccination) (Buntinx 1993; Austin 1994; Balas 2000; Dexheimer 2008). They aim to prompt healthcare professionals to recall information that they may already know but could easily forget in the midst of performing other activities of care. Reminders can take many forms, depending on the way in which computers are involved in their production and delivery. Thus, we can distinguish the following three major groups of reminders.

1. Manually-generated paper reminders are those where no computer is involved in the production or delivery of the reminder or in selecting target patients. They could range from simple notes attached to the front of every chart ('static' prompts) to more sophisticated reminders given under specific conditions for specific types of patients ('dynamic' prompts).
2. Computer-generated paper reminders are those where a computer is used either to generate paper reminders or to identify patients for whom health professionals should receive a paper reminder.
3. Point-of-care computer reminders are those where the computer reminder is delivered to the health professional at the time they are engaged in the target activity of interest through a computer screen.

This review is focuses on the first group of reminders. The effectiveness of the other two groups has been reviewed by related Cochrane Reviews (Shojania 2009; Arditi 2017).

How the intervention might work

Health professionals sometimes do not use the best evidence to treat their patients, in part due to unconscious acts of omission, information overload or a number of practical issues including lack of time (McDonald 1976; Carlsen 2007). Reminders help clinicians overcome some of these problems by prompting them to recall information that they already know or would be expected to know, by presenting information in a different and more accessible or relevant format. In that sense, reminders work as a feedback of information intended to modify clinical practice, but in contrast with audit and feedback the information is presented close to the time of decision-making, increasing the probable effect of intervention (Mugford 1991; Ivers 2012a).

The effects of reminders on professional practice may be influenced by a number of factors such as: how the reminders are delivered (e.g. checklist, coloured stickers); whether they provide generic or patient-specific information; whether they provide an explanation of their content or not; whether they are explicitly supported by an influential source (Flodgren 2019); whether they require the healthcare professional to record a response (Litzelman 1993); whether targeted clinicians were involved in their development (Cohen 1994); and the behaviour targeted by them (Carlsen 2007; Arditi 2017).

Why it is important to do this review

When implementing a reminder system, the decision to use manual methods or a computer to produce or deliver reminders has major resource implications. Many health systems around the world, especially those in low-income countries, cannot afford electronic clinical records currently or in the foreseeable future (Bosch-Capblanch 2017). Relatively cheap interventions to change clinical practice, such as paper reminders, are therefore especially relevant in many settings, provided that they are effective.

Although a number of systematic reviews have indicated that reminders to healthcare professionals can be effective in promoting change in professional practice across a variety of clinical areas and settings (Johnston 1994; Wensing 1994; Mandelblatt 1995; Oxman 1995; Bero 1998; Balas 2000; Szilagyi 2000; Grimshaw 2001; Grol 2003; Dexheimer 2008; Reckmann 2009; Schedlbauer 2009; Grimshaw 2012), they have focused on reminders as one of a wide range of interventions aimed at improving professional practice (Wensing 1994; Mandelblatt 1995; Oxman 1995; Grimshaw 2001; Grol 2003; Grimshaw 2012), or focused on computer reminders (Johnston 1994; Reckmann 2009; Schedlbauer 2009). In addition, factors that may modify the effectiveness of reminders have not been systematically considered, except for the Cochrane Reviews assessing computer-generated or point-of-care computer reminders (Shojania 2009; Arditi 2017). This review specifically assesses the effects of manual paper reminders on professional practice and patient outcomes, and assesses the extent to which different features of manual paper reminders modify their effectiveness.

OBJECTIVES

1. To determine the effectiveness of manually-generated reminders delivered on paper in changing professional practice and improving patient outcomes.
2. To explore whether a number of potential effect modifiers influence the effectiveness of manually-generated reminders delivered on paper.

METHODS

Criteria for considering studies for this review

Types of studies

We have included the following study designs in this review:

- Randomised trial:
  - a trial where the allocation of patients, encounters or groups of patients (grouped by practitioners, firms, teams, hospitals) to the reminder intervention is stated as being randomised;
- Non-randomised trial:
  - a trial where non-random but probably balanced methods of allocation such as alternation by day of the week, odd/even patient case-note numbers etc. are used.

The minimum methodological inclusion criteria across all study designs are (EPOC 2017a):

- the objective measurement of performance/provider behaviour of health/patient outcome(s) in a clinical situation; and
- relevant and interpretable data presented or obtainable.

We eliminated duplicate reports of studies by comparing authors' names and the type and location of the study. We included reports published in non-English languages.

Types of participants

Any qualified healthcare professional, where qualified healthcare professionals form the majority (more than 50%) of the study population. We excluded studies that primarily target healthcare professional trainees.

Types of interventions

Manually-generated reminders delivered on paper are defined as information given to the health professional with each patient or encounter (e.g. blood pressure measurement recommendation for annual health examination), provided on paper, in which no computer is involved in the production or delivery of the reminder. The reminder is designed or intended to prompt healthcare professionals to recall information usually encountered through their general education, in the medical records or through interaction with peers, and remind them to perform or avoid some action to aid individual patient care. They could range from simple notes attached to the front of every chart ('static' prompts) to more sophisticated reminders given under specific conditions for specific types of patients ('dynamic' prompts).

The comparisons assessed in this review are:

- manually-generated reminders delivered on paper as a single-component intervention compared with no intervention (control/usual care);
- manually-generated reminders deliver on paper added to other quality improvement (QI) co-interventions (multicomponent intervention) compared with the co-intervention(s) without the reminder component;
- manually-generated reminders delivered on paper compared with other QI interventions.

The QI interventions are those described in the Cochrane Effective Practice and Organisation of Care (EPOC) taxonomy under the implementation strategies category 'Intervention targeted at healthcare workers' (EPOC 2015).

Types of outcome measures

Primary outcomes

We include studies which report analysable data for any of the following outcomes:

Professional practice as measured by:

- Dichotomous process adherence outcomes: the percentage of patients receiving a target process of care (e.g. prescription of a specific medication, documentation of performance of a specific task, such as referral to a consultant) or whose care was in compliance with a guideline recommendation;
- Continuous process outcomes: any continuous measure of how providers delivered care (e.g. duration of antibiotic therapy, time to respond to a critical lab value).

Patient outcomes as measured by:

- Dichotomous clinical outcomes: patient-important endpoints (such as death or development of a pulmonary embolism), as well as surrogate or intermediate endpoints, such as achievement of a target blood pressure or serum cholesterol level;
- Continuous clinical outcomes: various markers of disease or health status (e.g. mean blood pressure or cholesterol level).

Although we have included studies reporting the effect of manually-generated reminders delivered on paper on patient outcomes, the primary goal of our analysis was to evaluate the impact of reminders on adherence to targeted processes of care or guideline recommendations (dichotomous process adherence outcomes). We recognise that improving patient outcomes represents the ultimate goal of any quality improvement activity. However, we focus on process improvement for this review because we want to capture the degree to which reminders achieve their main immediate goal: changing provider behaviour (Mason 1999; Grol 2005).

Secondary outcomes

We also consider the following relevant outcomes:

- Adverse effects: for instance, if reminders are intended to promote use of an underused service (e.g. cervical cancer screening services), but they decrease the use of the service.
- Resource use: the amount of resources used for implementing the intervention in the trial setting, and any costs or savings attributable to implementation of the intervention.

We did not specify a priori any anticipated differential effects of the intervention on disadvantaged groups. The potential for differential effects depends on the health issue being addressed by the intervention and on the setting. We considered relevant differential effects, if sufficient data were reported in post hoc subgroup analyses.

Search methods for identification of studies

Electronic searches

For this review, the Cochrane EPOC Information Specialist rewrote search strategies in consultation with the authors. We searched the following databases for primary studies on 5 December 2018:

- Cochrane Central Register of Controlled Trials (CENTRAL; 2017 Issue 5) in the Cochrane Library;
- MEDLINE (OVID) (including Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Versions);
- Embase (OVID);
- Cumulative Index to Nursing and Allied Health Literature (CINAHL (EBSCO)).

We searched all databases from database start date to date of search. We translated the MEDLINE search strategy for other databases using appropriate syntax and vocabulary for those databases. We present full search strategies in Appendix 1. We limited the results by two methodological filters: a modified version of the 'Cochrane Highly Sensitive Search Strategy to identify randomised trials in MEDLINE: sensitivity- and precision-maximising version (2008 revision)' (Higgins 2017), and a Cochrane EPOC Group search filter to identify other study designs.

Searching other resources

Grey literature

We conducted a grey literature search on OpenGrey (www.opengrey.eu/) to identify studies not indexed in the databases listed above. We documented additional sources, if any, in the review.

Trial Registries

- International Clinical Trials Registry Platform (ICTRP), World Health Organization (WHO) www.who.int/ictrp/en/ (searched 5 December 2018)
- ClinicalTrials.gov, US National Institutes of Health (NIH) clinicaltrials.gov/ (searched 5 December 2018)

We also:

- screened individual journals and conference proceedings (e.g. handsearching);
- reviewed reference lists of all included studies, relevant systematic reviews/primary studies/other publications;
- contacted authors of relevant studies or reviews to clarify reported published information/seek unpublished results/data;
- contacted researchers with expertise relevant to the review topic/EPOC interventions;
- conducted cited reference searches for all included studies in citations indexes.

Data collection and analysis

Selection of studies

Two review authors (from TP, NC, JL), working independently in pairs, screened all titles and abstracts to assess which studies met the inclusion criteria. We retrieved full-text copies of all papers that were potentially relevant and two review authors (from TP, NC, JL, CC), working in pairs, assessed them independently. We resolved any disagreement by discussion or by consulting an arbitrator (JG) in case of persistent disagreement. We kept a log of the selection process to complete a PRISMA flow diagram (Moher 2009) and a Characteristics of excluded studies table (See Figure 1).

Data extraction and management

Two review authors (from TP, NC, JL, CC) undertook data abstraction independently, using a modified version of the Cochrane EPOC Group data collection checklist (EPOC 2017b) in Covidence. We resolved any disagreements by discussion or by consulting an arbitrator (JG) if necessary.

Assessment of risk of bias in included studies

Two review authors (from TP, JL, CC), working independently in pairs, assessed the risks of bias of all eligible studies, using the criteria suggested in the Cochrane EPOC Resources for review authors (EPOC 2017c), resolving discrepancies by discussion and by involving an arbitrator (JG) where necessary.

We summarised the overall risk of bias for each study (across outcomes) and for each outcome or class of similar outcomes (across studies) using the following criteria (Higgins 2017).

- Within each study across domains:
  - we considered studies with low risk of bias for all key domains or where it seems unlikely for bias to seriously alter the results to have a low risk of bias;
  - we considered studies where risk of bias in at least one domain was unclear or judged to have some bias that could plausible raise doubts about the conclusions to have an unclear risk of bias;
  - we considered studies with a high risk of bias in at least one domain or judged to have serious bias that decrease the certainty of the conclusions to have a high risk of bias.
- Across studies, we defined:
  - each outcome (or class of outcomes) as having a low risk of bias if most information was from studies at low risk of bias;
  - as high risk of bias if the proportion of information from studies at high risk of bias was sufficient to affect the interpretation of the results;
  - an unclear risk of bias if most information was from studies at low or unclear risk of bias.

We present our findings in a 'Risk of bias' table, and use graphs and figures to summarise our assessments across studies.

Measures of treatment effect

Measures of effect depended on the type of outcome data presented in the individual studies. For dichotomous outcomes we calculated differences in proportions between the intervention and comparison groups before and after the intervention. For continuous outcomes we calculated standardised effect sizes by dividing the difference in mean scores between the intervention and comparison group in each study by an estimate of the (pooled) standard deviation. We reported a single effect size for each type of outcome in each comparison in each study. If more than one measure of treatment effect was reported for a type of outcome within the same study, we used the primary outcome as defined by the study author. If there was not a clear primary outcome reported,

we computed and used a median from all available outcomes of the same type.

Direction of improvement

Some studies targeted quality problems that involve 'underuse', so that improvements in quality correspond to increases in the percentage of patients who receive a target process of care (for example, increasing the percentage of patients who receive the influenza vaccine). However, other studies targeted 'overuse', so that improvements correspond to reductions in the percentage of patients receiving inappropriate or unnecessary processes of care (for example, reducing the percentage of patients who receive antibiotics for viral upper respiratory tract infections). In order to standardise the direction of effects, we defined all process adherence outcomes so that higher values represented an improvement. For example, data from a study aimed at reducing the percentage of patients receiving inappropriate medications would be captured as the complementary percentage of patients who did not receive inappropriate medications. Increasing this percentage of patients for whom providers did not prescribe the medications would thus represent an improvement. Each outcome can then be interpreted as compliance with desired practice.

Adjustment for baseline differences

See Differences between protocol and review.

Unit of analysis issues

We expected that many eligible studies would be cluster designs (studies in which the unit of allocation is not a person, but is instead a group of people). We determined whether the data were correctly analysed: comparisons that allocate groups of participants (for example, primary care centres) should account for clustering during analysis, in order to prevent 'unit of analysis' errors, resulting in artificially extreme P values and over-narrow confidence intervals (CIs) (Ukoumunne 1999).

In cluster-randomised trials, we considered data to have been analysed correctly if:

- the analysis was conducted at the same level as the allocation (i.e. at the cluster level);
- the usual analysis was used but the sample size was reduced to its 'effective sample size', or the variance was inflated by the design effect; or
- the analysis was conducted at the level of the individual, but appropriate statistical correction for the clustering was performed (such as generalised estimating equations (GEE), mixed models, or multilevel models).

When we detected 'unit of analysis' errors we did not attempt to re-analyse these data and we reported the results of the study as point estimates of the intervention effect, without using any statistical measure of precision (P values or CIs).

Dealing with missing data

We attempted to contact authors to obtain important missing information for studies that were published within the last 10 years. For studies published before 2008, we had planned to use our best judgement to determine the missing information from the available publication (e.g. obtaining the numbers corresponding to outcomes only presented in graphs). However, we were able to obtain all the data needed to compute effect estimates from the available publications.

Assessment of heterogeneity

We assessed heterogeneity visually by preparing box plots (displaying medians, interquartile ranges, and ranges) to explore the size of the observed effects in relation to a number of explanatory factors (Subgroup analysis and investigation of heterogeneity). We considered each of them one at a time by looking for patterns in the distribution of the effect sizes. As we anticipated that there would not be enough studies for each relevant comparison, we did not consider formal tests of homogeneity, and we did not plan to use meta-regression to see whether the effect sizes could be predicted by study characteristics.

Assessment of reporting biases

Because the number of health professionals/practices in most of the studies was not reported in a reliable way, we were unable to use a funnel plot to visually explore the risk of publication bias (see Differences between protocol and review).

Data synthesis

We based our primary analyses upon consideration of dichotomous process adherence measures (for example, the proportion of patients managed according to evidence-based recommendations). In order to provide a quantitative assessment of the effects associated with reminders without resorting to numerous assumptions or conveying a misleading degree of confidence in the results, we used the median improvement in dichotomous process adherence measures across studies. As mentioned before, where studies report more than one measure for each outcome, we extracted the primary measure (as defined by the authors of the study) or the median measure identified. For example, when the comparison reported five dichotomous process adherence outcomes and none of them was denoted as the primary outcome, then we ranked the effect sizes for the five outcomes and took the median value. This median would then contribute the single effect size for that study. With each study represented by a single median outcome, we calculated the median effect size and interquartile range across all included studies for that comparison.

Our secondary analyses explored consistency of primary analyses with other types of endpoints (for example, continuous process-of-care measures, dichotomous outcome of care measures and continuous outcome of care measures) using the same approach as for dichotomous process adherence outcomes.

'Summary of findings'

One author (TP) assessed the degree of confidence in the estimates of effect across studies for each outcome in each comparison using the GRADE approach (Guyatt 2008). A second author (JL) participated in discussion of unclear assessments. The evaluation included study design, risk of bias, inconsistency of effect size, indirectness, imprecision, and other considerations, including publication bias (EPOC 2017d). We present the certainty of evidence assessment results in GRADE evidence profiles (Appendix 2; Appendix 3; Appendix 4). We prepared 'Summary of findings' tables to summarise the effect estimates for changes in professional practice, patient outcomes, adverse effects and resource use for the three comparisons assessed in this review.

Subgroup analysis and investigation of heterogeneity

We assessed how the effectiveness of reminders was affected by the following modifiers, using subgroup analyses:

- Delivery of reminder:
  - reminders that indicate a response should be recorded or given versus reminders that do not.
- Type of reminder:
  - reminders that include some individual patient-specific information versus generic reminders.
- Content of reminder:
  - reminders that include an explanation of their content or advice versus reminders that do not include this; and
  - reminders that are explicitly from or justified by reference to an influential source versus reminders from another source (an influential source is a person or body likely to be perceived as credible by the target clinician).
- Development of reminder:
  - reminders developed by the same person/people conducting the study; and
  - reminders developed with the involvement of target clinicians versus reminders developed without their participation.
- Behaviour targeted by intervention:
  - reminders targeting different types of clinical activity (test ordering, medication prescribing); and
  - reminders targeting underuse of a process of care versus those targeting overuse of a process of care.

Based on other reminders reviews and the evidence from other literature on interventions to change professional behaviour (Shojania 2009; Arditi 2017), we hypothesised that greater effects would be associated with the following characteristics of reminders:

- where a response should be recorded (Litzelman 1993);
- including patient-specific information;
- including an explanation of their content/advice;
- explicitly from or justified by reference to an influential source (Flodgren 2019);
- developed by the same person/people conducting the study;
- developed with the involvement of target clinicians (Cohen 1994);
- targeting different types of clinical activity (test ordering, medication prescribing) (Arditi 2017);
- targeting underuse of a process of care (Carlsen 2007).

We explored the effect of the following study features in the effect of reminders:

- Publication year: older studies (before 1997) versus those carried out between 1998 and 2002 versus newer ones (after 2002);
- Study design: randomised versus non-randomised trials;
- Country: studies carried out in the USA versus those performed in other countries;
- Setting: reminders implemented in an outpatient setting versus those implemented in inpatient settings (Ivers 2012a);
- Sample size: studies with large (> median) sample sizes versus those with small (< median) sample sizes;
- Co-interventions: studies assessing multifaceted interventions (reminders + other interventions) versus those assessing single interventions (reminders only);
- Level of analysis: studies analysed at the level of group of professionals versus at the individual professional/patient level).

We used univariate statistical analyses using a non-parametric rank-sum test (Mann-Whitney or Kruskal-Wallis) for comparisons of the median effect sizes across studies in those different subgroups. We ran all of these analyses on Stata Statistical Software: Release 14 (StataCorp 2015). The figures displaying those analyses were also produced in Stata Statistical Software. We had planned to use meta-regression to examine how the effect size was related to the potential explanatory variables previously detailed, but it was not possible to obtain or impute variances of effect sizes (without unit of analysis errors) for most of the included studies.

Sensitivity analysis

We performed sensitivity analyses using, instead of the primary outcome as defined by studies' authors, the median outcome for each study. We calculated a summary effect measure using the adjusted (for baseline differences) difference for dichotomous outcomes, in order to include information presented in studies with baseline compliance measures. We also recalculated the summary effect size for the main comparison, excluding those studies at high risk of bias.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies

Results of the search

We identified 10,717 records through our search strategy, of which we removed 503 as duplicates and excluded 9972 after screening the titles and abstracts. After assessing full texts of the remaining 242 articles, we selected 63 studies (65 articles) that met all our inclusion criteria. We were unable to obtain useable data for a quantitative analysis for six studies (Cheney 1987; Cohen 1989a; Cohen 1989b; Saitz 2003; Beaulieu 2004; Roetzheim 2004), resulting in 57 studies (64 comparisons) included in our quantitative synthesis (Figure 1).

Figure 1. Study flow diagram (Moher 2009)

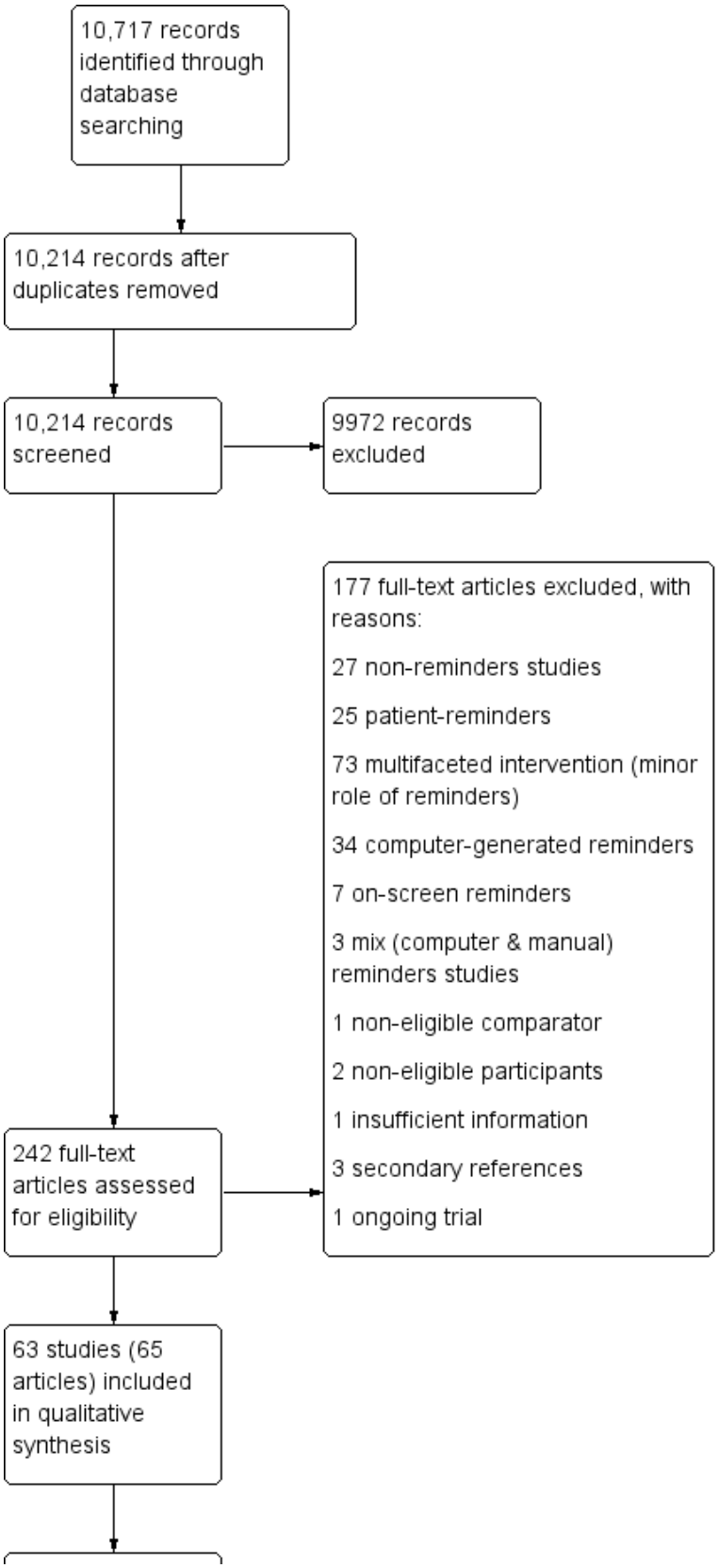
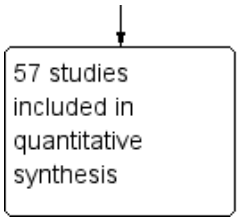


Figure 1. (Continued)



Included studies

Participants and settings

Of the 63 included studies, 42 came from North America (34 from the USA and eight from Canada) and eight from the UK. The remaining studies took place in various countries (two each from France, Switzerland and Taiwan and one each from Australia, Germany, Hong Kong, India, Israel, Spain and Thailand). Most studies (54) took place in outpatient/ambulatory settings, with nine focused on hospital care. Thirty-four studies were carried out in non-academic institutions. Cardiovascular disease management (11 studies), cancer screening (10 studies) and preventive care (10 studies) were the clinical areas most frequently targeted. General management of a clinical condition (17 studies), test ordering (14 studies) and prescription (10 studies) were the behaviours more commonly targeted by the intervention. Fifty-seven studies targeted physicians, four targeted multiple cadres of health professionals, and one study each targeted dentists and nurses. In 35 out of the 50 studies that reported funding sources, this came from government agencies. Other sources of funding were academic institutions (seven studies), private not-for-profit organisations (four studies), and the pharmaceutical industry (four studies).

Design

Fifty-nine of the studies were randomised trials, including one cross-over trial (Chan 2002), and four studies were non-randomised trials (Wigton 1981; Gonzalez 1989; Burns 2002; Cibere 2002), including one cross-over trial (Cibere 2002). In 41 of the 59 randomised trials the allocation of the study groups was by cluster (providers or provider groups, cluster-randomised trials) and in 18 the allocation was by individual (randomised trials).

Intervention (reminder features)

There was a variety of reminder features in the included studies. For illustrative purposes we present below the description of the intervention from selected studies:

- "The reminder was red in colour, written in mix Chinese and English. Beneath the reminder, the current policy of statins reimbursement issued by National Health Insurance (NHI) of Taiwan was attached." "In the study group, a reminder was stamped on the next blank page of the medical chart." "The statement stamped on the paper chart read: 'Statin can be beneficial to the patients with documented coronary artery disease regardless of their LDL level'.'' (Hung 2008; Figure 2).

Figure 2. A reminder to improve the adherence to lipid guidelines (Hung 2008)

- "The chart reminder was a sticky note following National Osteoporosis Foundation guidelines that practices could place on the charts wherever they though it would be most effective." "...office personnel where to place these reminders on the charts of all women aged 65 years and older who were scheduled to come in for annual exams, not just those women in the study." (Levy 2009; Figure 3).
- The reminder was "a self-inking paper stamp memory aid tool for use by primary care physicians when they examine their asthmatic patients. The stamp provides a checklist for the physicians that summarizes the eight CPG criteria for asthma control..." "the self-inking stamp that was given to physicians was designed to be stamped onto the patient's chart at each visit." (Renzi 2006; Figure 4).

Figure 3. A reminder to improve osteoporosis screening (Levy 2009)

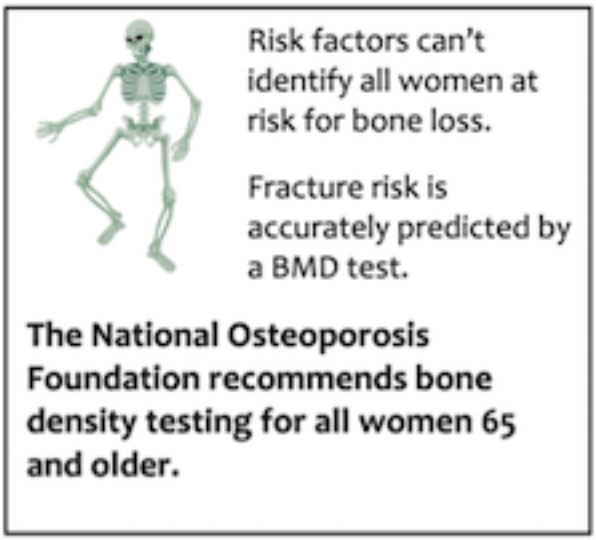


Figure 1. Osteoporosis screening chart reminder.

Figure 4. A reminder to increase asthma guidelines knowledge and implementation by primary care physicians (Renzi 2006)

In 59 studies the intervention was 'pushed' on the target health professional. In 45 studies the intervention did not use patient-specific information (generic reminders). For other reminder features, in 23 studies a response to the reminder was required, in 19 studies the reminder was supported by an explanation, in 13 studies there was mention of an influential source in the reminder, in 45 studies the reminder was clearly developed by authors, and in only four studies was there a clear involvement of recipients in the development of the reminder.

Outcome measures

There were large variations in the outcomes measured by the included studies. Forty-eight studies reported changes in professional practice measured as dichotomous process adherence outcomes (e.g. compliance with guidelines recommendations), with 16 reporting those changes as continuous process-of-care outcomes (e.g. number of days with catheters), eight reporting patient outcomes measured in a dichotomous way (e.g. mortality rates, incidence of nosocomial infections) and five reporting patient outcomes measured on a continuous scale (e.g. mean systolic blood pressure, mean cardiovascular risk). In 16 studies, it was not possible to identify the time at which outcomes were measured. For those in which this temporal information was available the range was from immediately after consultation to 18 months after the introduction of the intervention. However, in most of them (38 studies) the outcomes were measured between six and 12 months after the intervention.

Excluded studies

We excluded 174 studies (177 articles) (Figure 1). Seventy-three studies were excluded because they assessed a multifaceted intervention in which reminders played only a minor role. Twenty-seven studies assessed the effect of a non-reminder intervention (in most cases audit and feedback), and 25 studies evaluated

patient-reminder interventions. In 34 studies the reminders were computer-generated, in seven studies the reminders were presented on a screen, and in three studies the intervention was a mix of computer and paper reminders. The other four studies were excluded because of a non-eligible comparison group (1), non-eligible participants (2), and insufficient information to make an inclusion/exclusion judgement (1).

Risk of bias in included studies

See Figure 5 and Figure 6 for summaries of risk of bias, and Characteristics of included studies for details of risks of bias in each study.

Figure 5. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

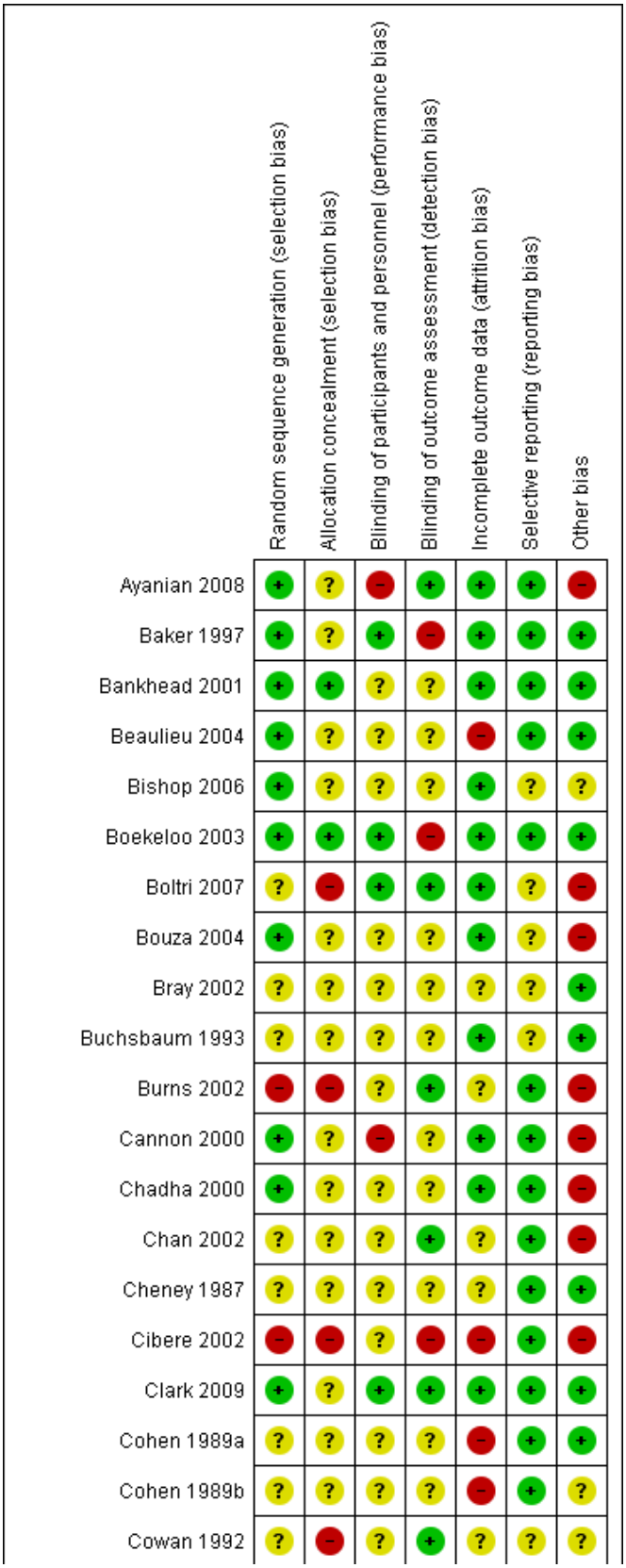


Figure 5. (Continued)

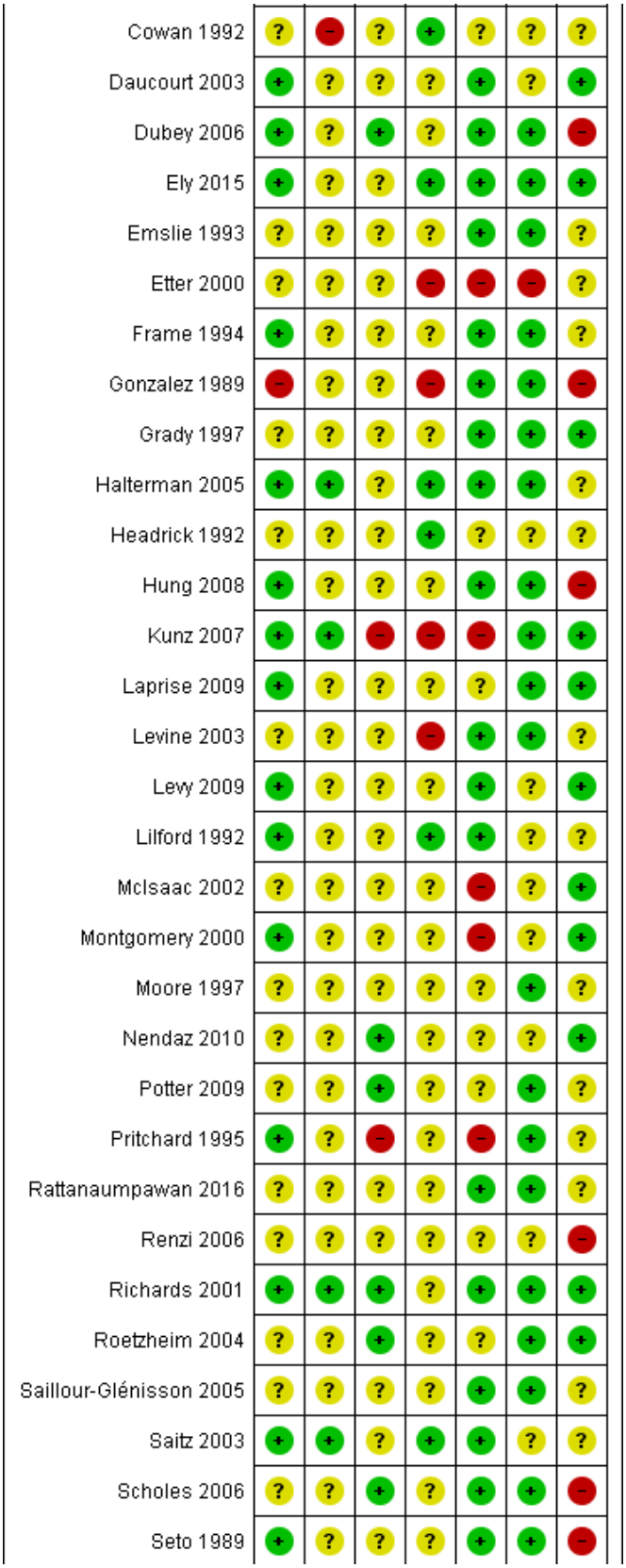


Figure 5. (Continued)

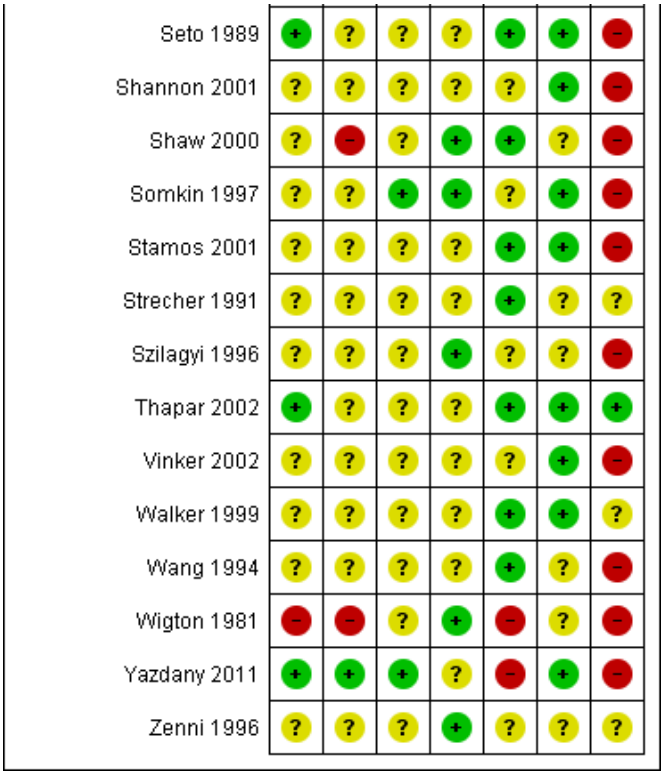
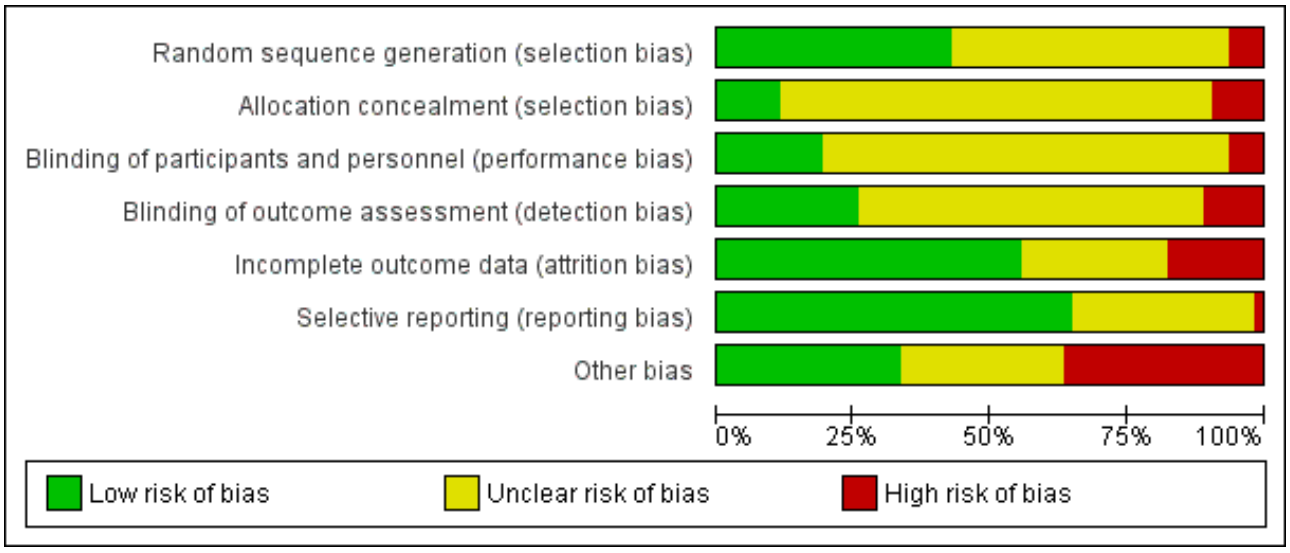


Figure 6. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.



Allocation

Four of the included trials were clearly non-randomised and therefore their risk of bias for this domain was high (Wigton 1981; Gonzalez 1989; Burns 2002; Cibere 2002). In 39 of the 59 randomised trials the sequence generation procedure was not clearly described, and in only seven trials (Bankhead 2001; Richards 2001; Boekeloo 2003; Saitz 2003; Halterman 2005; Kunz 2007; Yazdany 2011) the process of allocation concealment clearly took place.

Blinding

Because of the type of intervention, in most cases personnel and patients were unblinded, but the impact of these on effect estimates was unclear. Sixteen studies reported that outcomes assessors were blinded (Wigton 1981; Cowan 1992; Headrick 1992; Lilford 1992; Szilagyi 1996; Zenni 1996; Somkin 1997; Shaw 2000; Burns 2002; Chan 2002; Saitz 2003; Halterman 2005; Boltri 2007; Ayanian 2008; Clark 2009; Ely 2015) and in another seven they were

clearly unblinded, with a high risk of detection bias (Gonzalez 1989; Baker 1997; Etter 2000; Cibere 2002; Boekeloo 2003; Levine 2003; Kunz 2007).

Incomplete outcome data

Incomplete outcome data were considered when less than 80% of the patients/practices/providers randomised were included in the analysis or when reasons for attrition were different across groups. We considered outcome data to be incomplete in 11 studies (Wigton 1981; Cohen 1989a; Cohen 1989b; Pritchard 1995; Etter 2000; Montgomery 2000; Cibere 2002; McIsaac 2002; Beaulieu 2004; Kunz 2007; Yazdany 2011), and complete in 35 studies. In 17 studies it was uncertain.

Selective reporting

We judged only one study (Etter 2000) to be at high risk of reporting bias, with 41 studies assessed as low risk. We rated the remaining 21 studies at unclear risk of selective reporting (Wigton 1981; Strecher 1991; Cowan 1992; Headrick 1992; Lilford 1992; Buchsbaum 1993; Wang 1994; Szilagyi 1996; Zenni 1996; Montgomery 2000; Shaw 2000; Bray 2002; McIsaac 2002; Daucourt 2003; Saitz 2003; Bouza 2004; Bishop 2006; Renzi 2006; Boltri 2007; Levy 2009; Nendaz 2010).

Other potential sources of bias

Baseline outcome measurements were reported in 23 studies, and population (patients/practices) characteristics at baseline were reported in 47 studies. Only 13 studies (Seto 1989; Chadha 2000; Richards 2001; Bray 2002; Cibere 2002; Daucourt 2003; Beaulieu 2004; Roetzheim 2004; Dubey 2006; Renzi 2006; Boltri 2007; Clark 2009; Levy 2009) reported relevant baseline differences in outcomes or patient characteristics potentially related to a risk of selection bias.

Lack of protection against contamination is a potential source of bias in this type of interventions, because of the risk of physicians receiving reminders for some patients and no reminders for others. We identified this potential source of bias in 22 studies, in which the allocation was by individual patients (and there were no specific procedures to protect from contamination) or when allocation was by cluster but the study was carried out in small organisations where information exchange among health professionals was highly probable.

Effects of interventions

See: **Summary of findings for the main comparison** Manual paper reminders compared with usual care; **Summary of findings 2** Manual paper reminders added to another QI intervention compared with the same QI intervention; **Summary of findings 3** Manual paper reminders compared with other quality-improvement (QI) interventions

See: Summary of findings for the main comparison; Summary of findings 2; Summary of findings 3.

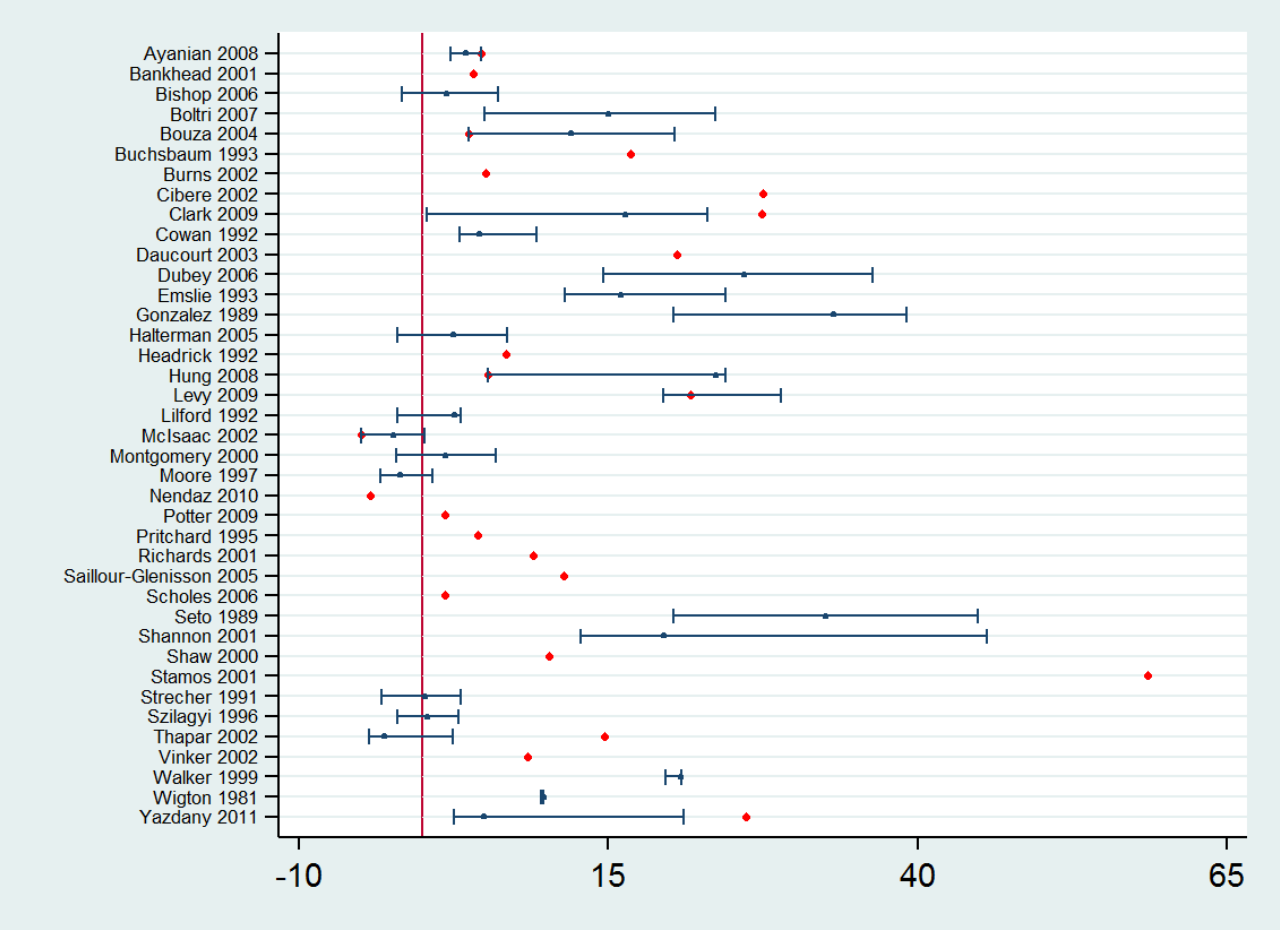
Twenty-three out of the 57 studies with useable data reported baseline outcome measurements, with the primary analysis based on post-intervention differences between study groups (See Differences between protocol and review).

1. Reminders versus no intervention (control/usual care)

Summary of findings for the main comparison; Appendix 2.

Forty-seven studies assessed the effect of reminders compared with control or usual care. Forty-five of them reported effect estimates for professional practice outcomes: in 39 studies as dichotomous process adherence outcomes (23 of them reporting as the primary outcome) and in eight studies (two reporting as the primary outcome) as continuous process outcomes (e.g. number of office visits, number of transfusion units, number of missed opportunities per patient per year). Two studies (Bouza 2004; Halterman 2005) assessed both types of outcomes. In the studies assessing process adherence outcomes, 11 of the effect estimates involve test-ordering, five were related to prescription, 11 to general management of different clinical conditions, three to professional-patient relationship (e.g. counselling), three to recommended vaccination practices, five to multiple clinical behaviours, and one effect estimates related to hospital infection control. The absolute post-intervention improvements (differences) in these outcomes for each of the studies are displayed in Figure 7. Manually-generated paper reminders probably improve professional practice measured as dichotomous process adherence outcomes compared with control/usual care (median improvement 8.45% (IQR 2.54% to 20.58%); 39 comparisons, 40,346 participants; moderate certainty of evidence). On the other hand, reminders may make little or no difference to continuous process outcomes compared with control/usual care (median of standardised mean differences 0.0 (IQR −0.02 to 0.01); 8 comparisons, 3263 participants; low certainty of evidence).

Figure 7. Reminders versus control/usual care: absolute improvements in processes of care outcomes by study using the primary outcome as defined by authors (red dot) and median improvement (blue dot)



Ten studies reported patient outcome effect estimates (Strecher 1991; Wang 1994; Zenni 1996; Moore 1997; Montgomery 2000; Chan 2002; Thapar 2002; Bouza 2004; Hung 2008; Rattanaumpawan 2016): in seven studies (8390 participants, five reported as the primary outcome) as dichotomous clinical outcomes (e.g. mortality rates, smokers quitting rates; median improvement 3.24%, IQR 2.31% to 4.12%) and in four studies (1222 participants, none of them reported as primary outcome) as continuous clinical outcomes (e.g. systolic and diastolic blood pressure; median of standardised mean differences 0.0, IQR 0.0 to 0.11). One study (Montgomery 2000) assessed both types of outcomes. We were uncertain whether reminders led to better or worse patient outcomes compared with control/usual care, because the certainty of the evidence was very low.

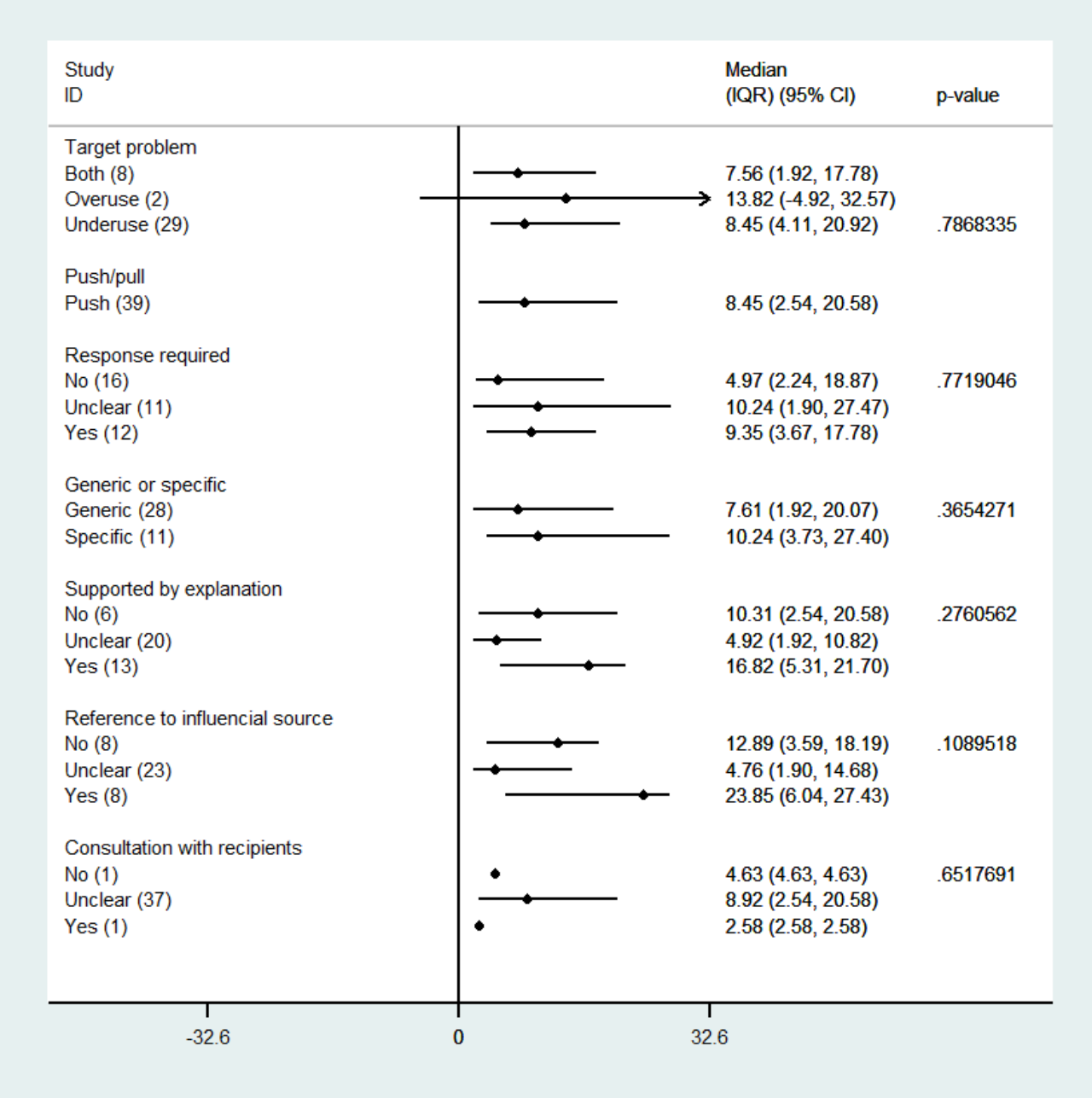
Two studies (Bankhead 2001; Saillour-Glénisson 2005) (2570 participants) reported outcomes related to resource use. Bankhead 2001 reported additional health services costs of GBP 65 (1998 - 1999) per additional attendance for breast cancer screening compared with no intervention. Simiarly, Saillour-Glénisson 2005 reported additional costs of between EUR 41 and EUR 59 per point of efficacy gained (guidelines conformity rate) when comparing a memorandum pocket card with control.

None of the included studies reported outcomes related to adverse effects/harms of reminders compared with control/usual care.

Subgroup analyses: impact of reminder features on quality-of-care effect size

We examined the impact of a number of reminder features on the magnitude of the effect, with a similar approach as in other reminders reviews (Shojania 2009; Arditi 2017). We did not find an association between effect size and any of the features assessed: overuse/underuse, response required, generic/specific, supported by an explanation, reference to influential source, type of behaviour targeted by the reminder (general management of a condition, prescription, vaccination, test-ordering, professional-patient relationship, other), or consultation with recipients in the reminder development process (Figure 8).

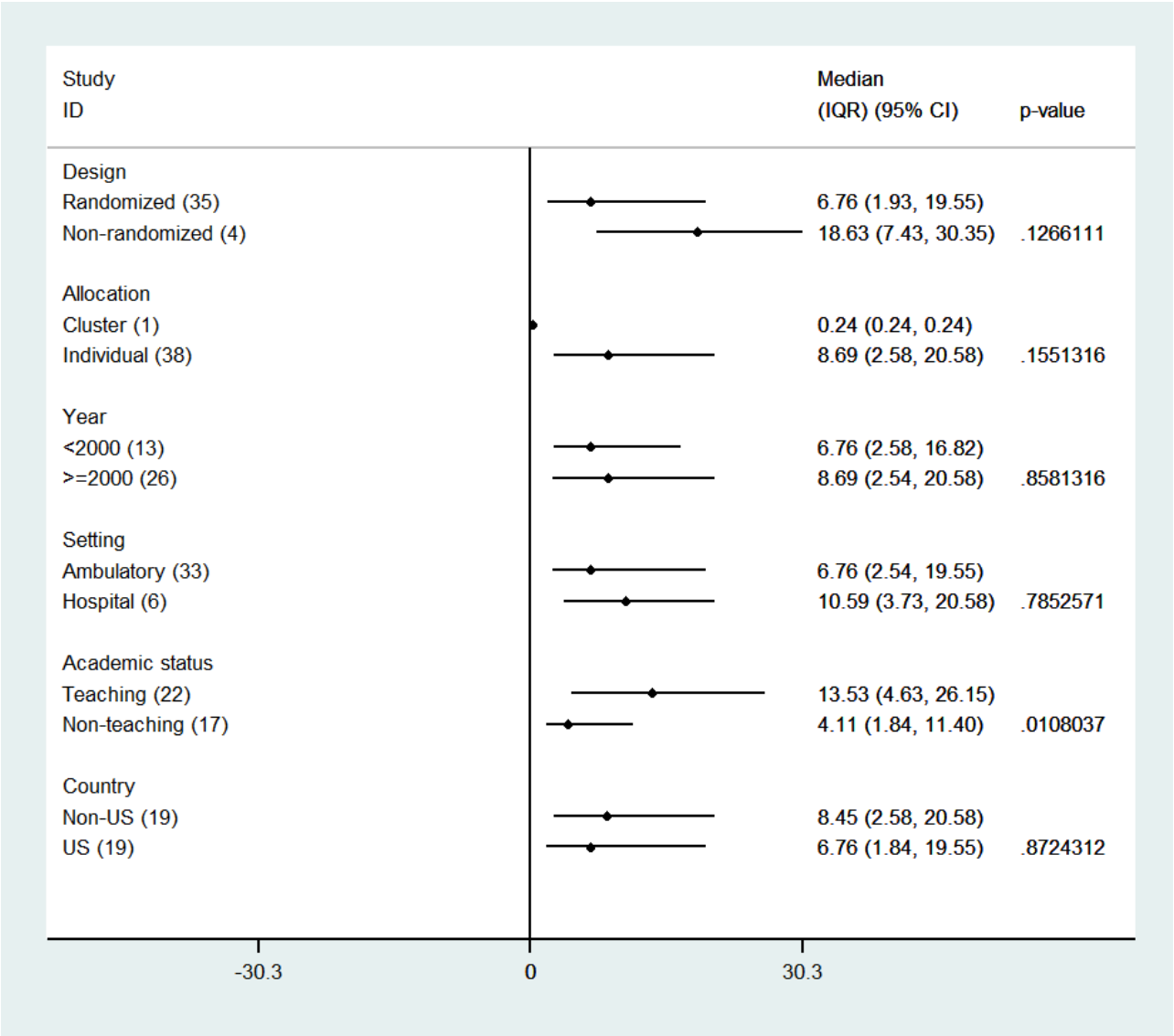
Figure 8. Reminders versus control/usual care: median effects for process of care (adherence) outcomes by reminder feature (p values are from Kruskall-Wallis and Mann-Whitney tests)



Subgroup analyses: impact of study features on quality-of-care effect size

When we explored the impact of a number of study/setting features on the magnitude of the effect, we found an association only with the type of academic setting (teaching/non-teaching) in which the study was conducted (Figure 9). Studies conducted in teaching settings (e.g. University hospitals and health centres) achieved larger improvement than studies conducted in non-teaching settings (median improvement 13.53% versus 4.11%; P = 0.0108).

Figure 9. Reminders versus control/usual care: median effects for process of care (adherence) outcomes by study feature care (p-values are from Mann-Whitney test)

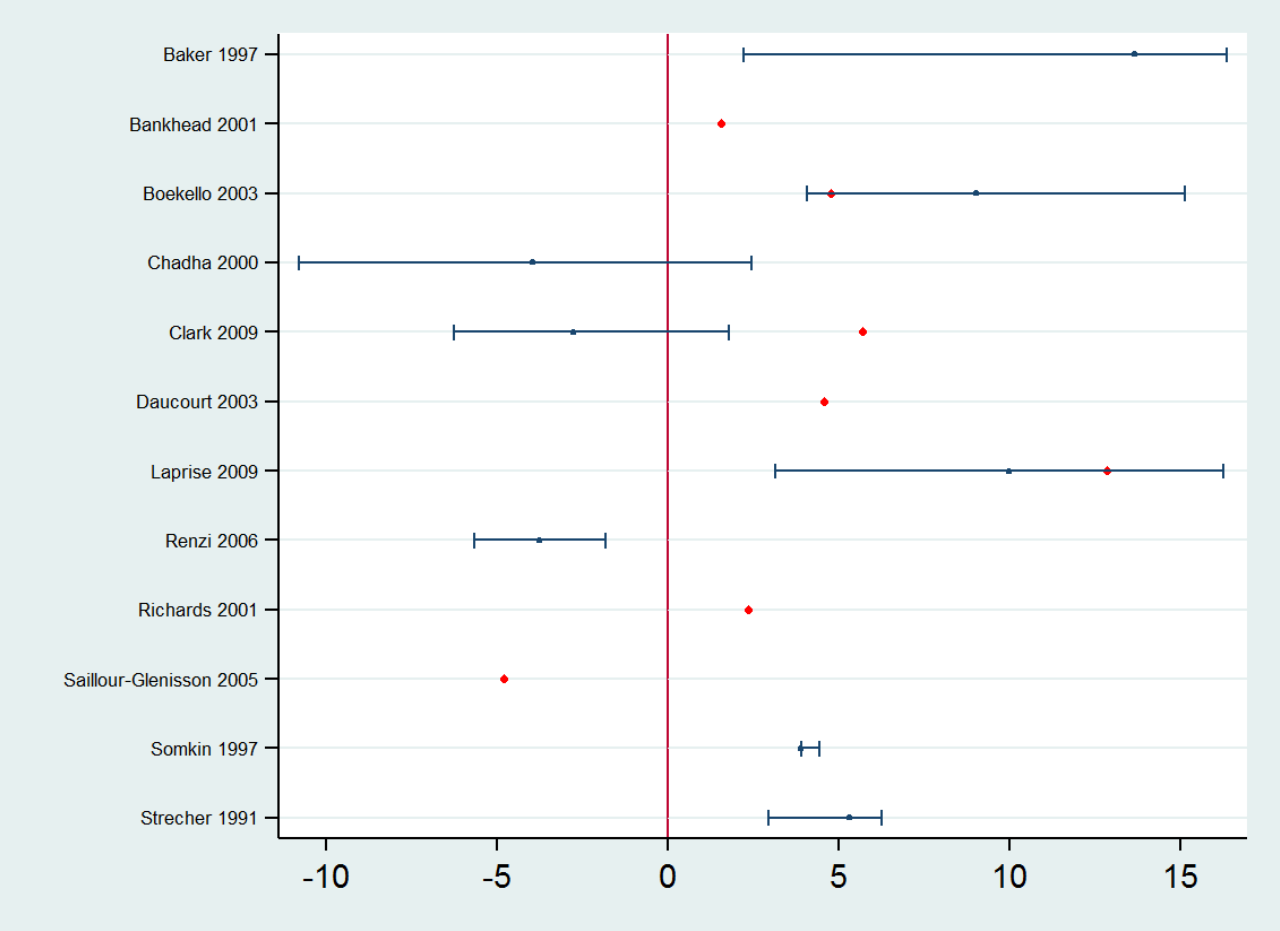


2. Reminders added to other QI intervention(s) compared with the QI intervention without the reminder

Summary of findings 2; Appendix 3.

Thirteen studies assessed the effect of reminders added to one or more QI co-interventions compared with the same QI intervention without the reminder component, such as feedback (Baker 1997), patient reminders (Somkin 1997; Bankhead 2001; Richards 2001; Boekeloo 2003; Clark 2009), educational meetings (Strecher 1991; Grady 1997; Chadha 2000; Laprise 2009), educational materials (Renzi 2006), and test-ordering forms (Daucourt 2003; Saillour-Glénisson 2005). All of them reported effect estimates for professional practice outcomes: in 12 studies as dichotomous process adherence outcomes (eight of them reported as the primary outcome) and in two studies as continuous process outcomes (none of them reported as the primary outcome) such as mean scores of compliance with guidelines (Chadha 2000) or mean practice mammography referral rates (Grady 1997). One study (Chadha 2000) assessed both types of outcomes. The absolute post-intervention improvements (differences) for the studies assessing process adherence outcomes are displayed in Figure 10. Manually-generated reminders added to one or more QI co-interventions may slightly improve professional practice measured as process adherence outcomes (median improvement 4.24% (IQR −1.09% to 5.50%); 12 comparisons, 25,359 participants; low certainty of evidence). Reminders added to one or more QI co-interventions probably slightly improve practice measured as continuous process outcomes (median of standardised mean differences 0.28 (IQR 0.04 to 0.51); 2 comparisons, 12,372 participants; moderate certainty of evidence).

Figure 10. Reminders plus another QI intervention versus another QI intervention: absolute improvements in processes of care outcomes by study using the primary outcome as defined by authors (red dot) and median improvement (blue dot)



Two studies (1883 participants) reported patient outcome effect estimates (Chadha 2000; Strecher 1991), in both of them as dichotomous outcomes (e.g. smoking cessation rates; median improvement −3.2%, IQR −8.5% to 2.2%) and in one study (Chadha 2000) as a continuous outcome (e.g. scores in specific or generic quality-of-life scales; median of standardised mean differences 0.0, IQR 0.0 to 0.0). Manually-generated reminders delivered on paper added to other QI interventions (such as reminders for other clinical conditions, or tutorials) may make little or no difference to health outcomes compared with the QI intervention alone (low and moderate certainty of evidence, respectively).

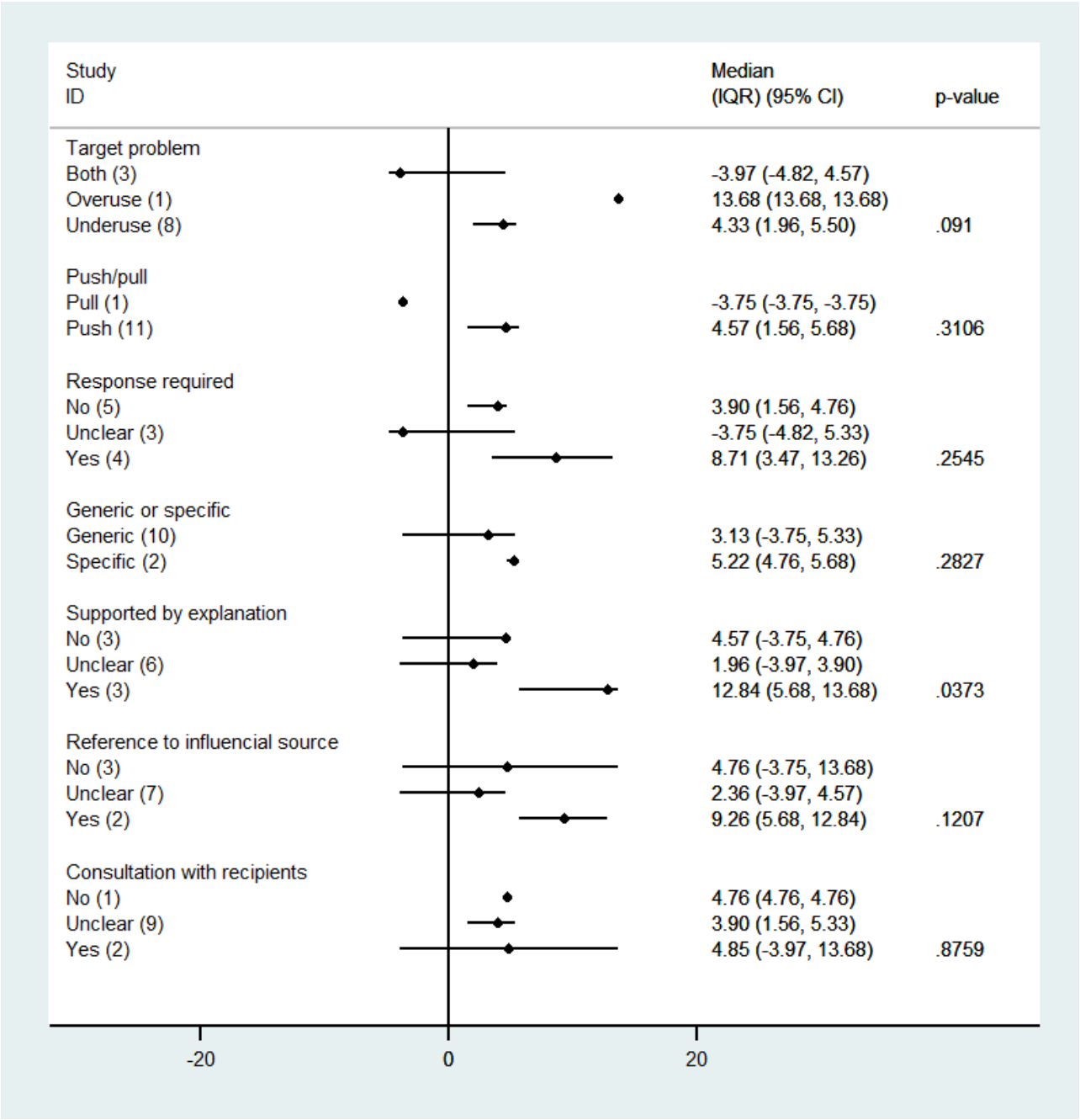
Two studies (Bankhead 2001; Saillour-Glénisson 2005) (2570 participants) reported outcomes related to resource use. Bankhead 2001 reported additional health service costs of GBP 30 (1998 - 1999) per additional attendance for breast cancer screening when comparing a patient letter plus a flag with the letter intervention alone. Saillour-Glénisson 2005 reported additional costs of between EUR 16.5 and EUR 67 per point of efficacy gained (guidelines conformity rate) when comparing a memorandum pocket card added to a test request form versus the form alone.

None of the included studies reported outcomes related to adverse effects/harms for this comparison.

Subgroup analyses: impact of reminder features on quality-of-care effect size

We did not find an association between effect size and any of the reminder features assessed, except when the reminder was supported by an explanation (Figure 11). Studies where the reminder was supported by an explanation achieved larger improvements than studies where the reminders were not supported or where this was unclear (median improvement 12.8% versus 4.6% versus 1.9%; P = 0.0373).

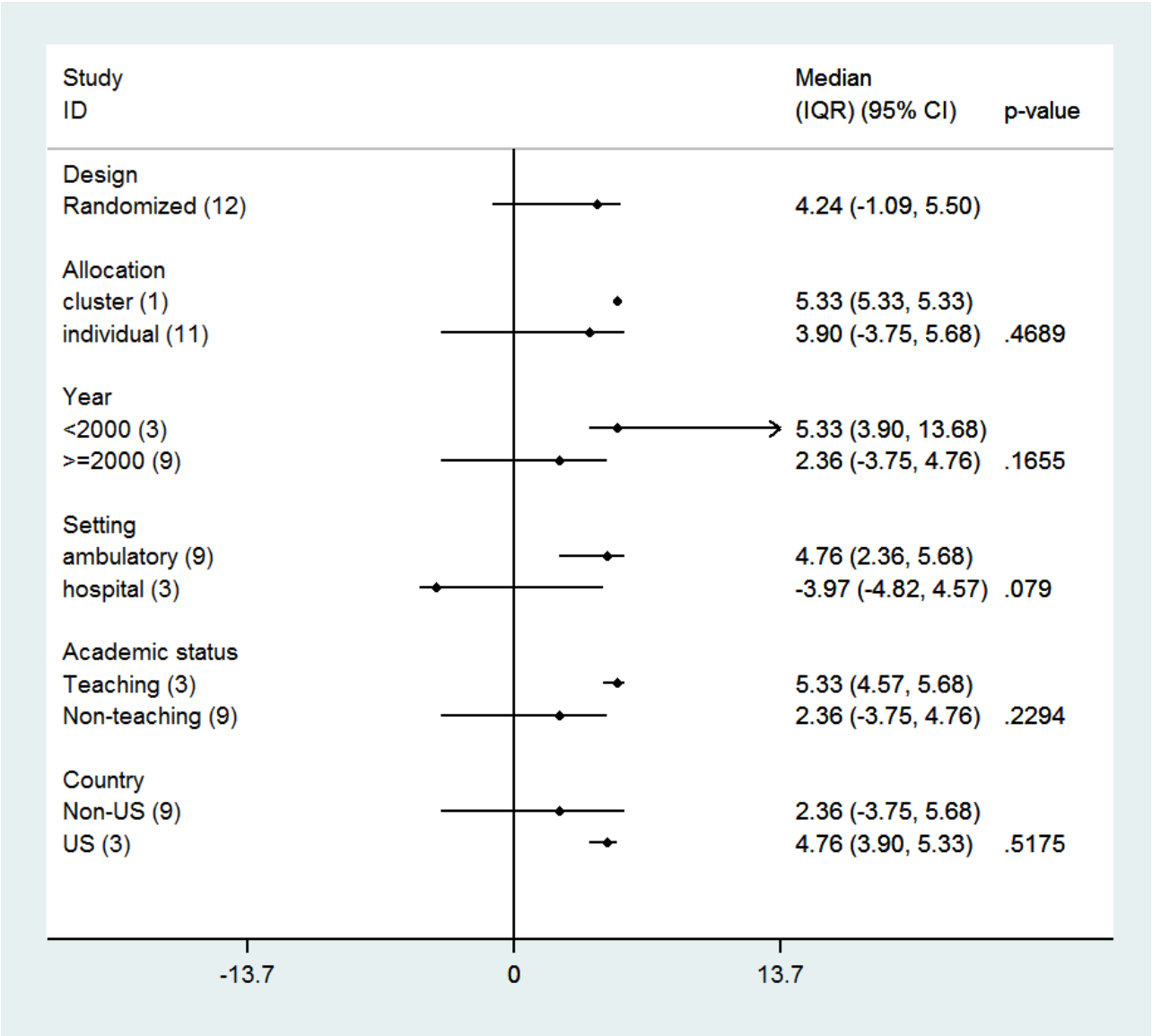
Figure 11. Reminders plus another QI intervention versus another QI intervention:median effects for process adherence outcomes by reminder feature (p values are from Kruskall-Wallis and Mann-Whitney tests)



Subgroup analyses: impact of study features on quality of care effect size

We did not find an association between effect size and any of the study features assessed (Figure 12).

Figure 12. Reminders plus another QI intervention versus another QI intervention: median effects for process adherence outcomes by study feature (p values are from Kruskall-Wallis and Mann-Whitney tests)

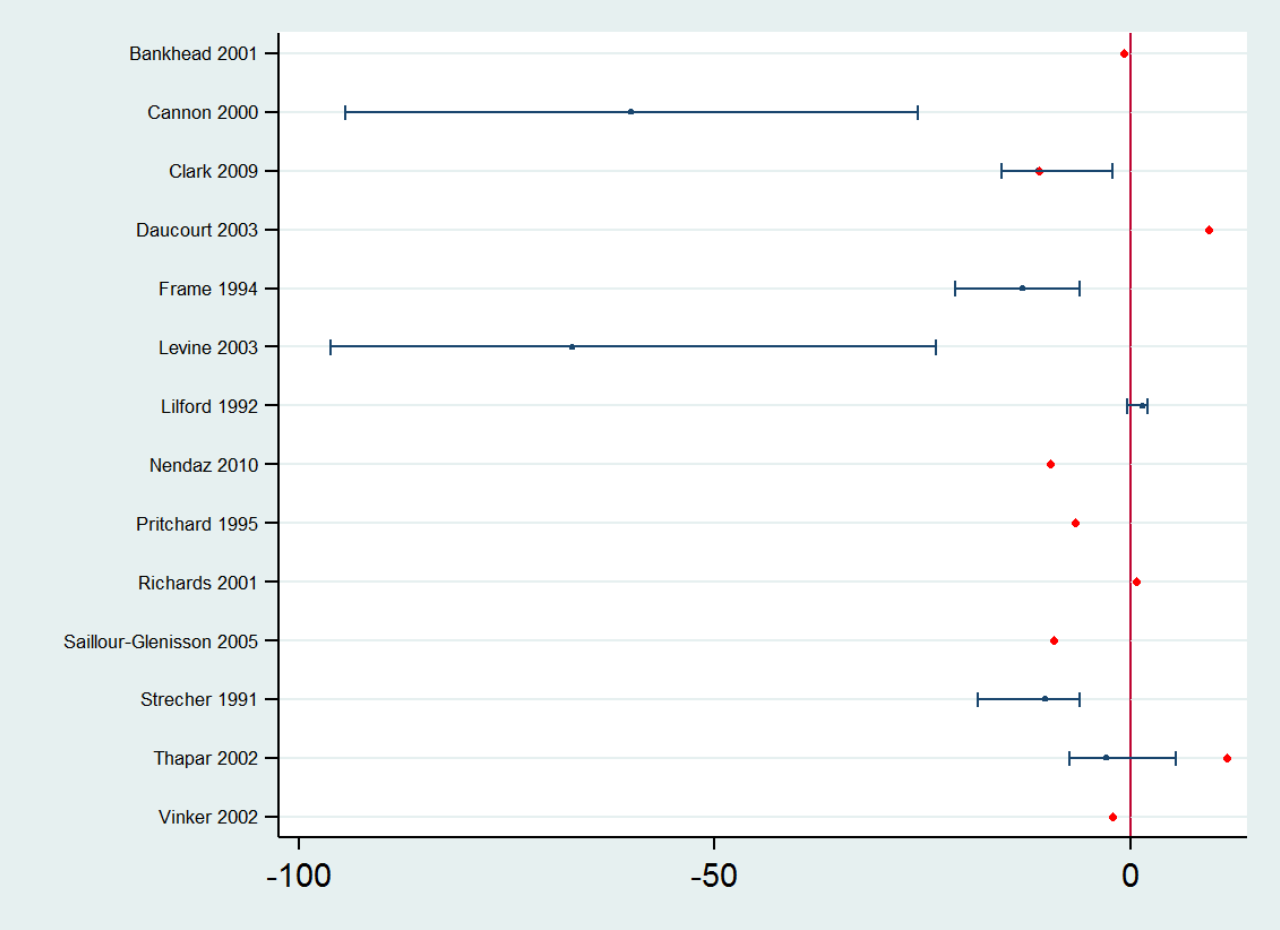


3. Reminders versus other QI intervention

Summary of findings 3; Appendix 4.

Fifteen studies assessed the effect of reminders compared with other QI interventions such as patient reminders (Pritchard 1995; Bankhead 2001; Richards 2001; Thapar 2002; Vinker 2002; Clark 2009), on-screen or computerised reminders (Lilford 1992; Frame 1994; Cannon 2000; Nendaz 2010), educational meetings (Strecher 1991; Wang 1994), test request forms (Daucourt 2003; Saillour-Glénisson 2005), and multifaceted interventions (Levine 2003). Fourteen of them present effect estimates for changes in professional practice measured as dichotomous process adherence outcomes (in nine of them reported as the primary outcome). There were no studies assessing continuous professional practice outcomes. The absolute post-intervention improvements (differences) for each of those studies are displayed in Figure 13. Compared with other QI interventions, manually generated reminders may slightly decrease professional practice measured as process adherence outcomes (median decrease 7.9% (IQR −0.7% to 11%); 14 comparisons, 21,274 participants; low certainty of evidence). There were two studies (Cannon 2000; Levine 2003) with a large effect favouring the other QI groups, but with an unusual 100% adherence to recommendations in most of the outcomes measured in those groups.

Figure 13. Reminders versus another QI interventions: absolute improvements in processes of care outcomes by study using the primary outcome as defined by authors (red dot) and median improvement (blue dot)



Three studies reported patient outcomes for this comparison (Strecher 1991; Thapar 2002; Wang 1994) (2305 participants) measured as dichotomous outcomes and reported as the primary outcome. We were uncertain whether reminders led to better or worse patient outcomes (such as smokers quit rates or seizure-free rates for patients with epilepsy) compared with educational meetings (Strecher 1991; Wang 1994), or patient reminders (Thapar 2002), because the certainty of this evidence was very low (median improvement −2.08%, IQR −17.95% to 2.28%).

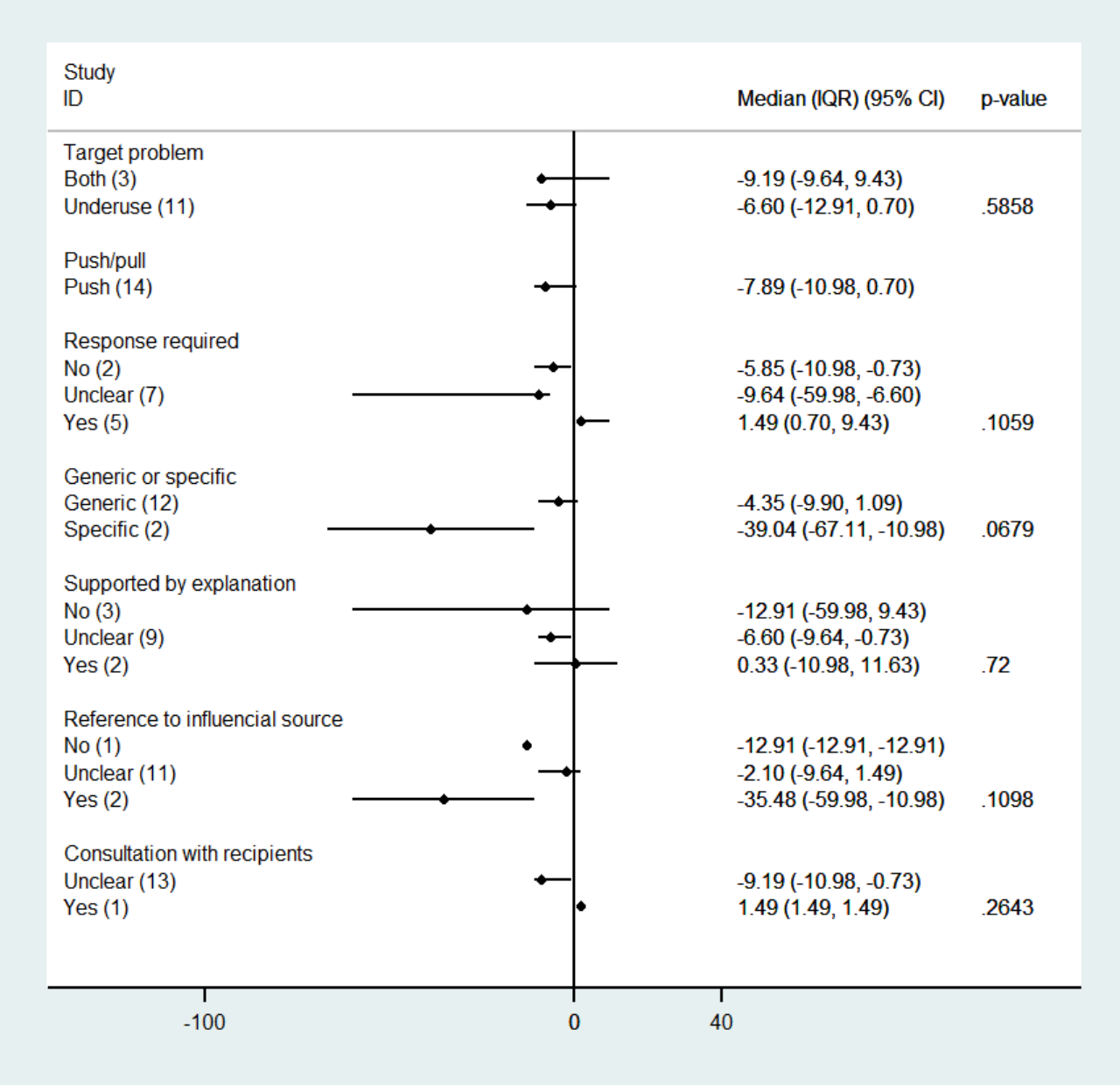
Three studies (Frame 1994; Bankhead 2001; Saillour-Glénisson 2005) (4235 participants) reported outcomes related to resource use. Bankhead 2001 reported additional health service costs of GBP 30 (1998 - 1999) per additional attendance for breast cancer screening when comparing the flag with the letter intervention. Saillour-Glénisson 2005 reported additional costs of between EUR 17 and EUR 55 per point of efficacy gained (guidelines conformity rate) when comparing a memorandum pocket card with a test request form. Frame 1994 only reported that the additional cost of maintaining the computer system that generated the computer reminders was 78 cents (USD 1991) per patient per year.

None of the included studies reported outcomes related to adverse effects/harms for this comparison.

Subgroup analyses: impact of reminder features on quality-of-care effect size

We did not find an association between effect size and any of the reminders features assessed (Figure 14).

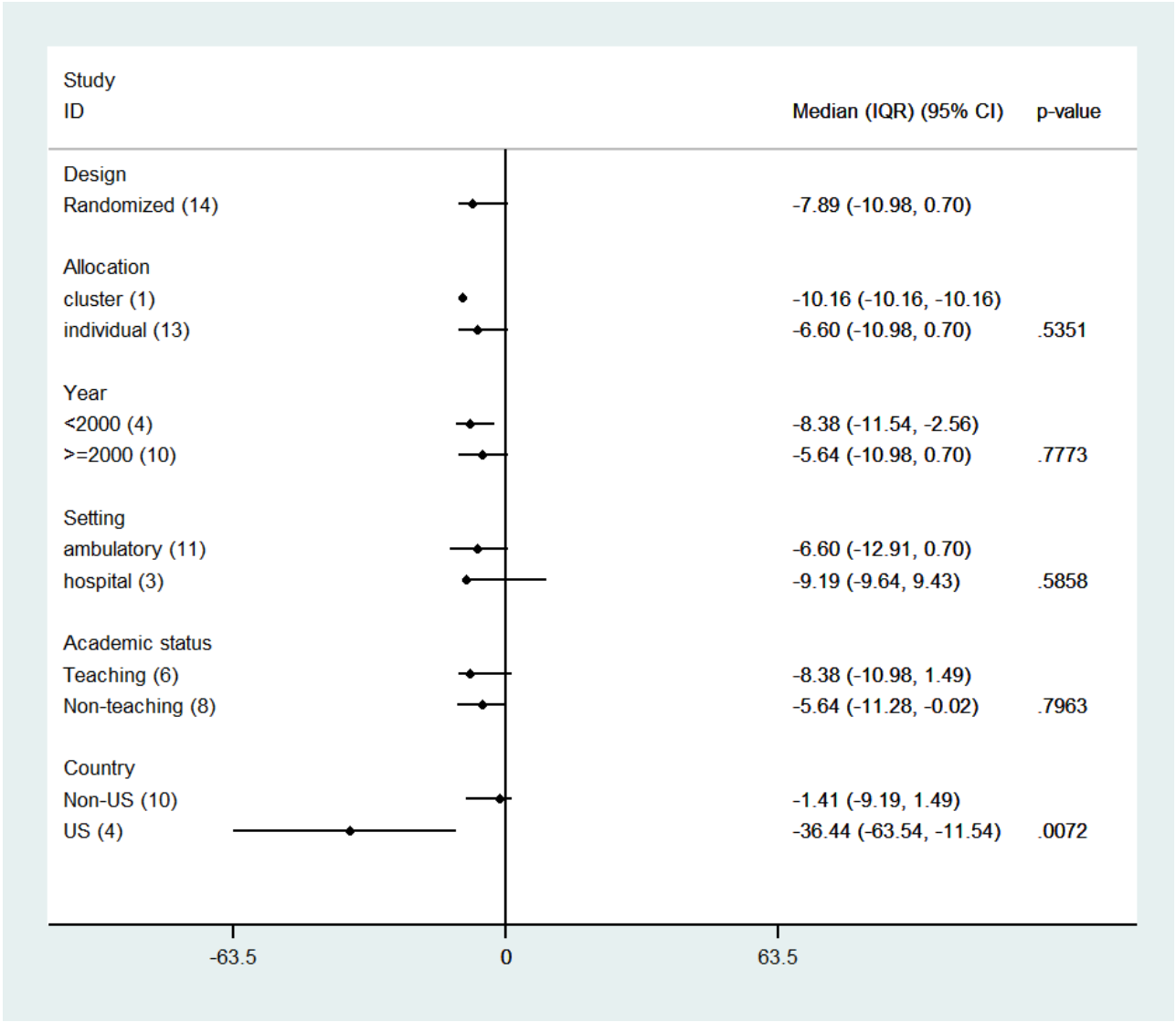
Figure 14. Reminders versus another QI interventions: median effects for process adherence outcomes by reminder feature (p values are from Kruskall-Wallis and Mann-Whitney tests)



Subgroup analyses: impact of study features on quality-of-care effect size

We did not find an association between effect size and any of the study features assessed, except for the country where the study was carried out (Figure 15). Studies carried out in non-USA settings showed smaller absolute differences than those conducted in the USA (median differences 1.41% versus 36.44%; P = 0.0072).

Figure 15. Reminders versus another QI interventions: median effects for process adherence outcomes by study feature (p values are from Kruskall-Wallis and Mann-Whitney tests)



Disadvantaged populations

Because of limitations in the reporting of specific characteristics of populations in the included studies, we were unable to identify any differential effect of reminders in settings serving disadvantaged populations.

Sensitivity analysis

We found similar median improvements in professional practice measured as process-of-care adherence outcomes for each of the three main comparisons assessed when:

- we used the median outcome for each study instead of the primary outcome as defined by studies' authors;
- we calculated the effect estimate for each study using the adjusted (for baseline differences) difference when available, instead of the unadjusted post-intervention difference;
- we excluded the studies at high risk of bias.

DISCUSSION

Summary of main results

Evidence from 39 studies (40,346 participants) showed that manually-generated reminders delivered on paper to healthcare professionals (as a single-component intervention) probably improve professional practice compared with control/usual care. Likewise evidence from 12 studies (25,359 participants) showed that adding these type of reminders to one or more QI co-interventions (multicomponent intervention) may slightly improve professional practice. On the other hand, evidence from 14 studies (21,274 participants) showed that, compared with other QI interventions, manually generated reminders may slightly decrease professional practice.

It was uncertain whether manually-generated reminders delivered on paper, compared with usual care or with other quality improvement interventions, led to better or worse patient outcomes (10 studies, 13 comparisons). Likewise, reminders added

to other QI interventions may make little or no difference to patient outcomes compared with the QI intervention alone (2 studies, 2 comparisons). None of the included studies reported outcomes related to harms or adverse effects.

The lower median improvement for multicomponent compared with single-component interventions mirrored what was found by the other Cochrane reminders reviews (Shojania 2009; Arditi 2017). One possible explanation suggested for this finding is that the improvement achieved by the other components in multifaceted interventions leaves less room for improvement by reminders. In the same way as Arditi 2017, our analyses support this explanation as post-intervention adherence rates in the control groups of multicomponent intervention comparisons were higher than in the control groups of single-component interventions (49.4%; IQR 22.8 to 61.8; 12 comparisons versus 31.7%; IQR 12.9 to 51.5; 39 comparisons). Another explanation mentioned by the other reviews is that multicomponent interventions target more complex and difficult-to-change behaviours than single-component interventions. However, our analyses did not find differences in effect sizes among different behaviours, and we were not able to classify behaviours targeted in each study by degree of complexity or difficulty to change.

Only one reminder feature was associated with larger effect sizes: providing an explanation for the reminder. This was only found in the comparison between multicomponent interventions and other QI intervention. Although it could seem that providing an explanation may allow health professionals to better understand why they are receiving a reminder and then to act on it, and it is an association also reported by Arditi 2017, it is not possible to draw definitive conclusions, because it was an isolate finding and we did not find a similar association in the comparison between reminders as a single intervention and usual care.

Two study features were associated with effect sizes, although in different directions. When we compared reminders as a single intervention with usual care, studies conducted in academic settings showed larger effect sizes than those conducted in non-academic settings (median improvement 13.5% versus 4.1%). A possible explanation for this could be related to the efforts spent on implementing the intervention in academic compared with non-academic settings, and then on different degrees of implementation fidelity. However, there was not enough information in the reports about implementation fidelity to test this hypothesis. On the other hand, when we compared reminders as a single intervention with other QI intervention (such as patient reminders, or computerised reminders), studies conducted in the USA showed larger effect sizes (favouring the other QI intervention) than those carried out in non-USA settings (median improvement 36.4% versus 1.41%). We could not identify any compelling explanation for this finding, as it was led mainly by huge effect sizes in two studies comparing computerised reminders (Cannon 2000) and a multifaceted intervention (Levine 2003) with paper reminders.

Overall completeness and applicability of evidence

The studies included in this review were conducted over the last 37 years in a variety of countries with different health system structures and organisations. Although computerised clinical record systems are currently widespread in most high-income countries, paper records remain an important source of clinical information and documentation in health systems of many low-income countries (Bosch-Capblanch 2017). In this context paper-based reminders systems are still a frequently-used quality improvement strategy that co-exists with computerised reminder systems. In our review most of the studies were conducted during the 1990s and 2000s (similar to what was reported by Arditi 2017). Taking into account that manual paper reminders should have been developed prior to computerised reminders, it is noteworthy that only six studies published in the 1980s were included in our review. A possible explanation for this could be that early published studies assessed the effect of reminders using designs not considered in our review (such as uncontrolled trials) and were then excluded at the titles and abstracts screening stage. However, it is not possible to discard publication bias as contributing to this finding.

Although most of the included studies were conducted in North America (USA and Canada) and the UK, studies carried out in a number of other countries with different healthcare delivery systems were also included. Additionally, studies were carried out in both ambulatory and hospital care, and interventions targeted various clinical areas for preventive and for chronic and acute care. We therefore consider that the studies included in this review represent a relatively complete body of evidence that could reasonably be applied to many health systems searching for ways to improve their quality of care through the use of manually-generated reminders delivered on paper in their organisations. An additional aspect to consider is that most of the studies included in the review were assessing the effects of this intervention in health systems that were substantially different in technological terms from what they are currently (health systems' technology in the 1980s and 1990s compared with current health systems), which could limit their applicability. We were uncertain if reminders may have a different effect in settings serving disadvantaged populations, because of the lack of specific information about the characteristics of the populations in the included studies.

Certainty of the evidence

Overall, we rated the certainty of the evidence about the effects of manually-generated reminders as a single intervention compared with usual care or added to other QI interventions compared with the same QI intervention on process-of-care adherence outcomes as moderate and low respectively. In both comparisons we downgraded the level of certainty because of methodological limitations of the included studies, mainly related to the lack of reporting of the procedures used for allocation concealment and for blinding of outcome assessors, and the high risk of contamination in trials where providers were able to take care of patients in both the intervention and control arms, and in cluster-randomised trials where the unit of randomisation did not avoid the possibility of contact between providers in both arms of the trial. Furthermore, in both cases there was a wide range of effect sizes within individual studies (imprecision), and in the comparison between reminders as part of a multicomponent intervention the effect sizes were inconsistently spread over a range of positive and negative effects.

We rated the certainty of the evidence about the effects of manual paper reminders on patient outcomes as very low for all the comparisons included in this review. We downgraded the level of certainty because of methodological limitations, the imprecision of results and unexplained inconsistency.

Potential biases in the review process

Although we conducted extensive literature searches of multiple databases to avoid publication bias, it is possible that we have missed some studies published in the 1970s and 1980s because of problems with their indexing in different databases at an early stage of their development. It is noteworthy that we only identified six studies published in the 1980s and none before that decade. In some cases we thoroughly discussed the inclusion of some studies because of disagreements about the type of reminders being assessed or the relative importance of the reminder in a multifaceted intervention, or both. Although the use of the median effect size as an analytical approach allowed us to avoid unit-of-analysis errors in unadjusted cluster-randomised trials, it limited the interpretability of the results, as we only have a range of effects for relatively heterogeneous process-of-care adherence outcomes, without a specific distribution that allows us to make inferences.

Agreements and disagreements with other studies or reviews

There are a number of previous reviews assessing the effectiveness of reminders as a single intervention or as part of a multifaceted intervention (Buntinx 1993; Balas 2000; Dexheimer 2008; Baron 2010). This body of evidence has recently been summarised by overviews focusing specifically on reminders (Cheung 2012) or on broader professional behaviour-change interventions (Grimshaw 2012; Johnson 2015). In both cases, the more credible (high-quality) reviews were the Cochrane Reviews assessing the effects of on-screen, point-of-care reminders (Shojania 2009) and computer-generated reminders delivered on paper to healthcare professionals (Arditi 2017). It is worth noting that although our review was related to those reviews, we did not have any studies that overlapped with them. When comparing reminders as a single intervention with usual care the median improvement in dichotomous process adherence outcomes in this review was slightly higher than in the review of on-screen point-of-care computer reminders (8.4% versus 4.2%), and slightly lower than in the review on computer-generated reminders delivered on paper (8.4% versus 11.0%). The median improvement in the same type of outcomes (dichotomous process adherence) by adding a reminder to another QI intervention was similar to that found by Arditi 2017 for computer-generated reminders delivered on paper (4.2% versus 4.0%). Although Arditi 2017 found the largest improvement in process adherence outcomes for studies focusing on vaccination (median improvement 13.1%), we did not find differences among studies targeting different behaviours (similar finding to Shojania 2009) with an improvement of only 5.1% for studies focused on vaccination. Our findings on effect modifiers agree partially with Arditi 2017 in observing differences in effect sizes when reminders are supported by an explanation. However, unlike the review on computer-generated reminders we did not find an association between effect sizes and providing space for a response or reference to an influential source. On the other hand, we did find an association with the type of academic setting that was not found in Arditi 2017. Other reviews (Shojania 2009; Baron 2010) have not found specific associations between any reminders or study features and effect sizes.

AUTHORS' CONCLUSIONS

Implications for practice

Although the effect of manually-generated reminders delivered on paper on patients outcomes is uncertain, the evidence supports their use when no other QI intervention is available in order to increase adherence to clinical recommendation by healthcare professionals. It is more uncertain whether this type of reminder should be added to other QI interventions already in place in the health system, although the effects may be positive, especially when the reminder added is supported by an explanation. If other QI interventions, such as patient or computerised reminders, are feasible, the evidence does not support the use of this kind of reminder.

Implications for research

In order to improve the body of evidence available in this area, and mirroring the conclusions previously offered by Arditi 2017, we suggest that researchers should:

- improve the reporting of methods used in their studies (randomisation, allocation concealment, blinding, etc.) following existing reporting standards in the field such as the CONSORT statement (Schulz 2010).
- improve the description of quality-improvement interventions (including reminders) in order to improve identification of studies, assessment of intervention complexity and comparison of reminder features (Ogrinc 2016).
- improve reporting of patient outcomes and information about adverse effects (harms produced by reminders incorrectly phrased or with major information gaps) and cost of interventions.
- improve reporting of baseline data in order to obtain adjusted outcome measures.
- use rigorous statistical methods for the analysis of cluster designs (Higgins 2011).
- carry out studies in a wider range of settings in low- and middle-income countries.
- assess the role of manually-generated reminders in health systems transitioning to digital health records (at the national or local level).
- assess the modifying effects of different characteristics of reminders (variations in format, content and delivery), using subgroup analysis.

ACKNOWLEDGEMENTS

We acknowledge the significant contributions from authors of the previous version of the protocol: Alberto Romero, Flora Haaijer Ruskamp, Jeremy Wyatt, Michael E Green, Nicholas Hicks, Paramjit Gill, Petra Denig, Pierre Durieux, Rachel Rowe, Richard Gordon.

We acknowledge the following Cochrane EPOC editors for their contribution to the review: Julia Worswick, managing editor; Paul Miller, Information Scientist; Sofia Massa, statistical editor; Noah Ivers, internal editor; and Xavier Bosch-Capblanch, contact editor. We also acknowledge the external peer referees: Carolina Danovaro and David Brown, specialist referees, and Jonathan Fuchs, Sheila Page and Vijayluxmi Bose. consumer referees.

We also acknowledge the contribution of the National Institute for Health Research, via Cochrane Infrastructure funding to the Effective Practice and Organisation of Care Group. The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Systematic Reviews Programme, NIHR, NHS or the Department of Health.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Ayanian 2008

Methods	Randomised trial
Participants	Participants were 717 patients who had colorectal adenomas removed and their primary care physicians in 2 Massachusetts (USA) primary care networks
Interventions	Patient-specific reminders
Outcomes	Primary: Proportion of patients receiving colonoscopy during the 6-month observation period Secondary: Proportion of patients with a new adenoma or cancer detected Time: 6 months
Notes	1 relevant comparison (reminders versus control) Funding: This study was supported by a grant (R21-CA112365) from the National Cancer Institute

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Physicians were randomised through their patients
Allocation concealment (selection bias)	Unclear risk	No mention of this issue
Blinding of participants and personnel (performance bias) All outcomes	High risk	The randomisation was at patient level, so it was possible that a physician provided care for patients in both the control and intervention groups
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Although the outcomes were objective, outcome assessors were blinded to the physician and patient's allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	No losses to follow-up reported
Selective reporting (reporting bias)	Low risk	Unlikely
Other bias	High risk	Possible contamination in the case of physician providing care to patients in both the control and intervention groups

Baker 1997

Methods	Cluster-randomised trial
Participants	18 general practices in Leicestershire (UK). Participants were 1731 patients who had been taking a benzodiazepine anxiolytic or hypnotic drug for 4 weeks or longer
Interventions	Intervention group: Reminders plus feedback Control group: Feedback alone
Outcomes	Entries in medical records indicating compliance with 5 criteria of care: assessment of suitability for withdrawal; being told about dependency; withdrawal being recommended; withdrawal or continuing medication; and a consultation with the general practitioner in the past year Assessed at: 12 months
Notes	1 relevant comparison (reminders + another QI versus another QI alone) Funding: The study was funded by the Department of Health and Trent Regional Health Authority Directorate of Research and Development

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "After the first data collection, practices were randomly allocated, with a table of random numbers and without stratification..."
Allocation concealment (selection bias)	Unclear risk	No specific details given
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "The practices were told that the study was an audit and to this extent were blinded to the trial of reminders."
Blinding of outcome assessment (detection bias) All outcomes	High risk	Quote: "We were unable to blind the second data collector to study groups" but the outcomes were relatively objective (from medical records)
Incomplete outcome data (attrition bias) All outcomes	Low risk	Only 2 practices (out of 20) withdrew from the study
Selective reporting (reporting bias)	Low risk	Not explicitly mentioned by authors, but it seems low risk
Other bias	Low risk	None identified

Bankhead 2001

Methods	Randomised trial
Participants	13 general practices with low uptake in the second round of breast screening (below 60%) in north-west London and the West Midlands, United Kingdom. Participants were 1158 women in these practices who were recent non-attenders for breast screening

Bankhead 2001 *(Continued)*

Interventions	4 arms: systematic intervention (general practitioner letter), an opportunistic intervention (flag in women's notes prompting discussion by health professionals), neither intervention, or both
Outcomes	1) Attendance for screening 6 months after randomisation 2) Additional cost associated with: the number of additional attendances generated by the interventions (with the ORs derived from the models presented in this paper); any additional consultations (as a result of the letter); lengthier consultations (as a result of the flag); and the production and administrative processes associated with both interventions Assessed at: 6 months
Notes	3 relevant comparisons (reminders versus control; reminders versus other QI (patient reminders) intervention; and reminders + other QI versus other QI) Funding: UK Medical Research Council

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation schedules were produced separately for each practice with a random permuted block procedure based on random number tables by two members of the research team involved neither in assessing eligibility nor initiating the interventions." "Individual women were randomised into one of four groups in a factorial design"
Allocation concealment (selection bias)	Low risk	Quote: "Sealed envelopes and audited time sheets were used, so these schedules were only available to field workers after they had checked the patients' notes for eligibility."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants and personnel were probably not blinded but the impact of this on routinely-collected outcome data is limited
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Outcome data seem to be routinely-collected data
Incomplete outcome data (attrition bias) All outcomes	Low risk	Only 1% - 1.5% of patients lost to follow-up (Figure 1)
Selective reporting (reporting bias)	Low risk	Unlikely, although no protocol available
Other bias	Low risk	None clearly identified

Beaulieu 2004

Methods	Cluster-randomised trial
Participants	A sample of 3293 Quebec physicians (Canada)

Beaulieu 2004 *(Continued)*

Interventions	3 arms: a 1-page summary of clinical practice guidelines on the treatment of stable angina sent to physicians; the summary plus a reminder; and no intervention (control)
Outcomes	Physicians' prescribing practices for the treatment of stable angina pectoris Assessed at: 6 months
Notes	Included in the review but it was not possible to obtain raw data for analysis (only OR from multilevel logistic regression models) Funding: Health Canada. One of the authors received financial support from Aventis Pharma

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The physicians identified in our previous study were randomly assigned, using computer-generated random numbers, to one of three groups."
Allocation concealment (selection bias)	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Unclear if physicians could be 'contaminated' by other interventions
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	High risk	Quote: "Of the 3293 physicians in our initial study, 967 (29.4%) were not in the database in 1999, hence were considered lost to follow-up."
Selective reporting (reporting bias)	Low risk	Unlikely
Other bias	Low risk	None identified

Bishop 2006

Methods	Randomised trial
Participants	428 patients with acute mechanical low back pain and accepted Workers' Compensation Board claims (British Columbia, Canada)
Interventions	3 arms: physician reminders, patient reminders, control
Outcomes	Concordance with specific clinical practice guideline recommendation for acute low back pain Assessed at: up to 16 weeks
Notes	1 relevant comparison (reminders versus control)

Risk of bias

Bishop 2006 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A total of 462 family physicians and their patients were enrolled in the study and using a random number generator were randomly assigned to three separate study groups"
Allocation concealment (selection bias)	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants and the personnel were not blinded to the allocation, but we are not sure about the impact of that on outcomes measurement
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	Low risk	Only 7.3% of patients lost to follow-up
Selective reporting (reporting bias)	Unclear risk	Unlikely
Other bias	Unclear risk	Unclear if there was some adjustment by physicians

Boekeloo 2003

Methods	Randomised trial
Participants	447 patients aged 12 to 17 years who were seeing primary care providers for health checkups in 5 managed group care practices in Washington DC (USA)
Interventions	3 arms: usual care, patients reminders (priming), patient reminders + provider reminders (prompting)
Outcomes	Adolescent-provider communication Assessed at: unclear
Notes	1 relevant comparison (reminders + other QI intervention versus other QI intervention) Funding: The study was supported by a grant from the National Institute on Alcohol Abuse and Alcoholism, Bethesda, Md, USA

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Study group assignment was based on computer-generated randomization, stratified by provider as well as adolescent age (12- 13, 14-15, and 16-17 years) and sex."
Allocation concealment (selection bias)	Low risk	Quote: "The principal investigator created sealed envelopes. In the provider's office just before the health checkup and after administration of an intake questionnaire, the research assistant, who was blinded to the adolescent's

Boekeloo 2003 *(Continued)*

		group assignment, opened the sealed envelope containing the adolescent's random assignment."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	From the point of view of participants both of the groups included in the comparison analysed received the same intervention. The prompt to providers was not blinded but we think that the risk of bias is still low
Blinding of outcome assessment (detection bias) All outcomes	High risk	Quote: "Interviewers were thus blinded to the adolescent's group assignment for the previsit interview only."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Data available for 294 out of 297 adolescents
Selective reporting (reporting bias)	Low risk	Not explicitly mentioned by authors, but it seems low risk
Other bias	Low risk	None identified

Boltri 2007

Methods	Cluster-randomised trial
Participants	1176 patients with at least 1 risk factor for diabetes in 10 practices from the Georgia-Mercer Practice Based Research Network (USA)
Interventions	2 arms: nurse-based prompt versus usual care
Outcomes	Receiving fasting glucose screening, diet plan, exercise plan, and weight loss plan Assessed at: 3 months
Notes	1 relevant comparison (reminders versus control) Funding: This project was supported in part by grants from the Medcen Foundation, Macon Georgia, the US Department of Health and Human Services, Health Resources and Services Administration (HRSA), Grant #5D12HP00159, and National Institutes of Health Grant #1 K07 HL04305-01

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "These 10 outpatient private primary care practices that included both internal medicine and family medicine were randomly assigned to either intervention or control groups". But the sequence generation procedure was unclear
Allocation concealment (selection bias)	High risk	Quote: "although this study was blinded to the practices, it was not blinded to the research assistants who recruited the subjects."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "None of the practices knew that the intervention was the nurse prompt"

Boltri 2007 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "A different research assistant who was blinded to the site (intervention or control) entered all data"
Incomplete outcome data (attrition bias) All outcomes	Low risk	It seems that there were no losses to follow-up
Selective reporting (reporting bias)	Unclear risk	Too many outcomes. Not clear which one was the primary
Other bias	High risk	There were baseline differences that potentially could impact on effect estimates Quote: "The proportions of women and Blacks were higher in the control group compared to the intervention group ($p < 0.001$)" "Although there were no significant differences in ADA risk scores, some differences were found between groups"

Bouza 2004

Methods	Randomised trial
Participants	297 patients with blood stream infections
Interventions	3 arms: physicians receiving a conventional report, physicians receiving a conventional report and a written alert on the chart with clinical advice, physicians receiving the above plus oral clinical advice
Outcomes	Adequacy of antibiotic therapy, mortality rates Assessed at: unclear
Notes	1 relevant comparison (reminders versus control) Funding: Red Espanola de Investigacion en Patologia Infecciosa and the research project of the Fondo de Investigaciones Sanitarias of Spain

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "We randomly classified the patients with significant episodes of bacteremia into 3 different groups by means of a computer-assisted random list."
Allocation concealment (selection bias)	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Personnel are aware of the intervention and participants (patients) could be unaware, but no information provided. Not sure how this could bias effect sizes
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned

Bouza 2004 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	No losses to follow-up reported
Selective reporting (reporting bias)	Unclear risk	It seems unlikely, but no protocol available
Other bias	High risk	There were differences by services. An adjustment by cluster would had been useful

Bray 2002

Methods	Cluster-randomised trial
Participants	12 hospitals across 4 areas in India (during the trial 56,171 units were transfused)
Interventions	Self-educating transfusion request form
Outcomes	Number of transfusions requests by admission, number of crossmatched per admission, number of units per admission Assessed at: 5 months
Notes	1 relevant comparison (reminders versus control) Funding: UK Department for International Development. The UK Medical Research Council

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure is not clearly established
Allocation concealment (selection bias)	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Personnel were aware of the group to which their hospital was allocated but we were not sure about the impact of this on effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information about losses to follow-up reported
Selective reporting (reporting bias)	Unclear risk	Quote: "The main process measure was the number of transfusion requests per in-patient admission. Information on the number of crossmatches per admission was also collected. The main outcome measures were proportion of in-patient admissions resulting in transfusion and the number of units transfused"

Bray 2002 *(Continued)*

		Not sure why authors used these outcomes
Other bias	Low risk	None identified

Buchsbaum 1993

Methods	Cluster-randomised trial
Participants	83 residents at the ambulatory medicine clinic of the Medical College of Virginia, Richmond (USA) and their 214 patients with harmful drinking habits
Interventions	A letter attached to the front of the patient's medical record with diagnostic information and treatment recommendations
Outcomes	Rates of physician counselling Assessed at: immediately after patient's session
Notes	1 relevant comparison (reminders versus control) Funding: This research was supported by a grant for Residency Training in General Internal Medicine, Bureau of Health Professions, Health Resources and Services Administration, Washington, DC, and by grant R01-AA08278-02, Improving Physician Management of Alcohol Disorders, National Institute of Alcohol Abuse and Alcoholism, Bethesda, Md

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	There is no mention of how the sequence was generated
Allocation concealment (selection bias)	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants were not blinded and it is not clear if patients were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No specific information about this
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss to follow-up reported
Selective reporting (reporting bias)	Unclear risk	No specific information reported
Other bias	Low risk	None identified

Burns 2002

Methods	Non-randomised trial
Participants	997 paediatric patients attending 2 inner-city primary-care health centres in urban Pittsburgh (USA)
Interventions	A nurse-prepared 1-page form about the child's immunisation status attached to children's charts (chart prompt)
Outcomes	Up-to-date immunisation for age (including an overall outcome and 7 vaccine-specific outcomes) Assessed at: 12 months
Notes	1 relevant comparison (reminders versus control) Funding: the Aetna Foundation

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Non randomised sequence Quote: "Each patient chart was systematically assigned to the control or intervention group based on the chart number. A random-number table was used to generate the following scheme: children with a chart number ending in 0, 1, 2, 5, or 6 were assigned to the intervention group, and children with a chart number ending in 3, 4, 7, 8, or 9 were assigned to the control group."
Allocation concealment (selection bias)	High risk	No information reported about this, but because of the non-random sequence the risk of bias is probably high
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants and personnel were not blinded but unclear about the impact of this in effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The chart reviewer was blinded as to intervention or control status"
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No specific information about this. It seems that there was complete follow-up
Selective reporting (reporting bias)	Low risk	Most of the relevant outcomes included
Other bias	High risk	Contamination possible

Cannon 2000

Methods	Randomised trial
Participants	78 outpatients in a mental health clinic in Salt Lake City, Utah, USA
Interventions	A 3-page paper checklist inserted into the medical record; a computer reminder system (CaseWalker)

Cannon 2000 *(Continued)*

Outcomes	Percentage of cases screened for mood disorders, percentage of cases in which MDD criteria were documented Assessed at: unclear
Notes	1 relevant comparison (reminders versus other QI (computerised reminder) intervention) Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "randomization was based on a table of random numbers."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Clinicians were not blinded and they could potentially see patients in both arms of the trial
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	5 out of 83 patients lost to follow-up (6%)
Selective reporting (reporting bias)	Low risk	The relevant outcomes at which the trial was aimed are reported
Other bias	High risk	High risk of contamination

Chadha 2000

Methods	Randomised trial
Participants	497 women with menorrhagia and 449 women with urinary incontinence seen in gynaecology units in 4 district general hospitals across Scotland
Interventions	Reminder (a disease-specific reminder comprising a single A4 sheet with the protocol algorithm on one side and brief reference notes on the other) + educational meetings versus educational meetings alone
Outcomes	Process of care within 6 key areas of clinical practice: initial hospital assessment (score of compliance with guidelines, continuous), appropriate use of hospital investigations, inappropriate use of hospital investigations, appropriate first line treatments, appropriate pre-surgery assessment, and use of surgical treatments Outcome of care using condition-specific outcome measures and 4 domains of SF-36 , and proportion of patients with no periods Assessed at: 6 and 12 months

Chadha 2000 *(Continued)*

Notes	1 relevant comparison (reminders plus other QI intervention versus other QI intervention) Funding: Grant support for this study was provided by the Chief Scientist Office of the Scottish Office of Home and Health Department, which also funds the Health Services Research Unit, University of Aberdeen, Scotland

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	The 2 conditions were allocated at random, stratified by size and location of hospital-menorrhagia for the 2 hospitals in the west, and urinary incontinence for the 2 in the east of Scotland
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants were not blinded but unsure about the impact of this in effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	It is unclear if the local research assistants were blinded: Quote: "The local research assistant at each hospital abstracted process of care data (details of history, examination, investigation, diagnosis and treatment) from the hospital casenotes onto condition specific data abstraction forms 12 months after date of first consultation"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Data available for 94% of eligible women: Quote: "Of these 946 women, 50 did not attend their first clinic appointment, hospital casenotes were not traceable for six, and two referred with urinary incontinence died (from other causes), leaving data available on 888 (94%) women (472 with menorrhagia and 416 with urinary incontinence) for the analysis of process of care"
Selective reporting (reporting bias)	Low risk	No specific information reported but unlikely
Other bias	High risk	Risk of contamination

Chan 2002

Methods	Cluster-randomised trial (cross-over)
Participants	All Washington State physiatrists billing the Medicare program (USA) and 4300 Medicare outpatients seen in Washington State in 1997
Interventions	Mailings reminding physicians to have their patients immunised against influenza
Outcomes	Influenza immunisation rates Assessed at: 12 months
Notes	1 relevant comparison (reminders versus control). Because of the risk of carry-over effects, we only included data for the first period

Chan 2002 *(Continued)*

	Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure was not reported Quote: "In 1997, the solo practitioners (n 44) and the practitioner groups (n 13) were separately randomized to receive either 4 separate monthly mailings during the influenza season or nothing"
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Not reported but unlikely because outcome was routinely-collected data
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No details reported
Selective reporting (reporting bias)	Low risk	Unlikely, the outcome seems to be the relevant one in this field
Other bias	High risk	No comments about carry-over effects

Cheney 1987

Methods	Cluster-randomised trial
Participants	The population studied comprised the 75 members (house officers) of the University of California, San Diego house staff in Internal Medicine (USA) and 200 randomly-selected records
Interventions	Checklist with preventive care recommendations attached to the medical record
Outcomes	Rates of compliance with preventive care recommendations Assessed at: 12 months
Notes	Included in the review but not included in the analysis. Number of participants per arm not reported Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No details about the randomisation procedure are provided:

Cheney 1987 *(Continued)*

		Quote: "...randomly assigned to control and experimental groups by postgraduate year and by traditional versus primary care residency track to ensure that house officers..."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants were not blinded but unclear about the impact of this in effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Authors audited 200 medical records to measure the outcome but they did not report how many of them were finally included in the analysis
Selective reporting (reporting bias)	Low risk	All relevant outcomes seem to be included
Other bias	Low risk	No other source of bias identified

Cibere 2002

Methods	Non-randomised cluster trial (cross-over)
Participants	7 rheumatologists from Saskatoon (Canada) and 82 patients at high risk of gastrointestinal bleeding
Interventions	Reminder sheet
Outcomes	Adherence to guidelines in high-risk NSAID users Assessed at: unclear (12 months?)
Notes	1 relevant comparison (reminders versus control). Because of the risk of carry-over effects, we only included data for the first period Funding: Canadian Institutes of Health Research Clinician Scientist

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Non randomised
Allocation concealment (selection bias)	High risk	There was no clear concealment of non-randomised allocation
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Subjective outcome, probably participants and personnel were unblinded but unclear about the impact of this in effect estimates

Cibere 2002 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	High risk	Because the main outcome is a judgement about guidelines compliance it is likely that the unblinding could have an impact on the effect estimates: Quote: "Charts of all patients that met the inclusion criteria were reviewed by one investigator (JC), who was not blinded to the study intervention"
Incomplete outcome data (attrition bias) All outcomes	High risk	We assume that there were 82 high-risk patients, but data for the first part of the study are available only from 20 patients and for the second part from 17 patients
Selective reporting (reporting bias)	Low risk	Unlikely
Other bias	High risk	There is a high risk of carry-over effects

Clark 2009

Methods	Randomised trial
Participants	256 women attending the High Risk Obstetrical Unit at the Ottawa Hospital (Canada)
Interventions	4 groups: (1) reminders sent to both physician and patient, (2) reminders sent to the physician but not to the patient, (3) reminders sent to the patient but not to the physician, or (4) no reminder sent (usual care).
Outcomes	Primary: proportion of patients who were screened for diabetes mellitus with an OGTT within 1 year after delivery Secondary: performance of other post-partum screening tests Assessed at: 12 months
Notes	3 relevant comparisons (reminders vs usual care; reminder + other QI versus other QI; and reminders vs other QI (patient reminders) intervention) Funding: provided by the Canadian Institute of Health Research, Knowledge Translation and Exchange (CIHR-KTE), Grant 200210KTS (H.D.C.).

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was performed with a computer-generated randomization list"
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Objective outcome (although personnel were not blinded). Participants (patients) were probably blinded
Blinding of outcome assessment (detection bias) All outcomes	Low risk	The investigators and statistician were blinded to group allocation because the patients were not seen routinely after delivery in follow-up

Clark 2009 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	Data available from 223 out of 256 patients (87%)
Selective reporting (reporting bias)	Low risk	Unlikely. They reported a set of relevant outcomes
Other bias	Low risk	No additional source identified

Cohen 1989a

Methods	Cluster-randomised trial
Participants	50 dentists in private practice in the Indianopolis area (USA) and their patients (1027)
Interventions	4 groups: reminder, nicotine gum, nicotine gum + reminder, and control
Outcomes	Smoking cessation rates at 6 and 12 months Assessed at: 6 and 12 months
Notes	Included in the review but not included in the analysis. Number of participants per group not reported Funding: This research was supported by a grant from the National Cancer Institute, Nº PHS1ROI CA38337

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "dentists and their entire panel of patients who smoked cigarettes were randomly assigned to.." but the specific randomisation procedure is not described
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Personnel seem to be unblinded but it is unclear if participants were or not (in this case the blinding could potentially impact on effect estimates)
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	High risk	Although the assumption was that the non-returners were smoking, 58% and 64% were lost to follow-up at 6 and 12 months respectively
Selective reporting (reporting bias)	Low risk	The outcomes are relevant and it does not seem that important outcomes were missed
Other bias	Low risk	No other relevant source identified

Cohen 1989b

Methods	Cluster-randomised controlled trial
Participants	97 residents in internal medicine and 15 faculty general internists who staffed the outpatient general medicine clinic of a city county teaching-hospital in Indianapolis (USA) and their patients (1420)
Interventions	4 groups: control, gum, reminders, gum + reminders
Outcomes	Smoking cessation rates at 6 and 12 months Assessed at: 6 and 12 months
Notes	Included in the review but not included in the analysis. Number of participants per group not reported Funding:The National Cancer Institute

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Before the lecture, physicians and their entire panel of patients who smoked cigarettes were randomly assigned...", but the specific randomisation procedure was not described
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants and personnel probably not blinded, and it is uncertain if this could have an impact on effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	High risk	Although the results are presented for the whole group on the assumption that non-returners are still smokers, the returners were only 895 out of 1420 (63%)
Selective reporting (reporting bias)	Low risk	The relevant outcomes have been reported
Other bias	Unclear risk	No other source identified

Cowan 1992

Methods	Cluster-randomised trial
Participants	29 residents staffing a general medical clinic of the University of Illinois Medical Center (USA). Data were assessed from a sample of 107 patients' charts
Interventions	Periodic health examination fact sheet on the front of every patient's chart (with age- and sex-specific recommendation on 7 periodic health examination actions)

Cowan 1992 *(Continued)*

Outcomes	Compliance with periodic health examination actions Assessed at: unclear
Notes	1 relevant comparison (reminders versus control) Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "We randomly assigned one of these groups according to week (odd/even) to receive a periodic health examination fact sheet on the front of every patient's chart"
Allocation concealment (selection bias)	High risk	Because the allocation procedure is every other week, it is absolutely predictable
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	The effect of the unblinding of participants and personnel on the effect estimates was not clear
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "One of the two investigators blinded to the resident group assignment reviewed a random sample of 107 charts from a total of..."
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	Although the 7 periodic health examination actions reported seems to be relevant, why they were chosen was not completely clear
Other bias	Unclear risk	It is not clear if clustering was considered in the analysis (they mentioned that "we reanalyzed the data using the resident as the unit of analysis, weighting each residents's performance equally regardless of the number of PHE actions for which patients were eligible")

Daucourt 2003

Methods	Cluster-randomised trial
Participants	67 wards in 6 hospitals in France (1412 orders for thyroid function tests ordered for 1306 patients)
Interventions	The 2 guideline diffusion interventions tested were a memorandum pocket card (MPC, reminder) and a test request form (TRF, other QI). The MPC summarised the recommendations according to the various clinical or therapeutic situations requiring thyroid exploration. 4 diffusion strategies were compared: TRF MPC (dual intervention group), TRF (order form group), MPC (pocket card group), and a control group
Outcomes	The main outcome measure of effectiveness was the Guideline Conformity Rate (GCR: proportion of thyroid function test ordering in accordance with the guidelines) Assessed at: Unclear

Daucourt 2003 *(Continued)*

Notes	3 relevant comparisons (reminders vs usual care; reminder + other QI versus other QI; and reminders vs other QI) Funding: Supported in part by the Agence Nationale de l'Accreditation et de l'Evaluation en Santé (ANAES)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was performed by the CCECQA using a random number table"
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It seems not to be blinded but the impact of this in effect estimates was unclear
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "The research assistant was not blind to the hypothesis but was an independent observer who did not have to judge whether the order for the test was appropriate or not." The effect of this lack of blinding is not clear
Incomplete outcome data (attrition bias) All outcomes	Low risk	Out of 1412 tests ordered there were only 37 patients (2,6%) in whom the prescriber status was unknown and 52 (3.68%) in which the indication of test ordering was unknown
Selective reporting (reporting bias)	Unclear risk	The rationale behind the selection of a single combined outcome was not clear
Other bias	Low risk	No other source identified Quote: "Calculation took into account clustering per ward and stratification per hospital size and activity."

Dubey 2006

Methods	Cluster-randomised trial
Participants	4 urban family practice clinics among 38 primary care physicians affiliated with the University of Toronto (Canada) (509 and 608 randomly-selected chart pre- and post-intervention respectively)
Interventions	Sex-specific preventive Care Checklist Forms with evidence-based recommendations on preventive health services and documentation space for routine procedures such as physical examination
Outcomes	Compliance with 13 preventive health manoeuvres Assessed at: 9 - 10 months
Notes	1 relevant comparison (reminders versus control) Funding: The PSI Foundation

Dubey 2006 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Clinics were randomised using a random-number table
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Personnel were not blinded but they were not aware that the forms were part of a study
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	The impact of unblinding on effect estimates is unclear
Incomplete outcome data (attrition bias) All outcomes	Low risk	Different samples for the pre-intervention (509 out of 697 (73%) analysed) and post-intervention periods (619 out of 672 (89%) analysed). With a focus on the post-intervention period the risk seems to be low
Selective reporting (reporting bias)	Low risk	Outcome for 13 preselected preventive manoeuvres presented (it is unlikely that some relevant outcome had not been reported)
Other bias	High risk	Baseline differences

Ely 2015

Methods	Cluster-randomised trial
Participants	14 primary care physicians (100 patients) at the University of Iowa Hospitals and Clinics, in the emergency department and the family medicine same-day access clinic (USA)
Interventions	A differential diagnosis checklist (printed on 4 × 6 cards with 1 symptom per card. Each symptom included an average of 22 possible diagnoses (SD 10, range 8 – 59). Commonly-missed diagnoses were marked with an asterisk. 'Don't miss' diagnoses (those with potentially serious consequences if missed) were marked with an ace of spades)
Outcomes	Frequency of diagnostic errors Assessed at: unclear
Notes	1 relevant comparison (reminders versus control) Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Physicians were randomly assigned to usual care vs. checklist using a randomized block design."

Ely 2015 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Clinicians (and probably patients) were not blinded to the intervention and the impact of this on the effect estimates was unclear
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The two investigators then independently reviewed this file, blinded to physician identity and study arm to determine the existence of a meaningful discrepancy between the chart diagnosis and the final diagnosis."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Only 3 out of 103 lost to follow-up
Selective reporting (reporting bias)	Low risk	Although there is only 1 outcome it seems to be the relevant one
Other bias	Low risk	None identified

Emslie 1993

Methods	Cluster-randomised trial
Participants	82 general practices (200 couples) in Grampian region (UK)
Interventions	A structured infertility management sheet (guidelines were embedded in the sheet). It consisted of 2 sheets of A4 paper printed on both sides. The front page gave a brief summary of the guidelines and the pointers towards early referral. When the booklet was opened the 2 inner pages were for details of the history and examination of the woman and the man. The final page was a reminder of investigations to perform and a record of the results
Outcomes	Compliance with 14 guideline recommendations related to the couple's sexual history and investigations performed Assessed at: 8 months
Notes	1 relevant comparison (reminders versus control) Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No mention about the specific way in which sequence was generated: Quote: "The 82 participating practices were randomised to study and control groups stratified for practice location."
Allocation concealment (selection bias)	Unclear risk	Not reported

Emslie 1993 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Personnel were clearly unblinded and for participants (patients) was unclear. The impact of this in the effect estimates was unclear
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Not mentioned specifically, but the study aimed to recruit 100 couples in each group and they reported results for 100 couples in each group
Selective reporting (reporting bias)	Low risk	A comprehensive set of outcomes reported
Other bias	Unclear risk	It seems that clustering was not considered in the analysis, but we were not sure

Etter 2000

Methods	Cluster-randomised trial
Participants	393 private practitioners in Geneva, Switzerland
Interventions	Physicians in the intervention group received a box containing 500 'Smoker' stickers (diameter, 22 mm) and a letter presenting arguments in favour of systematically labelling the smokers' charts and of counselling smokers
Outcomes	7 self-reported smoking prevention activities Assessed at: 1 month
Notes	1 relevant comparison (reminders versus control) Funding: Health Authority of the Canton of Geneva

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	The randomisation procedure is not reported: Quote: "The 542 physicians (58%) who returned the questionnaire were randomly assigned to receiving the intervention (n 272) or not (n 270)"
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It is unclear if patients were aware of the intervention
Blinding of outcome assessment (detection bias)	High risk	Not reported. This could be specially relevant for subjective outcomes (self-reported by physicians)

Etter 2000 *(Continued)*

All outcomes		
Incomplete outcome data (attrition bias) All outcomes	High risk	Only 393 out of 542 randomised physicians (72.5%) returned the follow-up questionnaire
Selective reporting (reporting bias)	High risk	Only subjective (self-reported) outcome reported. No chart audit data
Other bias	Unclear risk	No mention about how clustering was considered in the analysis

Frame 1994

Methods	Randomised trial
Participants	Adult members of families in which at least 1 member had been seen in a rural, multiple-office, non-profit, fee-for-service family practice in Dansville (NY, USA) within the past 2 years (1665 patients)
Interventions	Computer-based tracking system compared with a manual flowchart-based system
Outcomes	1) Provider compliance with a health maintenance protocol (11 manoeuvres) 2) Costs Assessed at: unclear
Notes	1 relevant comparison (reminders versus other QI (computer-generated reminders) intervention) Funding: This project was supported by grant No. HS06283 from the Agency for Health Care Policy and Research, Rockville, Md

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Each of the 1008 families included in the study was randomly assigned to either the computerized (trial) or manual (control) group." Quote: "A randomized list of guarantor (roughly equivalent to the head of the household) numbers, distributed among the four participating offices in proportion to the number of active patients at each office, was generated.'"
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "Thus, providers knew they were to use the computer-based tracking system for red-dot patients and the manual system for green-dot patients but they were blinded to which patients were actually included in the study." Unclear if this type of blinding is enough to avoid an impact on effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported

Frame 1994 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	Data available for 1469 (725 + 744 from Table 1) out of 1665 patients (88%)
Selective reporting (reporting bias)	Low risk	The reported outcomes seem to be a reasonable spectrum of the outcomes in this field
Other bias	Unclear risk	Possible risk of contamination between providers

Gonzalez 1989

Methods	Non-randomised trial
Participants	14 medical residents (159 patients) at the Medicine Clinic of the New Hanover Memorial Hospital in Wilmington, North Carolina (USA)
Interventions	A screening checklist (procedures not done were previously marked by a nurse) attached to the front of patients' charts
Outcomes	Compliance with 6 health-promotion and disease-prevention procedures Assessed at: 5 weeks
Notes	1 relevant comparison (reminders versus control) Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Although allocation on alternate days is not randomised, the allocation of residents to a specific day was randomised
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Personnel not blinded and this was unclear for participants. The impact of this on effect estimates was unclear
Blinding of outcome assessment (detection bias) All outcomes	High risk	Clearly not blinded and this could have an impact on effect estimates
Incomplete outcome data (attrition bias) All outcomes	Low risk	Losses to follow-up seem to be minimal (out of 159 doctor-patient encounters there seems to be information available from 157)
Selective reporting (reporting bias)	Low risk	It does not seems to be an issue
Other bias	High risk	No mention of a method to deal with clustering in the analysis

Grady 1997

Methods	Cluster-randomised trial
Participants	61 primary care practices (11,716 patients) in greater Dayton, Ohio and Springfield, Massachusetts (USA)
Interventions	3 arms: (1) education-only control, (2) education plus cue enhancement, and (3) education plus cue enhancement plus feedback and token rewards
Outcomes	Mean practice mammography referral and completion rates (continuous) Assessed at: 12 months
Notes	1 relevant comparison (reminders plus other QI (education) versus other QI intervention) Funding: This research was supported by National Cancer Institute Grant CA58243

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The specific randomisation procedure is not clearly described: Quote: "...was recruited and randomly assigned to one of three conditions: (1) education-only control, (2) education plus cue enhancement, and (3) education plus cue enhancement plus feedback and token rewards."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "A total of 11,716 patients were identified, and all but 290 (2.5%) who were documented to be lost because of death or transfer out of the practice completed the first year, resulting in a final sample of 11,426."
Selective reporting (reporting bias)	Low risk	Unlikely (relevant outcomes reported)
Other bias	Low risk	None clearly identified. No cluster adjustment, but the analysis was by cluster

Halterman 2005

Methods	Randomised trial
Participants	151 3- to 7-year-old children (and their primary care physicians) entering the Rochester City School District (USA)

Halterman 2005 *(Continued)*

Interventions	Primary care providers of children in the provider notification group were sent a letter by facsimile, signed by the principal investigator, indicating the number of days the child experienced daytime and night-time symptoms during the past 4 weeks and the number of emergency medical visits for asthma during the past 12 months. The letter also included a copy of the 2002 NHLBI guidelines for asthma management and a recommendation to consider medication action based on the child's current therapy For children assigned to the control group, PCPs were not contacted
Outcomes	Measures of preventive action taken (e.g. new medication or change in medication) and health care use (e.g. acute visits for asthma) Assessed at: 3 - 6 months
Notes	1 relevant comparison (reminders versus control) Funding: The Halcyon Hill Foundation, Rochester; the Robert Wood Johnson Foundation Generalist Physician Faculty Scholars Program

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "At the conclusion of the baseline interview, children were randomized into either the provider notification group or the control group. Randomization was stratified by use of preventive medications at baseline and was blocked in groups of 6. Randomization cards were made from a table of random numbers"
Allocation concealment (selection bias)	Low risk	Quote: "...were kept in sealed, opaque, sequentially numbered envelopes until after the baseline assessment was completed"
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Unclear if participants were blinded (this could affect outcome measurement)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Interviewers blinded to the child's group assignment called parents 3 to 6 months after randomization to assess the outcome measures for this study."
Incomplete outcome data (attrition bias) All outcomes	Low risk	150 out of 151 children included in the primary analysis (Figure)
Selective reporting (reporting bias)	Low risk	Unlikely, although only subjective outcomes reported
Other bias	Unclear risk	No adjustment by provider, and a risk of contamination

Headrick 1992

Methods	Cluster-randomised trial
Participants	Academic group practices (33 residents, 240 patients) of a major urban teaching hospital in Cleveland, Ohio (USA)

Headrick 1992 *(Continued)*

Interventions	3 arms: PCEP (Physicians Cholesterol Education Program) lecture only (group 1, the control group); PCEP lecture supplemented by generic chart reminders of the NCEP (National Cholesterol Education Program) guidelines placed on top of each patient's medical record at the time of his/her visit (group 2, the generic chart reminder group); and the PCEP lecture supplemented by the generic reminders and patient-specific feedback about current compliance with NCEP guidelines and explicit recommendations about immediate actions to be taken (group 3, the patient-specific chart reminder group)
Outcomes	Compliance with NCEP guidelines Assessed at: 5 weeks
Notes	1 relevant comparison (reminders versus control). Groups 2 and 3 were combined in the analysis (generic & specific reminders) Funding: Merck, Sharp and Dohme, administered by the Clinical Research International Research Triangle

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The procedure for generating the sequence is not explicitly described and the different descriptions of what was done were misleading: Quote: "Interventions were assigned to each geographically separated resident group practice." Quote: "The investigation was conducted as a randomized controlled trial of three strategies to improve resident physicians' compliance with published NCEP guidelines for identifying and treating patients with high blood cholesterol levels"
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was unclear if patients were blinded, and the impact of this on effect estimates is uncertain
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "These notes were reviewed blindly by a trained nurse-reviewer who recorded all lipid testing or management activity (drug therapy initiated or modified, dietary recommendations, or consultations requested), including any documentation of physician intent to undertake these actions."
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	The outcomes reported were a mix of objective (compliance with guidelines) and subjective (knowledge and attitudes)
Other bias	Unclear risk	There was no adjustment by clustering

Hung 2008

Methods	Randomised trial
Participants	194 patients with angiographically-proven CHD at National Taiwan University Hospital Yun-Lin Branch (Taiwan)
Interventions	A statement stamped on the paper chart ('Statin can be beneficial to the patients with documented coronary artery disease regardless of their LDL level'), red in colour, written in mixed Chinese and English. Beneath the reminder, the current policy of statin reimbursement issued by National Health Insurance (NHI) of Taiwan was attached
Outcomes	Primary: new prescription of either statin or ezetimibe during the follow-up period Secondary: the composite result of LLT or lipid profile measurement within 6 months Assessed at: 6 months
Notes	1 relevant comparison (reminders versus control) Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The subjects with proven significant CHD without statin use were randomized into two groups on a patient-by-patient basis according to the assignment from a computer-based algorithm."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was not clear if patients were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	No losses to follow-up reported
Selective reporting (reporting bias)	Low risk	The relevant outcomes were considered and reported
Other bias	High risk	Authors used logistic regression, but unclear if they controlled by clustering. Some risk of contamination

Kunz 2007

Methods	Cluster-randomised controlled trial
Participants	178 practices (417 patients' discharge letter) in the catchment area of the Department of Internal Medicine, Park-Klinik Weissensee, Berlin (Germany)

Kunz 2007 *(Continued)*

Interventions	Short, 1-sentence evidence summaries appended to the discharge letters (59 different pieces of evidence addressing 15 medical conditions)
Outcomes	Primary: rate of discontinuation of recommended medication (process of care continuous) Assessed at: unclear
Notes	1 relevant comparison (reminders versus control) Funding: The study was performed as part of a joint project of the Arztekammer Berlin, Park-Klinik Weissensee and the Techniker Krankenkasse, Hamburg

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Existing practices were randomised using a computer generated random list before establishing the practitioners' willingness to participate." Quote: "We randomised all primary care practices in the catchment area of the Department of Internal Medicine, Park-Klinik Weissensee, Berlin, from where patients had been admitted in the preceding year"
Allocation concealment (selection bias)	Low risk	Quote: "For practices that opened during the study period, we prepared opaque sealed envelopes that the department secretary opened sequentially."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants not clearly blinded and the outcome was reported by them
Blinding of outcome assessment (detection bias) All outcomes	High risk	They were unblinded but some precautions were taken to minimise bias (unclear if they were effective)
Incomplete outcome data (attrition bias) All outcomes	High risk	Outcome data obtained from 122 out of 469 randomised practices (26%). Although they identified some imbalance between control and intervention groups, the risk of bias seems to be high, considering the very high losses to follow-up
Selective reporting (reporting bias)	Low risk	Unlikely
Other bias	Low risk	Clustering considered in the analysis. No other source identified

Laprise 2009

Methods	Cluster-randomised trial
Participants	122 general practitioners (2344 patients) in 5 regions of Quebec (Canada)
Interventions	Continuous Medical Education (CME) only (control group) compared with CME with practice enablers and reinforces (PER intervention: screening medical records, prompting physicians, filling out and enclosing a 1-page checklist)

Laprise 2009 *(Continued)*

Outcomes	Primary: proportion of patients, undermanaged at baseline for at least 1 recommendation, for which study physicians undertook at least 1 preventive care action in the first visit following patients' recruitment in the study Secondary: compliance with guideline recommendations (7) Assessed at: variable
Notes	1 relevant comparison (reminders plus other QI (educational meetings) compared with other QI intervention) Funding: Sanofi-Aventis provided an unrestricted research grant to the University of Montreal

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Using a computer-generated list of random numbers ˜MS Excel: RANDOM!, half of the GPs within each stratum were randomly assigned by one investigator to the PER group and the other half to the control group."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Most of the participants were probably blinded to the intervention, but this is not completely clear
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "Outcomes were assessed by the investigators, using retrospective audit information abstracted by trained nurses." Probably unblinded but it was not clear
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	122 out of 133 (91.7%) GPs initially randomised were included in the analysis. However only 2344 out of 4488 (52.2%) of the patients were included in the analysis (low consent rates?)
Selective reporting (reporting bias)	Low risk	A wide range of relevant outcomes included
Other bias	Low risk	An appropriate analysis considering clustering: Quote: "...using logistic regressions, within the framework of a generalized estimating equation."

Levine 2003

Methods	Randomised trial
Participants	473 patients attending Internal Medicine and Family Medicine clinics in Nashville, Tennessee (USA)
Interventions	A physician-administered model that used reminders sent by the nurse (reminders) versus a nursing protocol model (other QI intervention). The nurse-administered protocol-driven preventive services delivery model was a kind of multifaceted intervention
Outcomes	Proportion of patients with 9 cancer-related preventive services documented as ordered or completed

Levine 2003 *(Continued)*

	Assessed at: 9 months
Notes	Cancer prevention services 1 relevant comparison (reminders versus other QI (multifaceted) intervention) Funding: The Agency for Healthcare Quality and Research and the Health Care Financing Administration

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No details about the sequence generation procedure
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was unclear if participants were blinded or not (they knew that were participating in a study). It was unclear if physicians knew they were participating in a study.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Nurses (the outcome assessors) were not blinded to the patient allocation and they were part of 1 arm of the trial
Incomplete outcome data (attrition bias) All outcomes	Low risk	They did not report any loss to follow-up
Selective reporting (reporting bias)	Low risk	Unlikely; a wide and relevant range of outcomes included
Other bias	Unclear risk	Quote: "...using physicians as the unit of analysis did not alter the conclusions." but the way in which this analysis was done is not reported. Contamination? adjustment by nurse?

Levy 2009

Methods	Cluster-randomised trial
Participants	5 practices (204 women aged 65 years or older) in the Iowa Research Network (USA)
Interventions	3 arms: physician chart reminders, physician chart reminders + patient education, usual care. The chart reminder was a sticky note following National Osteoporosis Foundation guidelines that practices could place on the charts wherever they thought it would be most effective.
Outcomes	Primary: rates of completed BMD testing Secondary: percentage of women who asked their physician about a BMD test, percentage of women who discussed a BMD test with their physician Assessed at: 6.7 months (median)
Notes	Osteoporosis screening

Levy 2009 *(Continued)*

	1 relevant comparison (reminders versus control) Funding: Financial support was provided by the American Academy of Family Physicians Foundation through an Advanced Research Training Grant awarded to Barcey Levy and the Department of Family Medicine, University of Iowa Roy J. and Lucille A. Carver College of Medicine, Iowa City

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Using a random number generator, the remaining 5 practices were randomized to one of 3 groups: 2 practices to physician chart reminder alone, 2 practices to physician chart reminder plus patient education, and 1 practice to usual care."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Personnel were unblinded and participants could be aware of the sticky note on their charts; the impact of this on effect estimates was unclear
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Assessors were probably unblinded and the impact of this on effect estimates was unclear (objective primary outcome)
Incomplete outcome data (attrition bias) All outcomes	Low risk	Outcome reported for 195 out of 204 (95.6%) patients initially considered
Selective reporting (reporting bias)	Unclear risk	Only a single objective outcome
Other bias	Low risk	It seems that the analytical methods used (4 different approaches) considered clustering and unit-of-analysis errors

Lilford 1992

Methods	Randomised trial
Participants	2424 women attending the hospital for the first (booking) visit in St James's University Hospital, Leeds (UK)
Interventions	3 arms (methods of history taking): manual system (usual care), structured checklist (manual reminder), and computerised (on-screen reminders)
Outcomes	Compliance with 101 clinical actions grouped in 7 medical categories: medical and surgical, obstetric, personal, current symptoms and treatment, related to maternal age, and 2 common actions that would have swamped all others if not grouped separately (carrying out a cervical smear test and giving advice on dental hygiene) Assessed at: unclear
Notes	Quality of obstetric care (history-taking)

Lilford 1992 *(Continued)*

	2 relevant comparisons (reminders versus usual care/control; reminders versus other QI (on-screen reminders) intervention) Funding: This work was supported by the UK Medical Research Council

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Before each clinic a computer programme randomised women to 1 of the 3 groups in blocks of 3
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Personnel not blinded and participants probably blinded, but unclear
Blinding of outcome assessment (detection bias) All outcomes	Low risk	For the first 430 assessments of the notes the research midwives were blinded to the group allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	Outcome data from 2223 out of 2424 randomised patients (91.7%)
Selective reporting (reporting bias)	Unclear risk	The clinical actions were grouped, then it is unclear if all the 101 actions were reported
Other bias	Unclear risk	It is not clear how relevant each action is for each patient. It is not clear if there is a risk of contamination

McIsaac 2002

Methods	Cluster-randomised controlled trial
Participants	97 family physicians (164 randomised) in Ontario (Canada) seeing 621 children and adults with sore throat
Interventions	Chart stickers or forms prompting physicians to use a score-management approach for the diagnostic of sore throat; control group use a form but without either the sticker or the chart prompt
Outcomes	Primary: prescription of unnecessary antibiotics Secondary: overall antibiotic use Assessed at: unclear
Notes	1 relevant comparison (reminders versus control/usual care) Funding: Medical Research Council of Canada

Risk of bias

Bias	Authors' judgement	Support for judgement

McIsaac 2002 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	Physicians were randomised but the procedure was unclear
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was unclear if participants (patients) were blinded or not
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	It was not clear how the outcomes were measured
Incomplete outcome data (attrition bias) All outcomes	High risk	Only 97 out of 164 (59.1%) randomised physicians completed the study and provided patient data
Selective reporting (reporting bias)	Unclear risk	The outcomes seem relevant, but there was a lack of clinically relevant outcomes
Other bias	Low risk	Clustering considered in the design (sample size calculation) and in the analysis

Montgomery 2000

Methods	Cluster-randomised trial
Participants	27 general practices (614 patients) in Avon (UK)
Interventions	3 arms: computer-based clinical decision support system plus cardiovascular risk chart; cardiovascular risk chart alone; and usual care
Outcomes	Percentage of patients in each group with a 5-year cardiovascular risk of 10% or more, systolic blood pressure, diastolic blood pressure, prescribing of cardiovascular drugs Assessed at: 6 - 12 months
Notes	1 relevant comparison (reminders versus control/usual care) Funding: NHS Wales Office of Research and Development

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was performed with a table of random numbers by a researcher not involved in the study and who was blind to the identity of the practices."
Allocation concealment (selection bias)	Unclear risk	Not reported

Montgomery 2000 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "...neither the doctors and nurses nor the patients were blind to their study group." The impact of this in effect estimates was unclear
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	High risk	At 12 months outcome data were available for 531 out of 810 randomly selected patients (65.5%), but there were few practices lost to follow-up
Selective reporting (reporting bias)	Unclear risk	Unlikely, but protocol not available and most of the outcomes were surrogate
Other bias	Low risk	Analysis addressed clustering and other confounding variables: Quote: "Since randomisation was by practice, we also corrected for clustering using procedures in Stata to derive robust estimates of standard error." No other source identified

Moore 1997

Methods	Cluster-randomised trial
Participants	26 community-based office practices of internists and family physicians in Los Angeles, California (USA). 261 patients aged 70 years or more and seeing these physicians for a new visit or a physical examination
Interventions	Screening form and clinical summaries for selected conditions (impairments in hearing, vision, and physical function, weight and memory loss, depression, incontinence, and gait disorders)
Outcomes	Detection of and intervention for conditions screened (impairments in hearing, vision, and physical function, weight and memory loss, depression, incontinence, and gait disorders), and health status 6 months after the intervention Assessed at: 6 months
Notes	1 relevant comparison (reminders versus control/usual care) Funding: Robert Wood Johnson Clinical Scholars Program and the National Institute on Aging Geriatric Academic Program

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	The randomisation procedure was not clear: Quote: "Physician group practices that agreed to participate in the study were matched on specialty and one member of each of the matched pairs was randomized (using a table of random numbers) to the intervention or control group."

Moore 1997 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It is not clear if patients were blinded or not and the consequences of this on effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	26 out of 35 physician groups (74%) completed the study. Main outcome data at 6 months available from 238 out of 261 (91%) patients
Selective reporting (reporting bias)	Low risk	A wide range of relevant outcomes reported
Other bias	Unclear risk	Not sure if clustering was considered in the analysis using ANCOVA

Nendaz 2010

Methods	Cluster-randomised trial
Participants	All eligible patients (1085 acutely ill hospitalised medical patients) from 8 randomly selected Swiss hospitals
Interventions	3 arms: pocket digital assistant programme (PDA, computerised reminder), pocket cards (manual reminder) and no CDSS (controls)
Outcomes	Adequacy of thromboprophylaxis prescription Assessed at: 4 months
Notes	2 relevant comparisons (reminders versus control/usual care; reminders versus other QI (computerised reminder) intervention) Funding: The study was funded by Sanofi-Aventis (Suisse)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	The specific way in which the sequence was generated was not clear: Quote: "We randomly assigned medical services to a pocket digital assistant program (PDA), pocket cards (PC) and no CDSS (controls)." Quote: "The centres without electronic charts were randomly assigned to pocket cards (PC) or pocket digital assistants (PDA) providing the thromboembolic risk score, or received no CDSS (controls, C)."
Allocation concealment (selection bias)	Unclear risk	Not reported

Nendaz 2010 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Low risk	Personnel were not blinded, and patients were probably blinded. Because of the setting it is unlikely that this could affect effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No mention of this (data extracted from a standardised form used by a multicentre study, but no explicit mention of who was extracting the data)
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	All the randomised units (wards) were included in the analysis (sample of patients were different at baseline than in the follow-up). The study included 1085 patients with 651 at baseline and 434 post-CDSS implementation (66.7%)
Selective reporting (reporting bias)	Unclear risk	A single outcome, not clear if there were more outcomes reported in the protocol
Other bias	Low risk	The analytical plan seems to take clustering into account: Quote: "To take into account a cluster effect at the hospital level, we used a Generalized Estimating Equations (GEE) model with an exchangeable working correlation matrix to assess global adequacy of thromboprophylaxis prescription." No other source identified

Potter 2009

Methods	Cluster-randomised trial
Participants	5 primary care clinics (7303 patients) at the University of California, San Francisco (USA)
Interventions	3 arms: usual care (no intervention), poster-only arm (reminder: a large colourful poster designed by the American Cancer Society presenting the menu of options for CRCS (Colorectal Cancer Screening) in a multilingual format placed in each exam room), and a poster/phone reminder arm
Outcomes	Proportion of patients with up-to-date CRCS Assessed at: 6 to 9 months
Notes	Colorectal cancer screening 1 relevant comparison (reminders versus control/usual care) Funding: San Francisco Unit of the American Cancer Society, a Cancer Control Career Development Award for Primary Care Physicians from the American Cancer Society (MBP), and a Research Scholars-Grant from the American Cancer Society (JMEW)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure is not explicitly described: Quote: "The 5 primary care practices were randomized to 1 of 3 arms..."
Allocation concealment (selection bias)	Unclear risk	Not reported

Potter 2009 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Low risk	Although participants and personnel were not blinded we think that the impact on effect estimates was minimal, because of the way in which the study is set (non-intrusive intervention and objective outcome)
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	It is not clear who extracted the data: Quote: "Patient data was extracted from the UCSF EMR."
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	There is no mention about losses to follow-up
Selective reporting (reporting bias)	Low risk	The selected outcome seems to be the relevant one
Other bias	Unclear risk	It was unclear if the analytical approach used by the authors addressed clustering

Pritchard 1995

Methods	Randomised trial
Participants	757 women, aged from 36 to 69 years, selected from the registers of a university general practice at Lockridge, near Perth (Australia)
Interventions	4 arms: a control group (which received opportunistic screening as part of normal practice care); a 'tagged notes' group, for which each patient's notes were tagged with a reminder for the treating doctor to invite the woman to have a Pap smear at a normal consultation or at the special screening clinic (reminders group); a 'letter only' group in which each woman received an invitation letter to either attend her normal doctor or make an appointment for the screening clinic, together with instructions for making an appointment at the clinic (patient reminders group 1); and an 'appointment letter' group in which each woman received an invitation letter to attend a special screening clinic at a specified date and time (patient reminders group 2). Both patient reminder groups were analysed together
Outcomes	Proportion of patients with a Pap smear taken Assessed at: 12 months
Notes	Cervical screening in primary care 2 relevant comparisons (reminders versus control/usual care; and reminders versus other QI (patient reminders) intervention) Funding: Australia Health, Housing and Community Services Research and Development Grant

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "757 were eligible for inclusion in the study and were allocated randomly to one of three intervention groups or a control group." "Eligible women were randomly allocated to one of four groups using a table of random numbers."

Pritchard 1995 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Clearly not blind, and the outcome was assess by patient's surveys. For the 'tagged notes' group it was unclear if patients were blinded. For the patient reminder groups it was not clear if personnel were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Outcome assessors were not blinded but unclear of the impact of this on the effect estimates, given that the outcome is objective
Incomplete outcome data (attrition bias) All outcomes	High risk	400 out of 757 randomised patients (52.8%) were lost to follow-up (Table 3)
Selective reporting (reporting bias)	Low risk	Although there was a single primary outcome it seems to be the relevant one for this study
Other bias	Unclear risk	Because the randomisation was at the patient level the risk of contamination (physicians seeing patients in the different study groups) was unclear. Clustering is not mentioned in the design or analysis contamination; how many women had the same physician?

Rattanaumpawan 2016

Methods	Cluster-randomised trial
Participants	6 general medicine wards (874 patients) at Siriraj Hospital, a 2300-bed tertiary care hospital (Thailand)
Interventions	A self-inking stamp in the doctor's order sheet versus usual infection control care
Outcomes	Mean duration of all catheter days, mean duration of temporary catheter days, mean duration of Foley's catheter days, mean duration of central venous catheter days, median length of hospital stay, cumulative incidence (infection episode per hospitalisation), incidence rate (infection episode per catheter day) of CAUTIs and CLABSIs, and hospital mortality Assessed at: unclear
Notes	Hospital-acquired infections 1 relevant comparison (reminders versus usual/control care) Funding: This study was primarily supported by the Health Systems Research and Development Project, Faculty of Medicine Siriraj Hospital and Health Systems Research Institute (Thailand)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure is not detailed: Quote: "A total of 6 general medicine wards were randomly allocated to receive the usual infection control care either with or without the Catheter Reminder and Evaluation (CARE) program."

Rattanaumpawan 2016 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Personnel were not blinded but unclear of the impact of this on effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	It seems that losses to follow-up were minimal
Selective reporting (reporting bias)	Low risk	There seem to be a wide range of objective outcomes compatible with the registered protocol (ClinicalTrials.gov identifier: NCT01797146)
Other bias	Unclear risk	Possible contamination: Quote: "...therefore, it is possible that residents in the CARE ward may transfer their positive behavior when rotating to the control ward."

Renzi 2006

Methods	Cluster-randomised trial
Participants	104 primary care physicians (1612 patients) located in 4 Quebec regions (Canada)
Interventions	Self-inking paper stamp checklist tool summarising the Canadian Clinical Practice Guidelines for physician assessment of asthmatic patient control and therapy. There were 4 groups: 3 of them including the self-inking paper stamp + educational materials; the control group was educational materials
Outcomes	Proportion of patients with emergency room visits and with hospitalisations Assessed at: 12 months
Notes	Asthma management 1 relevant comparison (reminders plus other QI (educational materials) intervention versus other QI) Funding: The Towards Excellence in Asthma Management (TEAM) project of the Quebec Asthma Education Network.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure is not clearly described: Quote: "The physicians were then randomly assigned to the four groups listed in Table 1"
Allocation concealment (selection bias)	Unclear risk	Not reported

Renzi 2006 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was unclear if patients were blinded; not mentioned but unlikely
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	Not sure if there were other relevant outcomes
Other bias	High risk	No mention of clustering and how it was addressed; no clear report of analysis

Richards 2001

Methods	Cluster-randomised trial
Participants	24 general practices with low uptake in the second round of screening (below 60%) in north west London and the West Midlands (UK) Participants were all women (6133) registered with these practices and eligible for screening in the third round
Interventions	Physicians' reminders (a green card to be inserted into patients' notes (flag), an encounter form integral to the flag, and an information leaflet), and patient reminders (a letter, translation sheet, and information leaflet). The practices were allocated to one of those interventions, neither of them or both.
Outcomes	Attendance for screening 6 months after the practices had been screened Assessed at: 6 months
Notes	3 relevant comparisons (reminders versus usual care; reminders plus other QI intervention versus other QI; and reminders versus other QI (patient reminders) intervention) Funding: UK Medical Research Council

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "With random number tables, the 24 practices were randomised within strata into one of the four intervention groups"
Allocation concealment (selection bias)	Low risk	Quote: "...study staff who were independent of the practice recruitment process and blind to the identities of the individual general practices."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Personnel were not blinded and patients in the flag group unclear, but the impact on effect estimates seems to be low

Richards 2001 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	It was not clear if assessors were blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	5732 out of 6133 (93,5%) women with reported outcomes
Selective reporting (reporting bias)	Low risk	Although there was a single outcome it seems to be the relevant one
Other bias	Low risk	None relevant. The analysis considered clustering

Roetzheim 2004

Methods	Cluster-randomised trial
Participants	8 primary care clinics (1196 patients) in Hillsborough County, Florida (USA)
Interventions	The intervention is a package called Cancer SOS. It has 2 components: a cancer-screening checklist with chart stickers that indicated whether specific cancer-screening tests were due, ordered, or completed; and a division of office responsibilities to achieve high screening rates
Outcomes	Proportion of patients up-to-date on 1 or more of the following cancer-screening tests: mammogram, Papanicolaou (Pap) smear, or FOBT Assessed at: 12 months
Notes	1 relevant comparison (reminders versus control) The study was included in the review but not considered in the analysis because we were unable to obtain denominators for each group (control and intervention) and then we were unable to compute an absolute effect estimate Funding: This research was supported by National Cancer Institute grant R01 CA77282

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure was not described: Quote: "We performed a cluster randomized experimental trial in which 8 clinics meeting eligibility criteria were randomized to either intervention or control conditions."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Participants were not blinded but the outcome was objective and it was unlikely that this could affect effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	They did not mention this issue, although something was done (abstraction was made 3 months after patients had visited the clinic) to prevent the influ-

Roetzheim 2004 *(Continued)*

		ence of records review from influencing patient or provider screening behaviour
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	The number of potentially eligible records (patients) in each arm is not presented
Selective reporting (reporting bias)	Low risk	A reasonable set of outcome included
Other bias	Low risk	None identified. The analysis took into account clustering and potential confusion variables

Saillour-Glénisson 2005

Methods	Cluster-randomised trial
Participants	6 hospitals (67 wards, 1412 orders for thyroid function tests) in France
Interventions	Pocket card (reminders), test request form (other QI), neither, and both
Outcomes	Guideline Conformity Rate and Cost-effectiveness ratios Assessed at: unclear (12 months?)
Notes	3 relevant comparisons (reminders versus control, reminders plus other QI (test request form) versus other QI intervention, and reminders versus other QI) Funding: Partial funding from l'Agence Nationale d'Accréditation et d'Évaluation en Santé (ANAES)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	1412 orders included without losses to follow-up reported
Selective reporting (reporting bias)	Low risk	Unlikely

Saillour-Glénisson 2005 *(Continued)*

Other bias	Unclear risk	Risk of contamination?

Saitz 2003

Methods	Cluster-randomised trial
Participants	Urban academic primary care practice: 41 faculty and resident primary care physicians and 312 patients with hazardous drinking
Interventions	Providing physicians with alcohol screening results (CAGE questionnaire responses, alcohol consumption, and readiness to change) and recommendations for their patients at a visit
Outcomes	Patient self-report of discussions about alcohol use immediately after the physician visit and alcohol use 6 months later Assessed at: 6 months
Notes	1 relevant comparison (reminders versus control/usual care) The study was included in the review but not considered in the analysis because we were not able to calculate the denominators for each stratum: 240 patients for faculty physicians and 72 for residents but not separated by intervention and control groups Funding: the Robert Wood Johnson Foundation (grant031489), Princeton, New Jersey.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Physicians were stratified by level of training (resident or faculty) and were randomly assigned to the intervention or control group at the start of the study.' 'The computer-generated randomization was done by off-site data management personnel who had no patient or physician contact."
Allocation concealment (selection bias)	Low risk	Quote: "...was done by off-site data management personnel who had no patient or physician contact."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was unclear if participants were blinded and this could have an important impact on effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "...at follow-up, interviews were done without knowledge of group assignment."
Incomplete outcome data (attrition bias) All outcomes	Low risk	41 out of 50 (82%) randomised physicians completed the study
Selective reporting (reporting bias)	Unclear risk	Only patient-reported outcomes included
Other bias	Unclear risk	No additional source identified

Scholes 2006

Methods	Randomised trial
Participants	3509 sexually active women, aged 14 - 20 years, enrolled in a mixed-model managed care system in Washington state (USA)
Interventions	Chart prompt reminders: a brief, highly visible prompt placed in the front of randomly selected patient charts, stated 'High Risk Age Group for Chlamydia. Consider Screening,' and included the guideline web-link
Outcomes	Chlamydia testing rates during 12 months post-intervention Assessed at: 12 months
Notes	This study included 2 parts: a clinic-level intervention and a chart prompt intervention. We only used data from the latter (reminders versus control) Funding: Financial support was provided by R01 HS10514 from the Agency for Healthcare Research, as part of the Translating Research into Practice (TRIP) initiative; and K07 CA84603 (JBM)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	It was clearly randomised but the sequence generation procedure was unclear: Quote: "We employed a two-by-two factorial randomized trial design to evaluate two conceptually-based interventions to increase adherence to the GHC chlamydia screening guideline in usual clinical practice" Quote: "Randomization at the enrollee level was employed to evaluate the effect of a chart prompt encouraging providers to screen for chlamydia per guideline recommendations"
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Participants unblinded but unlikely to impact on effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No mention of this issue. It could potentially affect outcome adjudication in some borderline cases
Incomplete outcome data (attrition bias) All outcomes	Low risk	No report of losses to follow-up
Selective reporting (reporting bias)	Low risk	Although there was a single outcome it seems to be the relevant one for this intervention
Other bias	High risk	There is mention of clustering in the analysis of the clinical-level intervention but not for the individual-level intervention:

Scholes 2006 *(Continued)*

	Quote: "we tested for interaction between the clinic- level and chart prompt interventions. Since this interaction was not significant, the results for the two interventions are reported separately." Even when this was done there is a risk of contamination in the individual-level intervention

Seto 1989

Methods	Cluster-randomised trial
Participants	Nine randomly-selected wards (235 participant nurses) in Queen Mary Hospital, Hong Kong
Interventions	3 groups: a simple announcement through the nursing hierarchy in group A (control), a passive method (posters and pamphlets) was added in group B, and both passive and active methods (in-service lectures) were used in group C
Outcomes	Proportion of nurses no longer recapping needles, proportion of needles uncapped Assessed at: 5 weeks and 6 months
Notes	1 relevant comparison (reminders (group B) versus control/usual care (group A)) Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "From the 36 clinical wards of the hospital, nine were randomly selected and divided into three groups (A: B and C) of three wards each with the help of a computerised randomization programme."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Personnel unblinded but unclear if they were aware of the other interventions
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned, but this could have an impact on effect estimates
Incomplete outcome data (attrition bias) All outcomes	Low risk	Outcome data available from 208 out of 235 (88.5%) of nurses
Selective reporting (reporting bias)	Low risk	No protocol available, but the scope of the study is very specific and the outcome seems to be the relevant ones
Other bias	High risk	Clustering not considered in the analysis and risk of contamination in a single hospital

Shannon 2001

Methods	Cluster-randomised trial
Participants	All (31) resident physicians (608 patients) in a large family practice residency programme in New Hampshire (USA)
Interventions	The Comprehensive Annotated Reminder Tool (CART): a form for documenting history and physical examinations containing 8 sections: history, screening history, physical examination, screening mnemonics, laboratory screens, prophylaxis, counselling, and the assessment/plan section. The CART forms were placed on all charts of new patients seen by physicians in the experimental group
Outcomes	Physician adherence to up to 49 preventive services recommendations Assessed at: unclear
Notes	1 relevant comparison (reminders versus control/usual care) Funding: a grant from the Advocate Christ Hospital Medical Fund

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure is not described: Quote: "Resident physicians were randomly assigned to a treatment group that was exposed to the CART (n=15) and a control group that used existing blank history and physical examination forms (n=16)."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was unclear if patients were blinded to the intervention
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	It was not clear if only a subgroup of all the charts was assessed without knowing the allocated group: Quote: "Blinded chart reviews were performed by the principal investigator and 2 other independent reviewers on randomly selected new patients."
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Low risk	A comprehensive set of preventive measures included in the analysis
Other bias	High risk	Clustering was not considered in the analysis, and some risk of contamination in a single practice

Shaw 2000

Methods	Cluster-randomised trial

Shaw 2000 *(Continued)*

Participants	52 first- and second-year paediatric residents (626 well-child care visits) in a hospital-based continuity clinic in Boston (USA)
Interventions	Manual prompts of immunisations due: a trained research assistant manually determined the immunisations due, using an algorithm. A list of all possible immunisations along with the words 'due today' was stamped on to the computerised printout, and the appropriate immunisations due that day were checked off. Although there were computers in the prompt elaboration process we think that the core mechanism of action of the intervention was similar to other paper reminders interventions
Outcomes	Proportion of visits with unacceptable missed opportunities/vaccine administration errors (reversed for analysis) Assessed at: unclear (immediate?)
Notes	1 relevant comparison (reminders versus control/usual care) Funding: This study was supported in part by the Massachusetts Immunization Program, Massachusetts Department of Public Health

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure is described but we were not sure if this was fully randomised (alternation): Quote: "First- and second-year residents were randomized by day of the week and assigned to either the control (no prompting) or the intervention (prompting) group." "...random- number generator program was used to choose 2 days for the intervention group and 3 days for the control group."
Allocation concealment (selection bias)	High risk	Assigning days of the week makes the randomisation sequence known to everyone
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It is unclear if patients were blinded. It is unclear if unblinding of residents could have had some impact on effect estimates
Blinding of outcome assessment (detection bias) All outcomes	Low risk	The final judgment of vaccination error was made by a clinician blinded to the allocation: Quote: "At the end of each day, post encounter chart review of all charts in both groups compared immunizations administered with those due. No variance was defined as complete administration of the vaccines due. Those charts with any variance from complete administration of immunizations due were further reviewed by a clinician, blinded to the resident groups."
Incomplete outcome data (attrition bias) All outcomes	Low risk	626 out of 686 visits (91%) were used in the analysis
Selective reporting (reporting bias)	Unclear risk	It seem to be a reasonable outcome to be measured in the context of this study but no protocol available

Shaw 2000 *(Continued)*

Other bias	High risk	Clustering was incorporated in the analysis, but contamination among residents was possible

Somkin 1997

Methods	Randomised trial
Participants	7077 female health maintenance organization members (aged 50 - 74 years with no prior mammogram in the previous 30 months or aged 20 - 64 years with no prior Pap smear in the previous 36 months) in Northern California (USA)
Interventions	A letter sent to participants described some common barriers to screening and provided women with a telephone number to call and schedule a 'VIP mammogram' or a 'VIP Pap smear' (patient reminder group), the patient reminder plus a chart reminder (yellow form) placed manually by a chart room clerk (patient plus provider reminder group), and control/usual care group
Outcomes	Proportion of patients with mammograms and Pap smear done Assessed at: 6 months
Notes	1 relevant comparison (reminders plus other QI intervention (patient reminders) compared with other QI intervention) Funding: This study was funded by the Innovation Program, Clinical Services Branch, The Permanente Medical Group, Oackland, California

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure is not described: Quote: "Separately for the mammography and Pap smear samples, we randomly selected 594 eligible women during each of 6 months (March to August 1994) and randomized them to receive one of the following..."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Low risk	None of them was blinded to the intervention group, but the impact on outcome measurement seems to be limited because the outcome was routinely-collected data
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Although this was unclear the outcome was assessed from a routinely-used computerised system
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	This is not mentioned, although the follow-up seems to be almost complete (?)
Selective reporting (reporting bias)	Low risk	Outcomes assessed were the relevant ones

Somkin 1997 *(Continued)*

Other bias	High risk	Authors incorporated a number of covariates in the analysis but unclear if this considered clustering appropriately. Risk of contamination?

Stamos 2001

Methods	Cluster-randomised trial
Participants	16 physicians (290 patients) in a Cardiology Clinic at Cook County Hospital, Chicago, Illinois (USA)
Interventions	Reminders attached to the front of the chart when patients were not being managed in accordance with NCEP guidelines. They were individualised to the given patient, citing the NCEP guidelines and suggesting the specific change in management required to restore compliance with the guidelines
Outcomes	Compliance with the NCEP guidelines Assessed at: unclear
Notes	1 relevant comparison (reminders versus control/usual care) Funding: This study was supported in part by an unrestricted educational grant from the Bristol-Myers Squibb Corporation, New York, New York

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No details about the sequence generation procedure: Quote: "This was a randomized, controlled study,..." "by 8 physicians (4 cardiology fellows, 4 attending cardiologists) randomly chosen to receive the intervention."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was not clear if patients were blinded (and this could affect effect estimates through them asking specific clinical questions)
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	The impact of unblinded outcome assessor in effect estimates is uncertain, especially for routinely-collected outcomes Quote: "Laboratory data were collected using the hospital laboratory information system."
Incomplete outcome data (attrition bias) All outcomes	Low risk	There is no mention of losses to follow-up at either the physician or at the patient level
Selective reporting (reporting bias)	Low risk	The outcomes chosen seem to be the relevant ones, but no information from the protocol available
Other bias	High risk	We were not sure if the analytical plan addressed clustering. Some risk of contamination among physicians in a single clinic

Strecher 1991

Methods	Cluster-randomised trial
Participants	11 residency programmes (261 residents, 937 patients), in internal medicine (6), family medicine (3), and pediatrics (2). Programmes were located in 3 university medical centres and 4 university-affiliated community hospitals in North Carolina and Pennsylvania (USA)
Interventions	2 interventions (tutorial and prompt) and 4 groups. The tutorial was a 2-hour educational programme in minimal-contact smoking cessation counselling for residents. The prompt was a chart-based reminder to assist physician counselling. 1 group of residents received the tutorial; 1, the prompt; and one, both. A 4th group received no intervention
Outcomes	The primary physician outcomes were 2 counselling practices: frequency (the percentage of smokers residents counselled who returned); and content (the number of 5 specific techniques residents reported having used in counselling). Several secondary physician outcomes were also examined, including the use of techniques to motivate patients to quit smoking and the presence of 3 attitudes toward smoking cessation counselling: confidence, perceived preparedness, and perceived success. The primary patient-related outcome was the patient quitting rate: the percentage of each resident's patients with a self-report of smoking cessation within 6 months of the exit interview Assessed at: 6 months
Notes	3 relevant comparisons (reminders versus control/usual care; reminders plus other QI (tutorial) versus other QI intervention; and reminders versus other QI (educational meetings) intervention) Funding: supported by the University of North Carolina Faculty Development Program in General Medicine and General Pediatrics and by grants from the Cancer Prevention and Control Program of the National Cancer Institute, the North Carolina Chapter of the American Heart Association and the University of North Carolina Center for Health Promotion and Disease Prevention

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure was not clearly described: Quote: "We used a randomized factorial design to test the two interventions, alone and in combination" Quote: "After the pretest, residents were randomly assigned by clinic half-day session to one of four groups: tutorial only, prompt only, tutorial + prompt, and control."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was unclear if patients were blinded to interventions and this could have had an impact on patient-reported outcomes
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	For the patients' self-report the outcome assessor was blind. But it is not clear for the physicians' self-report (probably not). It was not clear how self-reported outcomes data were collected: Quote: "Six months after the initial exit interview, telephone interviewers, who were blind to residents' and patients' group assignments, obtained patient reports on current smoking status."

Strecher 1991 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	6% lost from physicians, 29% lost from patients
Selective reporting (reporting bias)	Unclear risk	A comprehensive set of outcomes was reported but no information about the protocol
Other bias	Unclear risk	Not clear if they adjusted by physicians (clustering)

Szilagyi 1996

Methods	Randomised trial
Participants	878 patients attending a Pediatric Continuity Clinic in a teaching hospital in Rochester, NY (USA)
Interventions	"The No Missed Opportunities intervention has 3 components: (1) medical charts of study patients were marked with a conspicuous black dot to indicate that they were assigned to the NMO study group; (2) staff nurses were instructed to screen these medical charts for immunization status at all visit types, including acute-illness, follow-up, and nurse only visits; and (3) if a vaccination was due, a brightly colored immunization reminder card was to be attached by the triage nurse to the front of the medical chart indicating that a vaccination was due and listing the valid contraindications to immunizations according to current Advisory Committee on Immunization Practices and American Academy of Pediatrics criteria"
Outcomes	Missed opportunity rates, proportion of patients with up-to-date immunisation schedule Assessed at: 9 - 18 months
Notes	The study assessed two different strategies in separate studies: the No Missed Opportunities (NMO) intervention and the Vaccination Without Legal Guardian's Signature intervention. We only included the first one in our analysis 1 relevant comparison (reminders versus control/usual care) Funding: Supported by grants from the New York State Department of Health in Albany (Contract C-008975), and the Strong Children's Research Center, Rochester

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure was not detailed: Quote: "The study was a randomized controlled clinical trial as shown in Figure 1"
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It is not clear if patients were blinded and the impact of this on effect estimates is uncertain; Unlikely but outcome objective
Blinding of outcome assessment (detection bias)	Low risk	Quote: "At the end of the study, a medical chart review was performed by chart abstractors who were blind to the study hypotheses and to group allocations."

Szilagyi 1996 *(Continued)*
All outcomes

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	This information is not clearly reported
Selective reporting (reporting bias)	Unclear risk	The outcomes are not presented in a clear format and it is not always easy to identify effect estimates (not sure if this is related to selective reporting)
Other bias	High risk	Not adjusted by centre, and contamination possible in a single centre where physicians could see patients in both groups

Thapar 2002

Methods	Cluster-randomised trial
Participants	82 general practices (1275 patients with active epilepsia) in 4 areas of Greater Manchester (UK)
Interventions	The intervention consisted of an evidence-based epilepsy prompt and reminder card for GPs to complete. The card had 2 main parts: first, 'prompts' to collect key clinical information about an individual's epilepsy; and secondly, evidence-based information ('reminders') on which to then base any subsequent patient management decision. The card was passport-sized, bright yellow in colour, and consisted of 9 sections (including seizure frequency and pattern, seizure classification, medication, side-effects and indications for medication withdrawal, checking serum levels, information provision, and monitoring). In 1 group (provider reminder) the card was inserted into the patients' records, and in other group (patient reminder) the patient held the card
Outcomes	The primary outcome measures were recording of seizure frequency and self-reported seizure frequency in the previous year. Secondary outcome measures were the retrieval rate and completion rate of the epilepsy card, the proportion of patients on monotherapy with anticonvulsants, the proportion of patients reporting medication side-effects, whether serum levels of anticonvulsants were checked appropriately, the levels of patient satisfaction with GP care, and level of satisfaction with information provision by the GP Assessed at: 12 months
Notes	Clinical area: management of epilepsy 2 relevant comparisons (reminders versus control/usual care, and reminders versus other QI (patient reminders) intervention) Funding: the UK Department of Health Implementation of research methods programme (IMP 15/12) and Sanofi Pharmaceuticals

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The study was a pragmatic randomised trial. Practices were stratified into small (fewer than three partners in practice) or large (three or more partners in the practice). Using a random number table, practices were either allocated to the 'control' group, to the 'doctor-held card' group (where the card was inserted into the patients' records) or to the 'patient-held card' group (where the patient held the card)."
Allocation concealment (selection bias)	Unclear risk	Not reported

Thapar 2002 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Neither participants nor personnel were blinded and the impact of this on effect estimates is unclear
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	It was low for outcomes from medical records (94.9%) and borderline for outcomes from questionnaires (76.5%)
Selective reporting (reporting bias)	Low risk	It seems to be a complete set of outcomes (although no protocol available)
Other bias	Low risk	None identified

Vinker 2002

Methods	Cluster-randomised trial
Participants	6 family physicians (2315 patients) in 2 primary care clinics in Israel
Interventions	In the physician intervention arm (group I), a reminder note to the physician was placed in the patient file. It advised physicians to direct patients to perform a FOBT according to accepted practice. In the patient intervention arm (group II), 2 reminder strategies were used (a reminder letter or a phone call). In the control group (group III), physicians continued administering their usual level of care
Outcomes	The main outcome measure was the percentage of patients performing screening FOBT at the conclusion of the 1-year study period Assessed at: 12 months
Notes	Clinical area: Colorectal cancer screening 2 relevant comparisons (reminders versus control/usual care; and reminders versus other QI (patient reminders) intervention) Funding: The project was supported by a grant from the Israel Cancer Society.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure was not clearly described
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported

Vinker 2002 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Although in Figure 1 there was no losses to follow-up the issue is not explicitly described
Selective reporting (reporting bias)	Low risk	A single outcome but it seems to be the relevant one in this field
Other bias	High risk	Clustering not considered in the design or the analysis. The reminders arm included both manual and computerised reminders; we used only manual reminders in our analysis (breaking in some way randomisation)

Walker 1999

Methods	Cluster-randomised trial
Participants	10 physicians (74 patients) at the University of Cincinnati's Infectious Disease Center (USA)
Interventions	A coloured chart reminder placed on charts not earlier than 24 hours before patient's primary care clinic visit
Outcomes	Rate of documentation by the physician of discussion about advanced directives (AD) and the rate of AD completion by the patient by the end of the 6-month study period Assessed at: 6 months
Notes	Clinical area: care of HIV/AIDS patients 1 relevant comparison (reminders versus control/usual care) Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	They mention that groups were randomly assigned but they were also grouped by day of their clinical practice. The sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "Physicians were unaware of the purpose of the study" but it is not clear if they were unblinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Outcome assessors were independent from the researchers group but not blinded. Although the criteria to assess outcomes was objective it was not clear if this protected completely from bias

Walker 1999 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	No mention of losses to follow-up
Selective reporting (reporting bias)	Low risk	The 2 outcomes seems to be the relevant ones in this field
Other bias	Unclear risk	Contamination was unlikely because they grouped physicians by day of their clinical practice. They did a physician-level sensitivity analysis to determine if the intervention was physician-dependent. However, we were not sure if the analysis described (physician-level analysis using Fisher's exact test or multiple logistic regression) considered clustering

Wang 1994

Methods	Cluster-randomised trial
Participants	27 second- and third-year residents, part-time and full-time staff physicians (93 patients) at the Department of Family Medicine, National Taiwan University Hospital
Interventions	1 group of physicians received 2 lectures on the stages-of-change model on which to base their patient counselling (educational meetings). A second group was not exposed to the model but received a reminder reading 'Ask your patients to stop smoking' (reminders). A third group was not exposed to any of the previous interventions (usual care)
Outcomes	Quit-smoking rate Assessed at: 6 months
Notes	Clinical area: smoking cessation 2 relevant comparisons: reminders versus control/usual care; and reminders versus other QI intervention (educational meetings) Funding: This study was supported by a grant from the Department of Health

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "All physicians were numbered and randomly assigned to one of 3 groups by number of years in practice" (not truly randomised?)
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Unclear if participants were blinded and this could be relevant in a self-reported outcome
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported

Wang 1994 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	It seems that all the 27 physicians were at follow-up and 82 out of 93 patients (88.2%) completed the follow-up interview (although losses were higher in the control group)
Selective reporting (reporting bias)	Unclear risk	Smoking cessation was reported by patients without a complementary 'objective' outcome. Not sure if this could affect effect estimates
Other bias	High risk	Clustering not considered in the design or analysis Smoking cessation was reported by patients with no 'objective' confirmation Because residents were in a single hospital there is some risk of contamination

Wigton 1981

Methods	Non-randomised trial
Participants	291 patients with abnormal haemoglobin values evaluated at the University of Nebraska Hospital (USA)
Interventions	Chart reminder: it took the form of a questionnaire the same size as the progress note sheets. The questionnaire stated it was part of a study of anaemia, listed the patient's abnormal haemoglobin value, and then asked 2 questions
Outcomes	Diagnosis of anaemia, number of non-substantive errors (in the management of anaemia) A non-comparative description of costs included Assessed at: 6 months
Notes	1 relevant comparison (reminders versus control/usual care) Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Non-randomised allocation: Quote: "Those with low abnormal values were assigned alternately to a study group or to a control group."
Allocation concealment (selection bias)	High risk	No mention of this issue but probably not considered
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It was not clear if patients were blinded and this could potentially affect the effect of intervention
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Neither the committee members nor the records administrator knew which cases were assigned to the study group"
Incomplete outcome data (attrition bias) All outcomes	High risk	173 out of 291 (59.4%) of patients with outcome data. The characteristics of the other 118 patients are not detailed

Wigton 1981 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	It was not possible to make a judgement with the information available
Other bias	High risk	Possible contamination

Yazdany 2011

Methods	Randomised trial
Participants	204 patients seen at the gynaecology outpatient clinics at Harbor UCLA Medical Center, Los Angeles (USA)
Interventions	A chart-alert sticker reading 'do you leak urine'. The chart alert appeared as a white sticker placed on the lower left-hand corner of the preprinted history and physical intake assessment sheet, using the same text format as the form
Outcomes	Primary: documentation of urinary incontinence Secondary: diagnosis made, initiation of workout treatment plan, referral to an urogynaecologist Assessed at: unclear
Notes	1 relevant comparison (reminders versus control/usual care) Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "We randomized 350 new patient consults to receive a chart-alert sticker reading ''do you leak urine'' versus no sticker using a simple randomization computer-generated sequence. A team research assistant created the randomization sequence
Allocation concealment (selection bias)	Low risk	Quote: "The randomization sequence list was secured until completion of the study."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "Residents were not informed about the study and, if they asked, were told the reasons for the sticker were confidential."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	It was not clear if those involved in assessing the outcomes (reviewing the charts) were blinded
Incomplete outcome data (attrition bias) All outcomes	High risk	Outcome data for 190 out of 350 (54.3%) patients' charts randomised
Selective reporting (reporting bias)	Low risk	Unlikely. A relevant set of outcomes reported
Other bias	High risk	Probable contamination - not adjusted by resident

Zenni 1996

Methods	Cluster-randomised trial
Participants	53 paediatric house officers and 153 parents in the paediatric house staff continuity clinic at Lucile Salter Packard Children's Hospital, Stanford, California (USA)
Interventions	Structured encounter forms including checklists for developmental milestones and checklists for anticipatory guidance/preventive care
Outcomes	Patient satisfaction and compliance with recommended standards Assessed at: unclear
Notes	1 relevant comparison (reminders versus usual care) Funding: this work was performed during the tenure of a Clinician-Scientist Award from the American Heart Association, Dallas, Texas

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The sequence generation procedure was not clearly detailed
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It is not clear that patients were blinded (because of the way in which outcomes are measured this could have an impact on effect estimates) Quote: "House staff were informed that the general purpose of the study was to assess the impact of SEFs and were asked for their voluntary, confidential participation."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Patient and parent names were not labeled on the audiotapes. Audiotapes were scored by the 2 authors independently using structured checklists, and group assignments of subjects were blind."
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Of the 53 eligible residents, 50 (94%) completed both a pretest and post-test. However very few audiotapes were analysed
Selective reporting (reporting bias)	Unclear risk	It was not possible to make a judgement with the information available
Other bias	Unclear risk	Authors tested the assumption of no more correlation between the intervention responses of patients in the same clinic group than there is between the intervention responses of those in different clinic groups, but unclear if the method used for that is appropriate

BMD: bone mineral density; CAGE:cut-annoy-guilty-eye; CAUTI: catheter-associated urinary tract infection; CLABSI: central line-associated blood stream infection; CDSS: clinical decision support systems; CHD: coronary heart disease; FOBT: faecal occult blood test; GHC: group health cooperative; GP: general practitioners; HIV/AIDS: human immunodeficiency virus/acquired immune deficiency syndrome; LDL: low density lipoproteins; LLT: lipid lowering therapy; MDD: major depressive disorder; NCEP: National Cholesterol Education Program ; NHLBI: National Health, Lung and Blood Institute; NSAID: non-steroidal anti-inflammatory drugs; OGTT: oral glucose tolerance test; OR: odds ratio; PCEP: Physician Cholesterol Education Program; PCP: primary care providers; QI: quality improvement; VIP: very important person.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Albada 2012	Patient-reminders study
Althabe 2008	Multifaceted intervention
Ashe 2004	Multifaceted intervention
Aspesi 2012	Multifaceted intervention
Aspesi 2013	Multifaceted intervention
Aspy 2008	Multifaceted intervention
Avorn 1988	Multifaceted intervention (mainly educational materials)
Baker 2011	Computer-generated reminders study
Barkun 2013	Multifaceted intervention
Baskerville 2001	Non-reminders study
Bates 1995	Computer-generated reminders study
Bazian 2005	Computer-generated reminders study
Bejes 1992	Multifaceted intervention
Bekkering 2005	Multifaceted intervention
Berwanger 2012	Multifaceted intervention
Bhatia 2013	Multifaceted intervention
Bloomfield 2005	Multifaceted intervention
Boekeloo 1990	Non-eligible population (Internal Medicine interns)
Brink 1989	Computer-generated reminder study
Buchner 1987	Patient-reminders study
Burack 1996	Computer-generated reminders study
Burack 1998	Computer-generated reminders study
Burack 2003	Computer-generated reminders study
Canada 2011	Multifaceted intervention
Carruthers 2007	Computer-generated reminders study
Carter 2005	Patient-reminders study

Study	Reason for exclusion
Casebeer 1999	Multifaceted intervention
Cayten 1983	Non-reminders study
Champion 2003	Multifaceted intervention
Chanques 2006	Ineligible study design
Chase 1983	Computer-generated reminders study
Chokshi 2017	Computer-generated reminders study
Christensen 2004	Multifaceted intervention
Coenen 2004	Multifaceted intervention
Coleman 2003	Multifaceted intervention
Cox 2003	Non-reminder study
Coyle 2004	On-screen reminders study
Cranney 2008	Multifaceted intervention
Crawford 2011	Patient-reminders study
Cummings 1989	Non-reminders study
Dainty 2011	Multifaceted intervention
Daley 2004	Multifaceted intervention
Damery 2012	Patient-reminders study
Danchaivijitr 1992	Insufficient information to make a judgement
Davis 2007	Multifaceted intervention
Derose 2005	Computer-generated reminders study
Desai 2013	Computer-generated reminders study
Dexter 2004	Computer-generated reminders study
Dijkstra 2006	Multifaceted intervention
Duke 2013	On-screen reminders study
Eccles 2001	Computer-generated reminders study
Eschmann 2015	On-screen reminders study
Feder 1999	Multifaceted intervention
Fiscella 2010	Multifaceted intervention

Study	Reason for exclusion
Flottorp 2002	Non-reminders study
Foy 2011	Computer-generated reminders study
Frances 2001	Mixed (computerised and manual paper) reminders study
Frasure 2014	Multifaceted intervention
Frazier 1991	Non-reminders study
Friedmann 2006	Multifaceted intervention
Gans 1994	Multifaceted intervention
Garcia 2009	Computer-generated reminders study
Gilutz 2009	Computer-generated reminders study
Girotti 1990	Ineligible study design (seems to be a kind of retrospective audit)
Goff 2003	Multifaceted intervention
Goldstein 2005	Computer-generated reminders
Goodey 2000	Non-reminders study
Hagerman 1978	Patient-reminders study
Hajek 2002	Non-reminders study
Halbert 1999	Patient-reminders study
Hambidge 2004	Multifaceted intervention
Heard 2002	Non-reminders study
Heidenreich 2005	Computer-generated reminders study
Heidenreich 2007	Computer-generated reminders study
Heiman 2004	Computer-generated reminders study
Heranney 2011	Patient-reminders study
Hiatt 2001	Multifaceted intervention
Hilleman 2001	Multifaceted intervention
Holton 2010	Multifaceted intervention
Huang 2004	Non-reminder study
Ivers 2012	Patient-reminders study
Jones 1996	Multifaceted intervention

Study	Reason for exclusion
Karikoski 2003	Patient-reminders study
Kaye 2005	Multifaceted intervention
Kinsman 2009	Multifaceted intervention
Kirwin 2010	Computer-generated reminders study
Lafata 2007	Computer-generated reminders study
Lainscak 2016	Computer-generated reminders study
Lantz 1995	Patient-reminders study
Lesprit 2010	Non-reminders study
Levy 2013	Mixed (computerised and manual paper) reminders study
Linares 2011	Computer-generated reminders study
Lipkus 1999	Patient-reminders study
Luszczynska 2012	Non-reminders study
MacIntyre 2003	Computerised-reminder study
MacLean 2009	Multifaceted intervention
Majumdar 2004	Multifaceted intervention
Majumdar 2008	Multifaceted intervention
Majumdar 2012	Computer-generated reminders study
Manfredi 1998	Multifaceted intervention
Manns 2012	Ineligible comparator
Margolis 1992	Multifaceted intervention
Martin 2004	Multifaceted intervention
Martin 2007	Multifaceted intervention
McAlister 2009	Computer-generated reminders study
McDermott 2001	Non-reminders study
McDermott 2003	Non-reminders study
Meulepas 2007	Non-reminders study
Myers 2004	Multifaceted intervention
Naunton 2004	Multifaceted intervention

Study	Reason for exclusion
NCT00355004 2013	On-screen reminders study
NCT00699439 2009	Computer-generated reminders study
NCT01057888 2015	Patient-reminders study
NCT01126034 2015	Computer-generated reminders study
NCT01207232 2010	Patient-reminders study
NCT01325116 2014	Patient-reminders study
NCT01352390 2017	Patient-reminders study
NCT01401621 2015	Patient-reminders study
NCT01729429 2015	Patient-reminders study
NCT02411006 2016	Patient-reminders study
NCT02411032 2017	Patient-reminders study
NCT02438943 2015	Multifaceted intervention
NCT02564653 2015	Multifaceted intervention
NCT02640521 2016	Multifaceted intervention
NCT02927743 2016	Non-reminders study
Nguyen 2000	Multifaceted intervention
Ockene 1994	Multifaceted intervention
Okano 1995	Non-reminders study
Olivarius 2001	Multifaceted intervention
Olson 2009	On-screen reminders study
Ong 2011	Ineligible participants
Otero-Sabogal 2006	Multifaceted intervention
Paskett 1999	Multifaceted intervention
Peccoralo 2012	Non-reminders study
Piazza 2013	No paper reminders study
Polinski 2011	Non-reminders study
Pollack 1991	Multifaceted intervention
Puech 1998	Patient-reminders study

Study	Reason for exclusion
Raebel 2005	Computer-generated reminders study
Ray 2001	Multifaceted intervention
Rimer 1999	Computer-generated reminders study
Robie 1988	Multifaceted intervention
Rodewald 1999	Multifaceted intervention
Rossignol 2005	Non-reminders study
Roy 2014	Multifaceted intervention
Saint 2005	Multifaceted intervention
Scheel 2002	Multifaceted intervention
Sellors 2004	Computer-generated reminders study
Shelley 2010	Multifaceted intervention
Shevlin 2002	Multifaceted intervention
Shirai 2012	Patient-reminders study
Simon 2001	Patient-reminders study
Solomon 2004	Multifaceted intervention
Solomon 2007	Non-reminders study
Soureti 2011	Patient-reminders study
Srikrajang 2005	Multifaceted intervention
Stiell 2009	Multifaceted intervention
Stiell 2010	Multifaceted intervention
Stone 2005	Non-paper reminder study (reminder delivered by telephone)
Szilagyi 2015	On-screen reminders study
Taylor 1999	Multifaceted intervention
Thomas 2006	Computer-generated reminders study
Thomas 2007	Patient-reminders study
Thompson 2008	Multifaceted intervention
Tierney 1986	Computer-generated reminders study
Tseng 2002	Multifaceted intervention

Study	Reason for exclusion
Valanis 2002	Non-reminders study
Van der Sanden 2005	Multifaceted intervention
Van der Weijden 2001	Non-reminders study
Vissers 1996	On-screen reminders study
Wadland 2007	Non-reminders study
Waldorff 2009	Multifaceted intervention
Wee 2016	Multifaceted intervention
Weiss 2011	Non-paper reminders study
Zeler 1992	Multifaceted intervention

Characteristics of ongoing studies *[ordered by study ID]*

Feitosa-Souza 2018

Trial name or title	Creation of reminders to improve nurses' practice regarding registration and use of the child's book
Methods	Cluster-randomised trial
Participants	10 primary care nurses in Brazil
Interventions	Chart reminders
Outcomes	Adherence to guidelines on child development
Starting date	2018
Contact information	
Notes	

APPENDICES

Appendix 1. Search strategies

Medline (OVID)

Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE and Versions(R)

No.	Search terms	Results

(Continued)

1	reminder systems/	3032
2	(booklet? or chart? or checklist? or check-list? or flowchart? or flow sheet? or flowsheet? or form? or hard copy or hard copies or insert? or leaflet* or postal? or postcard? or post-card? or poster? or print* or sheet? or written or handwritten or chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or sticker?).ti,ab.	2358209
3	1 and 2	931
4	(reminder? adj3 (chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? or poster? or print* or sheet? or written)).ti,ab.	918
5	((prompt? or physician prompt?) adj5 (booklet? or chart? or checklist? or check-list? or display? or flowchart? or flow sheet? or flowsheet? or form? or hard copy or hard copies or insert? or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? or poster? or print* or sheet? or written or handwritten)).ab.	454
6	(alert? adj3 (chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? or poster? or print* or sheet? or written)).ab.	202
7	((chart? or medical record?) adj2 insert*).ti,ab.	16
8	((chart? or record?) adj4 (stamp* or sticker?)).ti,ab.	73
9	((alert? or prompt*) adj4 (stamp* or sticker?)).ti,ab.	26
10	((alert? or prompt?) adj3 (record? or chart? or progress note?)).ti,ab.	209
11	((alert? or prompt*) adj (physician? or provider? or practitioner?)).ti,ab.	906
12	((prompt* or alert? or sticker? or stamp*) adj5 (patient? profile? or cue sheet? or check list? or checklist? or patient-specific or gener* information)).ti,ab.	104
13	((memory aid? or memory aide?) adj10 (physician? or professional? or provider? or doctor? or nurse?)).ti,ab.	16
14	((prompt* or alert? or sticker? or stamp*) adj5 (patient? profile? or cue sheet? or check list? or checklist? or patient-specific)).ti,ab.	100
15	(medical records/ or documentation/) and (alert? or prompt? or stamp* or sticker?).ti,ab.	444
16	or/3-15	3757
17	randomized controlled trial.pt.	467294
18	controlled clinical trial.pt.	94249
19	multicenter study.pt.	230927

(Continued)

20	pragmatic clinical trial.pt.	599
21	(randomis* or randomiz* or randomly).ti,ab.	760365
22	groups.ab.	1748551
23	(trial or multicenter or multi center or multicentre or multi centre).ti.	215683
24	(intervention? or effect? or impact? or controlled or control group? or (before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or quasiexperiment* or quasi experiment* or pseudo experiment* or pseudoexperiment* or evaluat* or time series or time point? or repeated measur*).ti,ab.	8229357
25	non-randomized controlled trials as topic/	170
26	interrupted time series analysis/	300
27	controlled before-after studies/	259
28	or/17-27	9194643
29	exp animals/	2.1E+07
30	humans/	1.7E+07
31	29 not (29 and 30)	4423325
32	review.pt.	2320414
33	meta analysis.pt.	82107
34	news.pt.	183702
35	comment.pt.	693374
36	editorial.pt.	443417
37	cochrane database of systematic reviews.jn.	13481
38	comment on.cm.	693373
39	(systematic review or literature review).ti.	99257
40	or/31-39	7761099
41	28 not 40	6430508
42	16 and 41	2142

Embase (OVID)

Embase <1974 to 2017 June 26>

No.	Search terms	Results
1	reminder system/	2110
2	(booklet? or chart? or checklist? or check-list? or flowchart? or flow sheet? or flowsheet? or form? or hard copy or hard copies or insert? or leaflet* or postal? or postcard? or post-card? or poster? or print* or sheet? or written or handwritten or chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or sticker?).ti,ab.	2783099
3	1 and 2	606
4	(reminder? adj3 (chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? or poster? or print* or sheet? or written)).ti,ab.	1208
5	((prompt? or physician prompt?) adj5 (booklet? or chart? or checklist? or check-list? or display? or flowchart? or flow sheet? or flowsheet? or form? or hard copy or hard copies or insert? or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? poster? or print* or sheet? or written or handwritten)).ab.	601
6	(alert? adj3 (chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? or poster? or print* or sheet? or written)).ab.	277
7	((chart? or medical record?) adj2 insert*).ti,ab.	24
8	((chart? or record?) adj4 (stamp* or sticker?)).ti,ab.	138
9	((alert? or prompt*) adj4 (stamp* or sticker?)).ti,ab.	53
10	((alert? or prompt?) adj3 (record? or chart? or progress note?)).ti,ab.	321
11	((alert? or prompt*) adj (physician? or provider? or practitioner?)).ti,ab.	1244
12	((prompt* or alert? or sticker? or stamp*) adj5 (patient? profile? or cue sheet? or check list? or checklist? or patient-specific or gener* information)).ti,ab.	181
13	((memory aid? or memory aide?) adj10 (physician? or professional? or provider? or doctor? or nurse?)).ti,ab.	15
14	((prompt* or alert? or sticker? or stamp*) adj5 (patient? profile? or cue sheet? or check list? or checklist? or patient-specific)).ti,ab.	177
15	(*medical record/ or *medical documentation/) and (alert? or prompt? or stamp* or sticker?).ti,ab.	302
16	or/3-15	4461
17	randomized controlled trial/	458556
18	controlled clinical trial/	437367

(Continued)

19	quasi experimental study/	3850
20	pretest posttest control group design/	306
21	time series analysis/	19594
22	experimental design/	14408
23	multicenter study/	158354
24	(randomis* or randomiz* or randomly).ti,ab.	988182
25	groups.ab.	2287653
26	(trial or multicentre or multicenter or multi centre or multi center).ti.	275145
27	(intervention? or effect? or impact? or controlled or control group? or (before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or quasiexperiment* or quasi experiment* or pseudo experiment* or pseudoexperiment* or evaluat* or time series or time point? or repeated measur*).ti,ab.	10174246
28	or/17-27	11350937
29	(systematic review or literature review).ti.	114934
30	"cochrane database of systematic reviews".jn.	6165
31	exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/	24820539
32	human/ or normal human/ or human cell/	18661356
33	31 not (31 and 32)	6205960
34	29 or 30 or 33	6325956
35	28 not 34	8617895
36	16 and 35	2811

The Cochrane Library (Wiley)

No.	Search terms	Results
#1	[mh "reminder systems"]	799
#2	(booklet? or chart? or checklist? or check-list? or flowchart? or flow sheet? or flowsheet? or form? or hard copy or hard copies or insert? or leaflet* or postal? or postcard? or post-card? or poster? or print* or sheet? or written or handwritten or chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or sticker?):ti,ab	54151

(Continued)

#3	#1 and #2	260
#4	(reminder near/3 (chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? or poster? or print* or sheet? or written)):ti,ab	155
#5	((prompt or (physician prompt)) near/5 (booklet or chart or checklist or check-list or display or flowchart or (flow sheet) or flowsheet or form or "hard copy" or "hard copies" or insert or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal or postcard or post-card or poster or print* or sheet or written or handwritten)):ab	46
#6	(alert near/3 (chart or checklist or check-list or handwritten or "hard copy" or "hard copies" or insert* or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal or postcard or post-card or poster or print* or sheet or written)):ab	10
#7	((chart or (medical record)) near/2 insert*):ti,ab	0
#8	((chart or record) near/4 (stamp* or sticker)):ti,ab	3
#9	((alert or prompt*) near/4 (stamp* or sticker)):ti,ab	2
#10	((alert or prompt) near/3 (record or chart or (progress note))):ti,ab	22
#11	((alert or prompt*) near (physician or provider or practitioner)):ti,ab	109
#12	((prompt* or alert or sticker or stamp*) near/5 ((patient profile) or (cue sheet) or (check list) or checklist or patient-specific or (gener* information))):ti,ab	15
#13	(((memory aid) or (memory aide)) near/10 (physician or professional or provider or doctor or nurse)):ti,ab	0
#14	((prompt* or alert or sticker or stamp*) near/5 ((patient profile) or (cue sheet) or (check list) or checklist or patient-specific)):ti,ab	13
#15	([mh "medical records"] or [mh documentation]) and (alert or prompt or stamp* or sticker):ti,ab	80
#16	{or #3-#15}	582

Cinahl (EBSCO)

No.	Search terms	Results
S1	MH “reminder systems”	1,558
S2	(booklet? or chart? or checklist? or check-list? or flowchart? or flow sheet? or flowsheet? or form? or hard copy or hard copies or insert? or leaflet* or postal? or postcard? or post-card? or poster? or print* or sheet? or written or handwritten or chart? or checklist? or check-list? or handwritten or hard copy or hard	206,561

(Continued)

	copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or sticker?)	
S3	S1 AND S2	327
S4	(reminder? N3 (chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? or poster? or print* or sheet? or written))	129
S5	((prompt? or physician prompt?) N5 (booklet? or chart? or checklist? or check-list? or display? or flowchart? or flow sheet? or flowsheet? or form? or hard copy or hard copies or insert? or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? or poster? or print* or sheet? or written or handwritten))	50
S6	(alert? N3 (chart? or checklist? or check-list? or handwritten or hard copy or hard copies or insert* or leaflet* or manual or mail* or pamphlet* or paper or paper-based or postal? or postcard? or post-card? or poster? or print* or sheet? or written))	49
S7	((chart? or medical record?) N2 insert*)	4
S8	((chart? or record?) N4 (stamp* or sticker?))	3
S9	((alert? or prompt*) N4 (stamp* or sticker?))	3
S10	((alert? or prompt?) N3 (record? or chart? or progress note?))	16
S11	((alert? or prompt*) N0 (physician? or provider? or practitioner?))	83
S12	((prompt* or alert? or sticker? or stamp*) N5 (patient? profile? or cue sheet? or check list? or checklist? or patient-specific or gener* information))	26
S13	((memory aid? or memory aide?) N10 (physician? or professional? or provider? or doctor? or nurse?))	2
S14	((prompt* or alert? or sticker? or stamp*) N5 (patient? profile? or cue sheet? or check list? or checklist? or patient-specific))	12
S15	((MH "Medical Records") OR (MH "Documentation")) AND (alert? or prompt? or stamp* or sticker?)	90
S16	S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15	695

ClinicalTrials.gov

reminder AND (booklet OR chart OR checklist OR flowchart OR leaflet OR postal OR postcard OR poster OR print OR sheet OR written OR handwritten OR leaflet OR manual OR mail OR pamphlet OR paper OR sticker) in Intervention / treatment
Limited to Interventional Studies

WHO International Clinical Trials Registry Platform (ICTRP)

reminder* [intervention]

Appendix 2. GRADE evidence profile: Reminders versus usual care

Patient or population: Healthcare professionals (physicians, nurses and dentists)

Settings: Ambulatory and hospital care in USA, Canada, UK, France, Switzerland, Taiwan, Australia, Germany, Hong Kong, India, Israel, Spain and Thailand

Intervention: Manual paper reminders focused on improving compliance with preventive guidelines (e.g. cancer screening, vaccination) and disease management guidelines (e.g. annual follow-ups, test-ordering, medication adjustment, counseling)

Comparison: Control/usual care

Quality assessment							Effect	Certainty of the evidence (GRADE)	Importance
Number of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**			
Professional practice: dichotomous process adherence outcomes									
39 studies	23 cluster-randomised trials, 12 individual randomised trials, 4 non-randomised trials	Serious (−1)	No serious inconsistency	No serious indirectness	No serious imprecision	None	Median improvement (IQR): 8.45% (2.54% to 20.58%)	⊕⊕⊕⊖ **moderate**	IMPORTANT
Professional practice: continuous outcomes									
8 studies	5 cluster-randomised trials, 3 individual randomised trials	Serious (−1)	Some inconsistency (−0.5)	No serious indirectness	Some imprecision (−0.5)	None	Median standardised mean difference (IQR): −0.002 (−0.02 to 0.01)	⊕⊕⊖⊖ **low**	IMPORTANT
Patient outcomes dichotomous									
7 studies	6 cluster-randomised trials, 1 individually-randomised trial	Serious (−1)	Very serious (−2)	No serious indirectness	No serious imprecision	None	Median improvement (IQR): 3.24% (2.31% to 4.12%)	⊕⊖⊖⊖ **very low**	CRITICAL
Patient outcomes continuous									
4 studies	3 cluster-randomised trials, 1 individually-randomised trial	Some limitations	Very serious (-2)	No serious indirectness	Serious imprecision (−1)	None	Median standardised mean difference (IQR): 0.001 (−0.002 to 0.11)	⊕⊖⊖⊖ **very low**	CRITICAL
Adverse effects									

(Continued)

-	-	-	-	-	-	-	Not reported	-	IMPORTANT
Resource use									
2 studies	1 cluster-randomised trial, 1 individually-randomised trial	No serious	No serious inconsistency	Serious indirectness (−1)	Serious imprecision (−1)	None	Additional health service costs of GBP 65 and between EUR 41 and EUR 59	⊕⊕⊖⊖ **low**	IMPORTANT

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

Appendix 3. GRADE evidence profile: Reminders plus other QI intervention versus the same QI intervention

Patient or population: Healthcare professionals (physicians, nurses and dentists)

Settings: Ambulatory and hospital care in USA, Canada, UK, France, Switzerland, Taiwan, Australia, Germany, Hong Kong, India, Israel, Spain and Thailand

Intervention: Manual paper reminders added to other QI intervention (feedback, patient reminders, educational meetings, educational materials, test request forms)

Comparison: other QI intervention ((feedback, patient reminders, educational meetings, educational materials, test request forms)

Quality assessment							Effect	Certainty of the evidence (GRADE)	Importance
Number of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**			
Professional practice: dichotomous process adherence outcomes									
12 studies	7 cluster-randomised trials, 5 individually-randomised trials	Serious limitations (−1)	Some inconsistency (−0.5)	No serious indirectness	Some imprecision (−0.5)	None	Median improvement (IQR): 4.2% (IQR −1.1% to 5.5%)	⊕⊕⊖⊖ **low**	IMPORTANT
Professional practice: continuous outcomes									
2 studies	1 cluster-randomised trial, 1 individually-randomised trial	No serious limitations	No serious inconsistency	No serious indirectness	Serious imprecision (−1)	None	Median standardised mean difference (IQR): 0.28 (0.04 to 0.51)	⊕⊕⊕⊖ **moderate**	IMPORTANT
Patient outcomes: dichotomous									
2 studies	1 cluster-randomised trial, 1 individually-randomised trial	No serious limitations	Serious inconsistency (−1)	No serious indirectness	Serious imprecision (−1)	None	Median improvement (IQR): −3.2% (−8.5% to 2.2%)	⊕⊕⊖⊖ **low**	CRITICAL
Patient outcomes: continuous									
1 study	1 individually-randomised trial	No serious limitations	Not applicable	No serious indirectness	Serious imprecision	None	Median standardised mean difference (IQR): 0.001 (−0.003 to 0.003)	⊕⊕⊕⊖ **moderate**	CRITICAL
Adverse effects									

(Continued)

-	-	-	-	-	-	-	Not reported	-	IMPORTANT
Resource use									
2 studies	1 cluster-randomised trial, 1 individually-randomised trial	No serious	No serious inconsistency	Serious indirectness (−1)	Serious imprecision (−1)	None	Additional health service costs of GBP 30 and between EUR 16.5 and EUR 67	⊕⊕⊖⊖ **low**	IMPORTANT

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

Footnotes

Appendix 4. GRADE evidence profile: Reminders versus other QI intervention

Patient or population: Healthcare professionals (physicians, nurses and dentists)

Settings: Ambulatory and hospital care in USA, Canada, UK, France, Switzerland, Taiwan, Australia, Germany, Hong Kong, India, Israel, Spain and Thailand

Intervention: Manual paper reminders focused on improving compliance with preventive guidelines (e.g. cancer screening, vaccination) and disease management guidelines (e.g. annual follow-ups, test-ordering, medication adjustment, counseling)

Comparison: Other QI interventions (patient reminders, computerised reminders, educational meeting or multifaceted interventions)

Quality assessment							Effect	Certainty of the evidence (GRADE)	Importance
Number of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**			
Professional practice: dichotomous process adherence outcomes									
14 studies	7 cluster-randomised trials, 7 individually randomised trials	serious limitations (−1)	No serious inconsistency	No serious indirectness	Serious imprecision (−1)	None	Median improvement (IQR): −7.9% (−11.0% to 0.7%)	⊕⊕⊖⊖ **low**	IMPORTANT
Professional practice: continuous outcomes									
-	-	-	-	-	-	-	Not reported	-	IMPORTANT
Patient outcomes: dichotomous									
3 studies	3 cluster-randomised trials	Serious limitations (−1)	Serious inconsistency (−1)	No serious indirectness	Serious imprecision (−1)	None	Median improvement (IQR): −2.08% (−17.95% to 2.28%)	⊕⊖⊖⊖ **very low**	CRITICAL
Patient outcomes: continuous									
-	-	-	-	-	-	-	Not reported		CRITICAL
Adverse effects									
-	-	-	-	-	-	-	Not reported	-	IMPORTANT

(Continued)

Resource use

3 studies	1 cluster-randomised trial, 2 individually-randomised trials	No serious limitations	No serious inconsistency	Serious indirectness (−1)	Serious imprecision (−1)	None	Additional health service costs of GBP 30 and between EUR 17 and EUR 55. The additional costs of maintenance were 78 cents (USD 1991) per patient per year	⊕⊕⊖⊖ **low**	IMPORTANT

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

HISTORY

Protocol first published: Issue 3, 1998
Review first published: Issue 12, 2019

Date	Event	Description
15 July 2014	New search has been performed	The methods have been modified in accordance with updated EPOC guidance (EPOC 2013); the authorship has also changed.
4 June 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

TP led the writing of the protocol. JMG, NC, JL and CC provided comments and feedback. For the full review, TP, NC, JL and CC screened records for eligibility. JMG acted as arbiter when disagreements arose. TP, JL and CC abstracted data, undertook analysis and wrote up the review. JMG contributed to the interpretation of results.

DECLARATIONS OF INTEREST

TP is an editor with the Cochrane Effective Practice and Organisation of Care (EPOC) group.

JMG: none known.

NC: none known.

CC: none known.

JLM: none known.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- EBM_Network, FIS-G03/90 Program, Spain.
- Departamento de Medicina Familiar, P Universidad Católica de Chile, Chile.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Adjustment by baseline differences

Since important baseline differences between intervention and control groups are frequently found in cluster-randomised trials, in the protocol our primary analysis was based on estimates of effect adjusted for baseline differences. For dichotomous outcome data, we had planned to calculate the adjusted risk difference (RD) as the difference in compliance after the intervention minus the difference before the intervention. For continuous outcome data, we had planned to calculate adjusted change relative to the control group as the post-intervention difference in means minus the baseline difference in means divided by the baseline control group mean. We had therefore initially planned to include in the primary statistical analysis only those studies providing data on baseline compliance (performance). However, because only 23 out of 57 studies included some sort of outcome baseline data, we based the primary analysis on post-intervention differences between intervention and control groups, and we tested this in a sensitivity analysis (See Effects of interventions).

Assessment of publication bias

We had planned to use a funnel plot to visually explore the risk of publication bias, using the number of health professionals as a proxy for the precision of the estimate and the adjusted RD as the treatment effect. We did not do this because the number of health professionals/practices in most of the studies was not reported in a reliable way. We also used the unadjusted post-intervention RD as the primary treatment effect measure.

Data synthesis

We considered weighting the median effect size of each study by the number of health professionals involved in the trial, in order to ensure that very small trials did not contribute the same weight to the overall estimates as larger trials. Thus, we would have obtained a weighted median-adjusted RD or weighted median-adjusted change relative to baseline control as a summary effect size. However, because of the unreliable reporting of the number of health professionals/practices in the included studies we did not perform this analysis. For the primary analysis we had planned to exclude studies at high risk of bias, but we finally included all the studies in the primary analysis, and tested this assumption in a sensitivity analysis (See Effects of interventions).

Effect modifiers

We had planned to use reminder delivery mode (e.g. checklist versus coloured stickers), and baseline adherence (studies with high adherence rates in control groups versus those with low adherence) as effect modifiers to be used in subgroup analyses. However, we were not able to identify the delivery mode in a reliable way, or to clearly define a threshold for adherence rates, in view of the diversity of populations, clinical conditions and outcomes included in the studies.

Changes in outcomes terms

Because of a lack of consistency in the terms used to label the outcomes, we have combined dichotomous process adherence outcomes and continuous process outcomes under the label "professional practice outcomes", and dichotomous clinical outcomes and continuous clinical outcomes under the label "patient outcomes".

Electronic searches

The EPOC register was searched as part of CENTRAL.

Authorship

The following authors left the review author team: Alberto Romero, Flora Haaijer Ruskamp, Javiera Leniz, Jeremy Wyatt, Michael E Green, Nicholas Hicks, Paramjit Gill, Petra Denig, Pierre Durieux, Rachel Rowe, Richard Gordon. Carla Castañon and Javiera Leniz Martelli joined the review author team.

INDEX TERMS

Medical Subject Headings (MeSH)

*Evidence-Based Medicine; *Quality of Health Care; *Reminder Systems; Clinical Competence; Decision Support Systems, Clinical; Health Personnel [*psychology]; Outcome and Process Assessment, Health Care; Patient Compliance; Practice Patterns, Physicians' [standards]; Professional Practice [*standards]; Quality Improvement; Randomized Controlled Trials as Topic

MeSH check words

Humans