Local opinion leaders: effects on professional practice and health care outcomes (Review)

Flodgren G, Parmelli E, Doumit G, Gattellari M, O'Brien MA, Grimshaw J, Eccles MP

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[Intervention Review]

Local opinion leaders: effects on professional practice and health care outcomes

Gerd Flodgren[1], Elena Parmelli[2], Gaby Doumit[3], Melina Gattellari[4], Mary Ann O'Brien[5], Jeremy Grimshaw[6], Martin P Eccles[1]

[1]Institute of Health and Society, Newcastle University, Newcastle upon Tyne, UK. [2]Department of Oncology, Hematology and Respiratory Diseases, University of Modena and Reggio Emilia, Modena, Italy. [3]Department of Plastic Surgery, Cleveland Clinic, Cleveland, Ohio, USA. [4]School of Public Health and Community Medicine, The University of New South Wales, Sydney, Australia. [5]School of Rehabilitation Science, McMaster University, Hamilton, Canada. [6]Clinical Epidemiology Program, Ottawa Health Research Institute, Ottawa, Canada

Contact address: Martin P Eccles, Institute of Health and Society, Newcastle University, Badiley Clark Building, Richardson Road, Newcastle upon Tyne, NE2 4AX, UK. Martin.Eccles@newcastle.ac.uk.

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ABSTRACT

Background

Clinical practice is not always evidence-based and, therefore, may not optimise patient outcomes. Opinion leaders disseminating and implementing 'best evidence' is one method that holds promise as a strategy to bridge evidence-practice gaps.

Objectives

To assess the effectiveness of the use of local opinion leaders in improving professional practice and patient outcomes.

Search strategy

We searched Cochrane EPOC Group Trials Register, the Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, HMIC, Science Citation Index, Social Science Citation Index, ISI Conference Proceedings and World Cat Dissertations up to 5 May 2009. In addition, we searched reference lists of included articles.

Selection criteria

Studies eligible for inclusion were randomised controlled trials investigating the effectiveness of using opinion leaders to disseminate evidence-based practice and reporting objective measures of professional performance and/or health outcomes.

Data collection and analysis

Two review authors independently extracted data from each study and assessed its risk of bias. For each trial, we calculated the median risk difference (RD) for compliance with desired practice, adjusting for baseline where data were available. We reported the median adjusted RD for each of the main comparisons.

Main results

We included 18 studies involving more than 296 hospitals and 318 PCPs. Fifteen studies (18 comparisons) contributed to the calculations of the median adjusted RD for the main comparisons. The effects of interventions varied across the 63 outcomes from 15% decrease in compliance to 72% increase in compliance with desired practice. The median adjusted RD for the main comparisons were: i) Opinion leaders compared to no intervention, +0.09; ii) Opinion leaders alone compared to a single intervention, +0.14; iii) Opinion leaders with one or more additional intervention(s) compared to the one or more additional intervention(s), +0.10; iv) Opinion leaders as part of multiple interventions compared to no intervention, +0.10. Overall, across all 18 studies the median adjusted RD was +0.12 representing a 12% absolute increase in compliance in the intervention group.

Authors' conclusions

Opinion leaders alone or in combination with other interventions may successfully promote evidence-based practice, but effectiveness varies both within and between studies. These results are based on heterogeneous studies differing in terms of type of intervention, setting, and outcomes measured. In most of the studies the role of the opinion leader was not clearly described, and it is therefore not possible to say what the best way is to optimise the effectiveness of opinion leaders.

PLAIN LANGUAGE SUMMARY

Effectiveness of the use of local opinion leaders to promote evidence-based practice and improving patient outcomes

Clinical practice is not always evidence-based and, therefore, may not optimise patient outcomes. Opinion leaders disseminating and implementing 'best evidence' is one method that holds promise as a strategy to bridge evidence-practice gaps. Opinion leaders are people who are seen as likeable, trustworthy and influential. Because of their influence, it is thought that they may be able to help and persuade healthcare providers to use evidence when treating and managing patients.

We searched the scientific literature for randomised controlled trials that evaluated the effectiveness of the use of opinion leaders to disseminate and implement evidence-based medicine. We found 18 trials involving more than 296 hospitals and 318 primary care practices. Most of the included studies had some methodological shortcomings. The effects of interventions varied across the 63 outcomes from 15% decrease in compliance to 72% increase in compliance with desired practice. The median adjusted RD for the main comparisons were: i) Five trials that compared opinion leaders alone to no intervention, +0.09; ii) Two trials that compared opinion leaders alone to a single intervention, +0.14; iii) Four trials that compared opinion leaders with one or more additional intervention(s) to the one or more additional intervention(s), +0.10 and iv) Ten trials that compared opinion leaders as part of multiple interventions to no intervention, +0.10. Overall, the median adjusted RD across all studies was +0.12 representing 12% absolute increase in compliance in the intervention group.

In a majority of studies the sociometric method was used to identify opinion leaders, while two studies used the informant method, but due to the few studies using this method we could not conclude whether the method of identification had any impact on the effectiveness of interventions.

Three studies used multidisciplinary teams to promote evidence-based practice. The median adjusted RD for these trials was +0.18 representing a 18% absolute increase in compliance in the intervention group. However, two of the trials involved multiple interventions, and therefore the effectiveness of opinion leader teams could not be distinguished.

The results of this review show that opinion leaders may promote evidence-based practice. These results are based on heterogeneous studies using a variety of different interventions, performed in a variety of different settings, and aiming at changing a number of different outcomes. In most of the included studies the role of the opinion leader was not clearly described (educational methods used, degree or frequency of involvement of opinion leaders), and it is therefore not possible to say what is the best way to optimise the effectiveness of opinion leaders.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

Local opinion leaders alone or together with other intervention(s) compared with no intervention, the same other intervention or other interventions for improving compliance with desired practice

Patient or population: Healthcare professionals
Settings: Primary and secondary care
Intervention: Local opinion leaders with or without other intervention(s)
Comparison: No intervention or other intervention(s)

Outcomes	Adjusted absolute improvement (Risk difference)* Median (Interquartile range)	No of Studies	Quality of the evidence (GRADE)	Comments
Compliance with desired practice	Median 12% (6 to 14.5)	15 (17 comparisons)	++OO low	The effect of intervention on compliance with desired practice appears larger when a local opinion leader is included in the intervention.

*The post-intervention risk differences are adjusted for pre-intervention differences between the comparison groups, where pre-values were available.

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.

BACKGROUND

The translation of evidence into clinical practice is often slow, unpredictable and incomplete (Grol 1999). Studies have estimated that between 30 to 40% of patients do not receive treatment that accords with research evidence. Further, 20% of patients receive treatments that are proven to be detrimental (Grol 2001; Schuster 1998).There is significant interest in devising innovative methods to promote knowledge transfer of evidence into practice and ultimately improve patient health care (Grol 1999), of which one is using opinion leaders to disseminate evidence-based practice.

Description of the intervention

Social Learning Theory hypothesizes that individuals perceived as 'credible', 'likeable' and 'trustworthy' are likely to be persuasive agents of behavioural change. Such 'opinion leaders' may play a key role in assisting individuals to identify the evidence underpinning best practice and to facilitate behaviour change (Rogers 1976). Opinion leadership (more properly termed Informal Opinion Leadership) is the degree to which an individual is able to influence other individuals' attitudes or overt behaviour informally, in a desired way with relative frequency (Rogers 1995). This informal leadership is not a function of the individual's formal position or status in the system; it is earned and maintained by the individual's technical competence, social accessibility, and conformity to the system's norms. When compared to their peers, opin-

ion leaders tend to be more exposed to all forms of external communication, have somewhat higher social status, and to be more innovative. However, the most striking feature of opinion leaders is their unique and influential position in their system's communication structure; they are at the centre of interpersonal communication networks - interconnected individuals who are linked by patterned flows of information.Their use has been explored in different clinical disciplines such as surgery, obstetrics, neurology, general medicine, nursing and infection control (Gifford 1999; Ryan 2002; Rogers 1995).

How the intervention might work

Theoretically, opinion leaders use a range of interpersonal skills in order to achieve desired behavioural change. However, there is considerable variation in the types of educational initiatives opinion leaders use to implement best practice. Informal one to one teaching, community outreach education visits, small group teaching, academic detailing and preceptor-ships are examples of strategies used by opinion leaders for disseminating and implementing evidence-based practice (Ryan 2002; Rogers 1995). Whilst opinion leaders have also used formal strategies, such as delivering didactic lectures, education delivered informally is regarded as a key ingredient in marketing and innovation diffusion (Rogers 1976). However, it is unclear whether education delivered by opinion leaders in an informal way is more persuasive compared with formal strategies. Formalising the educational process may produce more diverse results than those in which the role of opinion leaders is allowed to be self-directed (Ryan 2002; Rogers 1995). It has been suggested that opinion leaders may be less influential when their role is formalised through mail-outs, workshops or teaching rounds (Ryan 2002). Research also suggest that the setting of an opinion leader intervention may be important for its success i.e. that opinion leader interventions in secondary care may be more effective than in primary care, due to more complex social networks in the former (Grimshaw 2006a). It has also been proposed that different opinion leaders may be needed for different (clinical) issues (Grimshaw 2006a).

Another issue is whether the process by which opinion leaders are selected affects the success or otherwise of their educational initiatives. Methods used to identify opinion leaders can be broadly classified into four categories: the observation method, the self-designating method, the informant method and the sociometric method (Rogers 1995) though this list of methods has recently been expanded (Valente 2007).The observation method employs an independent observer to identify opinion leaders amongst a group of professionals interacting with one another in a work context. The self-designating method requires that members of a professional network report their own perceptions of their role as an opinion leader. The informant method relies on asking individuals to identify those individuals who act as principle sources of influence. Via a standardised, self-reported questionnaire, the sociometric method asks members of a network to judge individuals according to the extent to which they are educational influential, knowledgeable and humanistic. Methods used to select opinion leaders have not been consistent across studies. Moreover, different methods result in different individuals being identified as opinion leaders (Grimshaw 2006a). The question of whether any one method is more likely to identify opinion leaders that are more effective in promoting knowledge transfer remains open to empirical assessment.

Why it is important to do this review

In order to improve patient outcomes and decrease inappropriate or potentially harmful patient treatments it is important to speed up and optimise the process of translating evidence-based research into practice. One way of doing this may be through the use of local opinion leaders. Several aspects of opinion leader interventions need further investigation, to be able to advise on their best use. We report an update of the previous Cochrane review to determine the effectiveness of the use of opinion leaders targeted at changing the behaviours of professionals and improving the healthcare outcomes of their patients. Our updated review uses revised methods of the Cochrane Effective Practice and Organisation of Care (EPOC) Group to systematically assess the risk of bias of included studies (EPOC 2009) and extends the earlier review by Doumit et al.(Doumit 2007) by aiming to investigate if the success of an intervention depends on if it was delivered by a single opinion leader or a multidisciplinary opinion leader team.

OBJECTIVES

To assess the effectiveness of local opinion leaders in improving the behaviour of healthcare professionals and patient outcomes.

The following questions were answered:

What is the effectiveness of local opinion leaders compared to no intervention?

What is the effectiveness of local opinion leaders compared to a single intervention?

What is the effectiveness of local opinion leaders plus a single or more intervention(s) compared to the same single or more intervention(s)?

What is the effectiveness of local opinion leaders as part of multiple interventions (opinion leaders + at least one more intervention) compared to no intervention?

Does the effectiveness of local opinion leaders vary according to the method used by researchers to identify opinion leaders?

Does the effectiveness of local opinion leaders vary according to the educational methods used by opinion leaders to encourage knowledge translation? We compared informal education (e.g. one to one teaching) versus formal education (e.g. community outreach education, small group teaching, academic detailing, and preceptorships).

Does the effectiveness of a local opinion leaders vary according to if a single opinion leader or a multidisciplinary opinion leader team deliver the intervention?

METHODS

Criteria for considering studies for this review

Types of studies

We included studies that described randomised controlled trials in the present review, as such studies represent the optimal design for evaluating knowledge transfer strategies (Eccles 2003).

Types of participants

Healthcare professionals in charge of patient care.

Types of interventions

We included any intervention evaluating the effectiveness of local opinion leaders in improving the behaviour of healthcare professionals and patient outcomes. Opinion leaders had to be identified by one of the following methods: sociometric method, informant method, self designating method, observation method. We excluded studies that did not utilise any of the above methods.

Types of outcome measures

We only included studies that objectively measured professional performance and/or patient outcomes in a healthcare setting. We excluded studies that measured knowledge or performance in a test situation only.

Search methods for identification of studies

For the first version of the review:
We searched MEDLINE to May 1998, the Research and Development Resource Base in Continuous Medical Education, and reference lists of related systematic reviews and articles.
For the second version of the review:
MEDLINE (1966-), Health Star (1975-) and SIGLE were searched using the OVID interface from the date of their inception up to February 2005. There were no language restrictions. In addition; The Cochrane Library and the Cochrane Effective Practce and Organisation of Care (EPOC) Trials Register were searched by EPOC's Trials Search Co-ordinator (Jessie McGowan) for additional studies. The contents lists of several key journals were also scanned (Medical Care; BMJ; JAMA, Lancet; Annals of Internal Medicine). The first author also read through reference lists of included trials to identify any additional studies.
For the present version of the review:
See: Effective Practice and Organisation of Care Group methods used in reviews.
We searched the Database of Abstracts of Reviews of Effectiveness (DARE) for related reviews.
We searched the following electronic databases for primary studies:

- The Cochrane Central Register of Controlled Trials (*The Cochrane Library* 2009, Issue 1)
- EPOC Specialised Register (to April 2009)
- MEDLINE, Ovid (1966 to May 2009)
- EMBASE, Ovid (1980 to May 2009)
- SIGLE (to February 2005)

At the time of the update search in May 2009, SIGLE was no longer being updated, so we searched the following databases for grey literature:

- Social Science Citation Index, Web of Knowledge (2005-May 2009)
- Science Citation Index, Web of Knowledge (2005-May 2009)
- Conference Proceedings, Web of Knowledge (2005-May 2009)
- Index to Theses (http://www.theses.com/) (2005-May 2009)
- WorldCat Dissertations, OCLC (2005-May 2009)
- HMIC, Ovid (2005-May 2009)

Search strategies for primary studies incorporated the methodological component of the EPOC search strategy combined with selected index terms and free text terms. We translated the MEDLINE search strategy (see Appendix 1) into the other databases using the appropriate controlled vocabulary as applicable. There were no language restrictions.The first review author also searched the reference lists of included trials to identify any additional studies.

Data collection and analysis

Selection of studies

We searched for randomised controlled trials (RCTs) that evaluated the effectiveness of the use of local opinion leaders in im-

proving the behaviour/practice of healthcare professionals and/or patients outcomes. Two review authors (GF and ME) screened the titles and abstracts found by the electronic search. All citations that appeared to evaluate opinion leaders in randomised controlled trials were retrieved. Where there was any doubt about a study's eligibility, the other review authors (from GD, MG and MO) assessed each study for eligibility independently and resolved discrepancies via discussion. Any study identified as potentially eligible after reviewing its title and abstract but subsequently excluded is documented in the Characteristics of excluded studies' table.

Data extraction and management

Two review authors (from GF, ME, EP, GD, MG and MO) extracted data into a modified data extraction form (Appendix 2). Data were reconciled and any disagreements were resolved by discussion. We contacted authors of included studies for additional information.

Assessment of risk of bias in included studies

We used The Cochrane Collaboration's tool for assessing risk of bias (Higgins 2008) on six standard criteria: adequate sequence generation, concealment of allocation, blinded or objective assessment of primary outcome(s), adequately addressed incomplete outcome data, free from selective reporting, free of other risk of bias. We used three additional criteria specified by EPOC (EPOC 2009): similar baseline characteristics, similar baseline outcome measures, adequate protection against contamination.

Studies achieved a 'low' risk of bias score if all risk of bias criteria were judged as 'adequate'. A score of moderate or high risk of bias was assigned to studies that scored inadequate on 'one to two' or 'more than two' criteria, respectively (Jamtvedt 2006). Studies that used cluster randomisation scored adequate on protection against contamination and on concealment of allocation (if the sequence generation was adequate). No studies were excluded because of poor methodological quality. We compared results between studies considered as having low risk of bias with studies judged to be at ' either moderate or high' risk of bias.

Measures of treatment effect

We calculated the adjusted risk differences (RD) for primary (dichotomous) outcomes, and expressed all outcomes as compliance with desired practice. An adjusted risk difference is the difference between intervention and control group means of compliance after (post) the intervention minus the difference between groups before (pre) the intervention which may be expressed as:

Adjusted risk difference (RD) = [risk of compliance (intervention - control) post-intervention] - [risk of compliance (intervention - control) pre-intervention]

A positive adjusted RD indicates that compliance improved more in the opinion leader intervention group that in the control group. Therefore a positive adjusted RD (e.g. of +0.12) indicates an absolute improvement in compliance with desired practice (of 12%) whilst a negative adjusted RD represents a decrease.

For continuous outcomes, we report means and standard deviations in tables and in the text, but this data was not included in the primary analyses. When necessary, results were approximated from graphical representations of results.

If a (objective) primary outcome measure was specified by the authors, we reported the adjusted risk differences for that outcome measure. If a primary outcome measure was not specified by the authors, we calculated adjusted risk differences for each (objective) outcome measure reported in a study and extracted the median value across outcomes. In the result tables, we tabulated the median adjusted risk difference for studies that reported an odd number of primary outcomes. For studies that reported an even number of outcomes we averaged the risk difference for the two middlemost to produce the median study adjusted RD.

Unit of analysis issues

Analyses of studies using cluster randomisation that do not account for the design effect risk inflating the type 1 error-rate and result in artificially narrow confidence intervals (Ukoumunne 1999). Therefore, we do not report P-values or confidence intervals for cluster randomised trials not accounting for the design effect.

Assessment of heterogeneity

Since no single estimate of effect could be found between trials and meta-analyses were not feasible, we made no statistical assessment of heterogeneity.

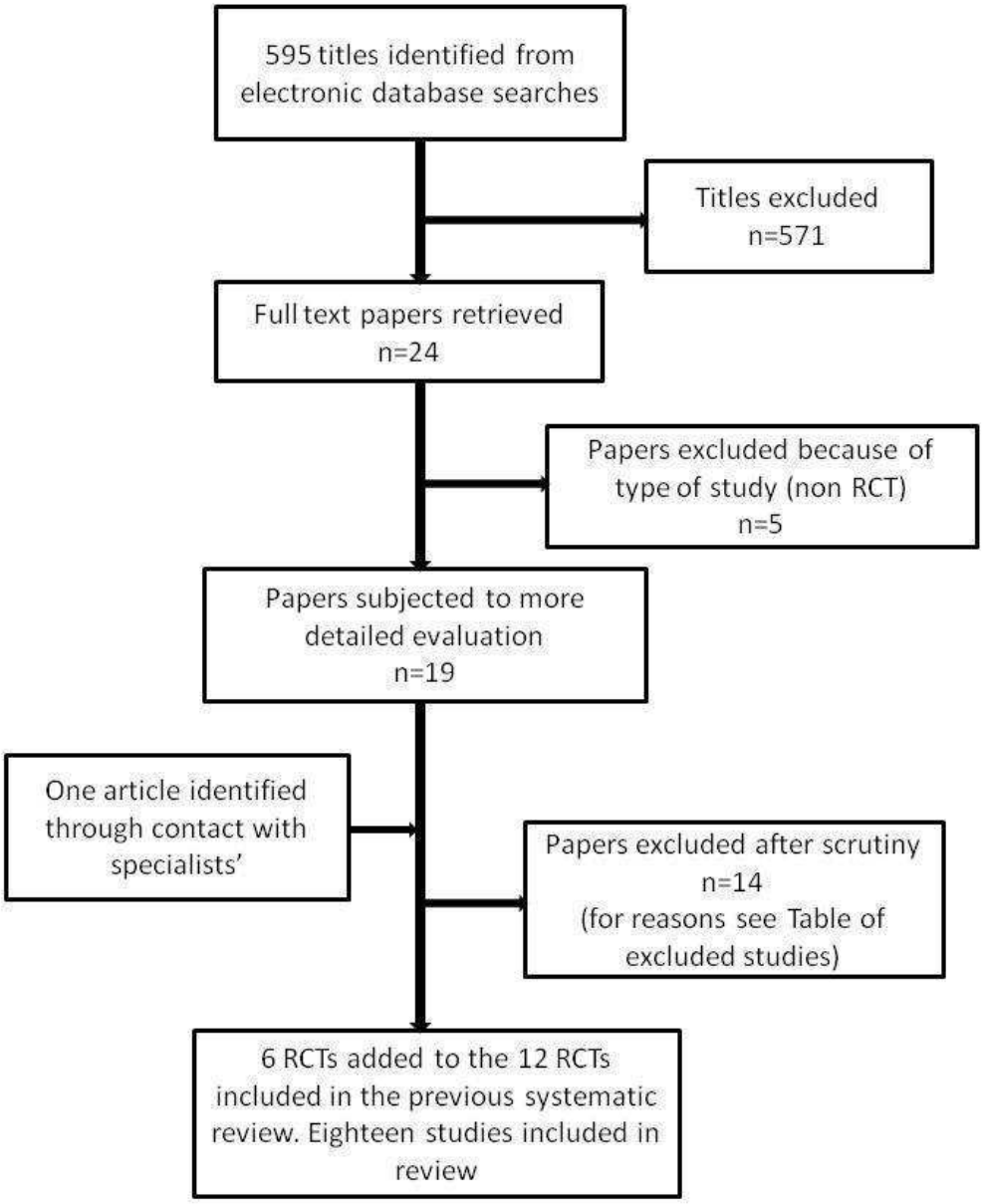
RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

Figure 1 shows the study flow chart (Moher 1999). A total of 595 non-duplicate citations were identified from electronic database searches. Reference lists and expert contacts yielded one additional citation. After screening all titles and abstracts of retrieved studies, 24 studies met the initial selection criteria and were obtained for full text review. Of these 24 studies,18 studies were excluded for different reasons, which are presented in the Characteristics of excluded studies table. The remaining six studies which met our inclusion criteria are reported in the 'Characteristics of included studies' table together with the 12 trials previously described and analysed by Doumit et al. (Doumit 2006). A total of 18 trials are thus included in the present review.

Figure 1.



Characteristics of setting and professionals

Ten trials were based in the United States, six in Canada, one in China (Hong Kong), and one in Argentina and Uruguay. Fourteen of the 18 trials evaluated interventions delivered in hospitals, one described an intervention delivered in primary care practices (McAlister et al 2008). In one study the intervention was delivered in both primary and secondary care (Elliott 1997). In two studies the setting was unclear (Majumdar 2007; Cabana 2006).

Physicians were targeted in 14 trials, nurses in two trials and two trials targeted physicians, nurses and midwives. In all trials the opinion leaders delivered educational initiatives to members of their own healthcare profession.

In 14 trials, opinion leaders were identified using the sociometric method in which healthcare professionals were asked to complete a self-administered questionnaire to identify educationally influential colleagues (Rogers 1995). All fourteen trials reported using a version of a questionnaire developed by Hiss and colleagues (Hiss 1978). Response rates identifying opinion leaders via the sociometric questionnaire were reported for seven studies and varied between 30% to 67%. Two trials identified opinion leaders using the informant method (Hong 1990;Leviton 1999). The two remaining trials (Cabana 2006; Sisk 2004) described two methods of identification, In Sisk 2004 the informant method and the sociometric method were used (Coleman 1966), and in Cabana 2006 the informant and the self designating method were used.

Targeted behaviours

Targeted behaviours involved the general management of a clinical problems as follows: rheumatoid arthritis care (Stross 1980), chronic obstructive pulmonary disease care (Stross 1983), osteoarthritis care (Stross 1985), urinary catheter care (Hong 1990), vaginal delivery post caesarean section (Lomas 1991), labour and delivery care (Hodnett 1996), cancer pain management (Elliott 1997), myocardial infarction treatment (Soumerai 1998), antenatal corticosteroids for foetal maturation (Leviton 1999), breast cancer surgical treatment (Guadagnoli 2000), unstable angina (Berner 2003), breast feeding (Sisk 2004), asthma care (Cabana 2006), appropriate medication for heart failure (HF) and ischaemic heart disease (IHD) (Majumdar 2007), management of third stage of labour (Althabe 2008), osteoporosis care (Majumdar 2008), lymph node assessment in stage II colon cancer (Wright 2008), statin management post-catheterization in CHD (McAlister 2009).

Characteristics of intervention

The use of a local opinion leader was the only intervention in five trials. In thirteen trials, local opinion leaders were supplemented by other interventions such as audit and feedback, chart reminders, faxed evidence summaries, educational materials, seminars and lectures.

Intervention duration ranged from one week (Cabana 2006) up to 18 months (Althabe 2008).

The frequency of opinion leader involvement was clearly described in two studies (Cabana 2006; Sisk 2004), and two more attempted a description (Hodnett 1996; Lomas 1991), but in most studies no description was provided.

In seven studies teams of opinion leaders were used (Althabe 2008; Cabana 2006; Elliott 1997; Hong 1990; Leviton 1999: Majumdar 2007; Majumdar 2008), of which five were multidisciplinary (Althabe 2008; Cabana 2006; Leviton 1999; Majumdar 2007; Majumdar 2008).

Stross and colleagues published three trials comparing the effect of local opinion leaders with a no intervention control group. In the first trial (Stross 1980), that aimed to improve management of patients with rheumatoid arthritis, the opinion leaders disseminated their knowledge via informal contact with colleagues as well as formal talks. In the second trial (Stross 1983), that aimed to improve the care of patients with chronic obstructive pulmonary disease (COPD), half of the contacts between opinion leaders and their colleagues were informal and half were formal. The opinion leaders had significant contact with community's primary care physicians (69%) during the study period. The third trial (Stross 1985), that aimed to improve care delivered to patients with osteoarthritis, did not describe the educational activities of the opinion leaders.

Hong et al (Hong 1990) assessed the effectiveness of two interventions involving opinion leaders, both aimed to increase correct urinary catheter practices. The first consisted of an opinion leader only intervention. Opinion leader activities were mainly centred on conducting tutorials on their own nursing ward. The second group received an in-service 30 minute lecture delivered by an infection control nurse, and in addition to the demonstration tutorials delivered by opinion leaders. The trial included a group of clinicians randomised to receiving the in-service lecture only.

Lomas et al (Lomas 1991) randomised clinicians to one of three groups. One group of clinicians received an opinion leader intervention together with written educational materials. Opinion leaders were involved in informal and formal educational sessions, sending out educational materials and hosting a community meeting with recognised experts in obstetric medicine, with the aim of increasing rates of trial of labour and vaginal birth in women with previous caesarean section. The second group of clinicians were randomised to receive audit and feedback about hospital rates regarding different modes of labour delivery. The third group of clinicians received standard dissemination.

Hodnett and colleagues (Hodnett 1996) used local opinion leaders to promote better care for women in labour and thereby to decrease the rate of epidural anaesthesia, but did not report their activities. The control group received standard dissemination.

In the trial by Elliott and colleagues (Elliott 1997), which aimed to improve cancer pain management, opinion leaders were involved in community based task forces, didactic programs and outreach

activities. Televised community programs were also held in two of the three communities studied. The control group was standard dissemination.

Soumerai et al (Soumerai 1998) randomised clinicians to receive an opinion leader intervention or audit and feedback of in-hospital drug usage. The authors reported that their opinion leader intervention was combined with the dissemination of educational materials. The opinion leaders worked with small groups of colleagues via informal and formal consultations to improve care for patients post acute myocardial infarction (i.e. correct medication). In addition, they worked to institute system changes through implementing protocols.

Leviton et al (Leviton 1999) used an opinion leader, chart reminder system and feedback to convey their recommendation of antenatal corticosteroid use for foetal maturation. The local opinion leaders in the trial were involved mainly in informal activities such as group discussions. The intervention group was compared with a standard dissemination control group.

Guadagnoli et al (Guadagnoli 2000) reported that the intervention group received a performance feedback report and were educated by an opinion leader. The opinion leader conducted mainly slide presentations at grand rounds and disseminated educational material to persuade surgeons to discuss treatment options with women with breast cancer prior to surgery. The control group received the performance feedback report.

Two intervention groups were reported in the trial by Berner et al (Berner 2003): (i) traditional health care quality improvement program (HCQIP) based mainly on hospital specific feedback data and (ii) local opinion leaders in addition to the HCQIP program. In this trial, the educational activities of the opinion leaders were not clearly reported. However, the authors stated that the opinion leaders received standardised educational materials (PowerPoint presentations, guidelines) and feedback data to help them educate their colleagues and to persuade them to adhere to unstable angina guidelines. A standard dissemination control group was included in this study.

In a study by Sisk et al (Sisk 2004), hospitals were randomised to receive standard dissemination or an opinion leader-led intervention to improve breast feeding rates. Opinion leaders engaged in formal educational activities and utilised feedback data on their hospital rates of breastfeeding.

Cabana et al (Cabana 2006) randomised providers to either receive an opinion leader-led intervention or standard care, and patients to receive care by an intervention doctor or standard care. The intervention group received two opinion leader-led interactive seminar sessions (2.5 hours each) that reviewed national asthma guidelines, communication skills, and key educational asthma messages to improve asthma care. Teams of three opinion leaders (one primary care paediatrician, one paediatric sub specialist and one behavioural scientist/ health educator) delivered the intervention.

In Majumdar et al (Majumdar 2007) physicians were randomised to either receive the opinion leader intervention or no intervention. An opinion leader team, consisting of five physicians specialising in HF and/or IHD, worked with the investigators to develop the evidence summaries. Opinion leaders signed a one page patient specific evidence summary that was faxed to the patient's physician together with the patient's most recent medication profile, to improve prescribing for patients with HF and /or IHD. In the comparison group the physician received only the patient's most recent medication profile.

In a study by Althabe et al (Althabe 2008) hospitals were randomised to receive standard care or an opinion leader led multifaceted behavioural intervention which included interactive workshops, training of manual skills, one-on-one academic detailing visits, reminders, and feedback, to implement guidelines for the use of episiotomy and management of the third stage of labour. Teams of three to six birth attendants (physicians, residents, or midwifes) delivered the intervention at each intervention hospital.

In another study by Majumdar et al (Majumdar 2008) patients were randomised to receive a multifaceted intervention including opinion leaders, aimed at improving the quality of osteoporosis care for older patients with wrist fractures, or to receive no active intervention. Teams, that consisted of five local opinion leaders, developed (and signed) the guidelines together with the investigators. The intervention consisted of three components: i) brief telephone based counselling delivered by a nurse to patients, ii) a patient specific reminder was sent to each physician of an intervention patient, and iii) evidence-based treatment guidelines, endorsed by opinion leaders sent by fax or mail to the patient's physician. Patients in the control group were sent only printed educational material. Physicians of control patients were routinely notified that their patients had been treated for a wrist fracture in the emergency department and were informed about follow-up plans and appointments.

In a study by Wright et al (Wright 2008) hospitals were randomised to receive either (i) a standardized lecture delivered by an expert opinion leader in colon cancer, academic detailing of a local opinion leader by the expert opinion leader, a toolkit and a follow-up reminder package to be used by the local opinion leader or (ii) only the standardised lecture. One local opinion leader was identified among hospital surgeons and pathologists at each intervention hospital. One regional expert opinion leader was identified, who visited all, but one, of the local opinion leaders at the intervention hospitals.

Two intervention groups were reported in the trial by McAlister et al (McAlister 2009) which aimed to improve the use of statins (new start or dose increase) six months post-cardiac catheterization. The interventions were: (i) an opinion leader signed statement (with a summary of evidence with explicit treatment advice about secondary prevention of coronary artery disease), plus a cardiac catheterisation result diagram faxed to the primary care physicians (PCP) of adults with coronary heart disease at the time of elective cardiac catheterization and (ii) an unsigned statement plus a cardiac catheterisation result diagram were faxed to the PCP.

PCPs in the control group were faxed only their patient's cardiac catheterisation result diagram.

Risk of bias in included studies

The risk of bias in included studies is described in the risk of bias tables within 'Characteristics of included studies' and summarised in Figure 2 and Figure 3.Ten studies were judged to have a high risk of bias (Berner 2003; Elliott 1997; Guadagnoli 2000; Hodnett 1996; Lomas 1991; Sisk 2004; Soumerai 1998; Stross 1980; Stross 1983; Stross 1985), six to have a moderate risk of bias (Cabana 2006; Hong 1990; Leviton 1999; Majumdar 2007; Majumdar 2008; Wright 2008, and two studies to have a low risk of bias (Althabe 2008; McAlister 2009).

Figure 2. Methodological quality graph: review authors' judgements about each methodological quality item presented as percentages across all included studies.

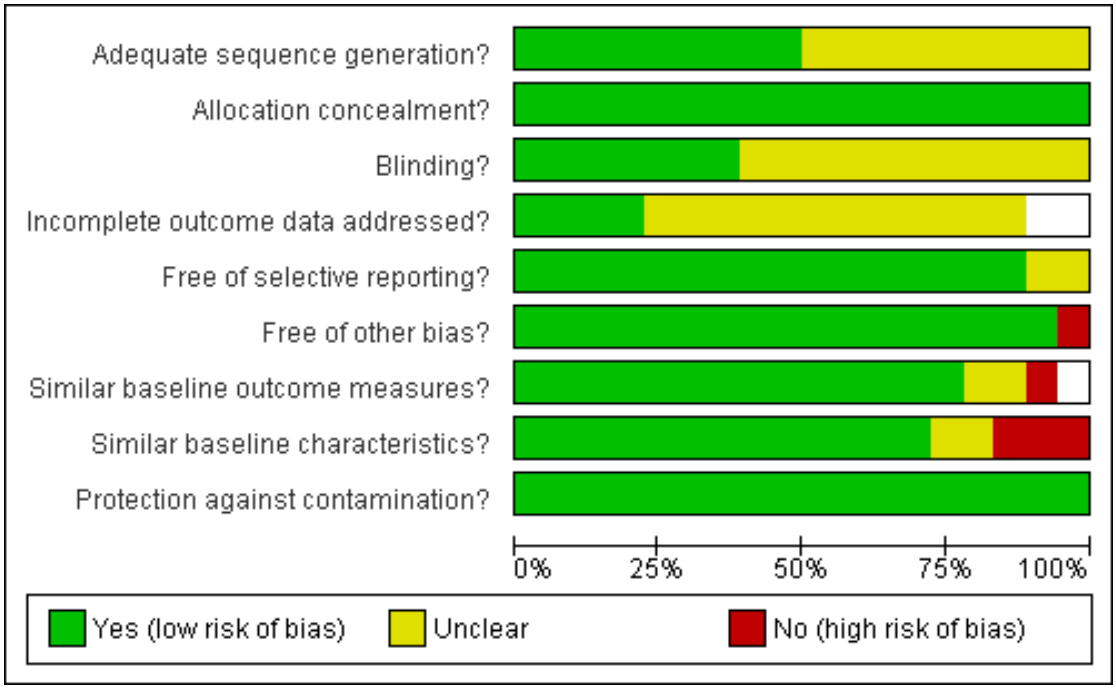
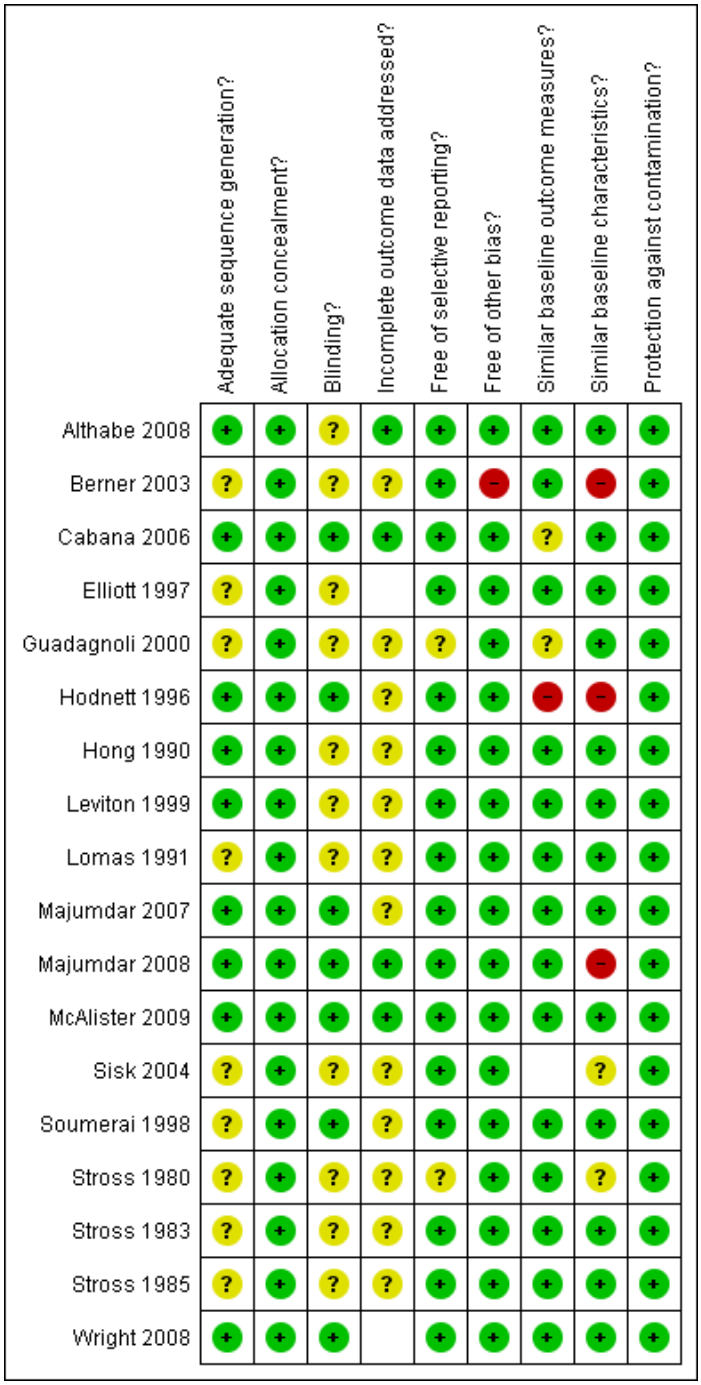


Figure 3. Methodological quality summary: review authors' judgements about each methodological quality item for each included study.



Adequate sequence generation

Seven studies reported adequate sequence generation in the randomisation process (Althabe 2008;Cabana 2006; Hodnett 1996; Hong 1990; Leviton 1999; Majumdar 2008; McAlister 2009). The sequence generation in the randomisation process was unclear in 11 studies (Berner 2003; Elliott 1997; Guadagnoli 2000; Lomas 1991; Majumdar 2007; Sisk 2004; Soumerai 1998; Stross 1980; Stross 1983; Stross 1985; Wright 2008).

Allocation concealment

The concealment of allocation was adequate in nine studies (Althabe 2008; Cabana 2006; Hodnett 1996; Hong 1990; Leviton 1999 ; Majumdar 2007; Majumdar 2008; McAlister 2009; Wright 2008). It was unclear in nine studies (Berner 2003; Elliott 1997; Guadagnoli 2000; Lomas 1991; Sisk 2004; Soumerai 1998; Stross 1980; Stross 1983; Stross 1985).

Blinding

Knowledge of the allocated intervention was adequately prevented during the study in seven of the included studies (Cabana 2006; Hodnett 1996; Majumdar 2007; Majumdar 2008; McAlister 2009; Soumerai 1998; Wright 2008).In a majority of studies it was not clear whether or not the assessment of outcomes were blinded (Althabe 2008; Berner 2003; Elliott 1997; Guadagnoli 2000; Hong 1990; Leviton 1999; Lomas 1991; Sisk 2004; Stross 1980; Stross 1983; Stross 1985).

Similar baseline outcome measures

Thirteen of the included studies had similar baseline outcome measures (Althabe 2008; Berner 2003; Elliott 1997; Hong 1990; Leviton 1999; Lomas 1991; Majumdar 2007; Majumdar 2008; McAlister 2009; Soumerai 1998; Stross 1980; Stross 1983;Stross 1985). In three studies it was not clear if the baseline outcomes were similar (Cabana 2006; Guadagnoli 2000; Sisk 2004). In Hodnett 1996 no baseline measurements were reported and in Wright 2008 they were not similar.

Similar baseline characteristics

The baseline characteristics were similar in 13 of the 18 included studies (Althabe 2008; Cabana 2006; Elliott 1997; Guadagnoli 2000; Hong 1990; Leviton 1999; Lomas 1991; Majumdar 2007; McAlister 2009; Soumerai 1998; Stross 1983; Stross 1985; Wright 2008). In Berner 2003 and in Majumdar 2008 the baseline characteristics were significantly different between intervention and control-group or tended to be so. No baseline characteristics were reported in Hodnett 1996, and in Sisk 2004 and Stross 1980 it was unclear if they were similar.

Incomplete outcome data

Incomplete outcome data was adequately addressed in four studies (Althabe 2008; Cabana 2006; Majumdar 2007; McAlister 2009), but for all other studies it was unclear whether the outcome data was complete or not.

Selective reporting

Most of the included studies were free from selective reporting. In only two of the included studies was the reporting of outcomes suggested to be selective (Guadagnoli 2000; Stross 1980).

Other risks of bias

In one included studies (Berner 2003) less than half of eligible hospitals agreed to participate creating a potential risk of selection bias as the hospitals that declined to participate were different from the others.

Protection against contamination

All included studies were protected against contamination.

Unit of analysis issues

In 13 studies the results were appropriately analysed at the cluster level or by considering the intra-cluster correlation when the analysis was conducted using data from individual patients. Five studies had unit of analysis errors (Hong 1990; Lomas 1991; Stross 1980; Stross 1983; Stross 1985).

Effects of interventions

See: **Summary of findings for the main comparison**

Comparisons

There were 63 usable objective outcomes from 15 studies.The median adjusted RD for compliance with desired practice across the 63 outcomes varied from 15% decrease in compliance to 72% absolute increase in compliance in the intervention group. Overall, the median adjusted RD for the 15 studies was +0.12. This represents an 12 % absolute increase in compliance in the intervention group.

See Summary of findings for the main comparison for the main comparison.

Opinion leaders compared to no intervention (Table 1)

Table 1. Opinion leaders alone compared to no intervention

Study	Med Eff Outcome	# participant (hosp)	Control - comp	Int - compliance	Median ARD (P value)
Hodnett 1996	Care provided to women in labour.Women who did not receive epidural anaesthesia. Desired change: increased rate of women who **did not** receive epidural anaesthesia	NOT CLEAR (20)	Pre: N/A Post: 49.6%	Pre: N/A Post 44.5%	-0.051
Stross 1985	Care of patients with osteoarthritis. i) Length of stay (days)-not included in analysis (ii) Patients who received ASA (iii) Patients who received NSAIDS (iv) Patients who **did not** receive corticosteroids (systemic) (v) Patients who received corticosteroids (intraarticular) (vi) Patients who received physical therapy (vii) Referrals Desired change:increase in all outcomes	48(6)	i) Pre: 8.4 Post: 8.6 ii) Pre:9/18 Post: 5/18 iii)Pre:14/18 Post:17/18 iv) Pre:15/18 Post:14/18 v) Pre:2/18 Post:2/18 vi) Pre: 15/18 Post:: 15/18 vii) Pre:7/18 Post:6/18	i) Pre: 8.8 Post: 8.4 ii) Pre:9/23 Post:6/30 iii) Pre:19/23 Post:26/30 iv) Pre:20/23 Post:29/30 v) Pre:4/23 Post:12/30 vi) Pre:20/23 Post:: 28/30 vii) Pre:9/23 Post:9/30	+0.045 (*) (P-value not reported due to unit of analysis error). i) not included in calculation ii) ARD +0.03 iii) ARD -0.12 iv) ARD +0.15 v) ARD +0.23 vi) ARD +0.06 vii) ARD -0.03
Stross 1983	Care of patients with COPD. i) Patients who received IV fluids- desired direction of effect not clear ii) Patients who received antibiotics iii) Patients who re-	510 (16)	i) Pre: 133/237 Post: 118/221 ii) Pre: 153/237 Post: 131/221 iii) Pre:83/237 Post 77/221 iv) Pre:118/237 Post:99/221 v) Pre: 51/237 Post:	i) Pre:120/227 Post: 189/289 ii) Pre: 160/227 Post: 200/289 iii) Pre: 87/227 Post: 225/289 iv) Pre:129/227 Post:156/289 v) Pre: 50/227 Post:	+0.13 (*) (P-value not reported due to unit of analysis error). i) not included in calculations ii) ARD -0.03 iii) ARD +0.35

Table 1. Opinion leaders alone compared to no intervention (*Continued*)

	ceived antibiotics seven days or more iv) Patients who received broncodilators- intravenous v) Patients who received broncodilators -loading dose vi) Patients who received broncodilators-aerosolised vii) Patients who **did not** receive broncodilators- oral viii) Patients who received broncodilators-single agent ix) Patients who **did not** receive broncodilators- combination x) Patients who **did not** receive intermittent positive pressure breathing xi) Oxygen- desired direction of effect not clear xii) Respiratory therapy referrals (xiii) Chest radiograph (xiv) Sputum gram stain (xv) Arterial blood gas measurement (xvi) Pulmonary function studies Desired effect: increase in all outcomes		86/221 vi) Pre:11/237 Post: 8/221 vii) Pre:94/237 Post:73/221 viii) Pre: 85/237 Post:89/221 ix) Pre:179/237 Post:162/221 x) Pre:84/237 Post: 82/221 xi) Pre:130/237 Post:148/221 xii) Pre:31/237 Post:33/221 xiii) Pre:223/237 Post:199/221 (xiv) Pre:92/237 Post:48/221 (xv) Pre:101/237 Post:107/221 (xvi) Pre:33/237 Post:35/221	171/289 vi) Pre:14/227 Post: 75/289 vii) Pre: 60/227 Post:80/289 viii) Pre: 104/227 Post:185/289 ix) Pre:164/227 Post:265/289 x) Pre:63/227 Post: 107/289 xi) Pre:139/227 Post:177/289 xii) Pre: 46/227 Post:88/289 xiii) Pre: 222/227 Post:265/289 (xiv) Pre:61/227 Post:81/289 (xv) Pre: 61/227 Post:134/289 (xvi) Pre:33/227 Post:44/289	iv) ARD +0.05 v) ARD +0.2 vi) ARD +0.21 vii) ARD +0.08 viii) ARD +0.26 ix) ARD +0.22 x) ARD +0.07 xi) not included in calculations xii) ARD +0.11 xiii) ARD -0.03 (xiv) ARD +0.19 (xv) ARD +0.15 (xvi) ARD -0.05
Stross 1980	Care of patients with rheumatoid arthritis. History-diagnosis i)Symptoms of inflammation ii)Extraarticular manifestations	62 (6)	i) Pre:1/34 Post:7/33 ii) Pre:3/34 Post:4/33 iii)Pre: 17/34 Post: 24/33 iv) Pre:3/34 Post:5/	i) Pre:0 Post:12/29 ii) Pre: 1/18 Post:2/29 iii) Pre: 8/18 Post: 23/29 iv) Pre:2/18 Post:5/29	+0.17 (*) (P-value not reported due to unit of analysis error). i) ARD +0.23 ii) ARD -0.02 iii)ARD +0.12

Table 1. Opinion leaders alone compared to no intervention (*Continued*)

	iii) Medications iv)Complications of therapy Physical examination v)Heat, redness, swelling vi)Range of motion vii) Deformity Diagnostic studies viii) Sedimentation rate ix) Latex fixation x) Joint roentgenogram Management xi) Patients who received aspirin xii) Patients who received nonsteroidal antiinflammatory agents (NSAIDS) xiii) Patients who received gold- desired direction of effect not clear xiv) Patients who **did not** receive corticosteroids xv) Patients who received physical therapy Desired change: increase in all outcomes		33 v) Pre:8/34 Post:15/33 vi) Pre:19/34 Post:9/33 vii) Pre:12/34 Post:18/33 viii) Pre:20/34 Post:12/33 ix) Pre:3/34 Post:6/33 x) Pre:5/34 Post:12/33 xi) Pre:19/34 Post:15/33 xii) Pre:8/34 Post:18/33 xiii) Pre:7/34 Post:6/33 xiv)Pre:21/34 Post:15/33 xv) Pre:21/34 Post:16/33	v) Pre:5/18 Post:22/29 vi) Pre:7/18 Post:14/29 vii) Pre:8/18 Post:19/29 viii) Pre:12/18 Post:22/29 ix) Pre:3/18 Post:14/29 x) Pre:3/18 Post:8/29 xi) Pre:13/18 Post:19/29 xii) Pre:4/18 Post:11/29 xiii) Pre:5/18 Post:3/29 xiv)Pre:10/18 Post:19/29 xv) Pre:12/18 Post:23/29	iv) ARD -0.002 v) ARD:+0.26 vi) ARD +0.38 vii) ARD +0.02 viii) ARD:+0.32 ix) ARD:+0.22 x) ARD:-0.04 xi) ARD:+0.04 xii) ARD -0.15 xiii) not included in calculations xiv) ARD +0.26 xv) ARD +0.27
Majumdar 2007	Care of patients with heart failure and ischaemic heart disease. Patients who received efficacious medication. (i) increased use of ACE inhibitors or ARBs in HF (ii) increased use of statins in IHD	128 (NOT CLEAR)	i) Pre:N/A Post:5/25 ii) Pre: N/A Post:10/59	i)Pre:N/A Post:11/29 ii) Pre: N/A Post:10/58	+0.09 (P=0.31) i) ARD +0.18 ii) ARD +0.003

Table 1. Opinion leaders alone compared to no intervention (*Continued*)

*: P value reported by author					

Five trials reported 40 outcomes [one continuous] for this comparison (Hodnett 1996; Majumdar 2007; Stross 1980; Stross 1983; Stross 1985). Four of the trials were considered to be of 'high' risk of bias (Hodnett 1996; Stross 1980; Stross 1983; Stross 1985), and one to be of 'moderate' risk of bias (Majumdar 2007). All five studies used the Hiss questionnaire to identify opinion leaders.

In the first trial by Stross and colleagues (Stross 1980) 14 outcomes concerning care of patients with rheumatoid arthritis were assessed. In the second (Stross 1983) 14 outcomes for care of patients with COPD were assessed, and in the third trial (Stross 1985) six outcomes were assessed concerning care of patients with osteoarthritis. Hodnett and colleagues (Hodnett 1996) assessed one primary outcome: rates of epidural anaesthesia. The fifth trial carried out by Majumdar et al (Majumdar 2007) assessed two primary outcomes: use of ACE inhibitors or ARBs in heart failure (HF) and statins in IHD.

Five comparisons yielded 37 usable dichotomous outcomes (for two of the outcomes the desired direction of effect was not stated). Across these outcomes the RDs varied from -0.15 to +0.38. The median adjusted RD for the five studies was +0.09 indicating a 9% absolute improvement in performance for the opinion leader intervention.

Opinion leaders alone compared to a single intervention (Table 2)

Table 2. Opinion leaders compared to a single intervention

Study	Med Eff Outcome	2nd gp intervention	# part (hosp)	Control - comp	Int - compliance	Median ARD (P Value)
Lomas 1991	Eligible women with previous caesarean section who underwent (i) a trial of labour and (ii) vaginal birth Desired change: increased trIal of labour rate and vaginal birth rate	Audit and feedback	1972 (16)	i) Pre: N/A Post: 21.4% ii) Pre:N/A Post:11.8%	i) Pre: N/A Post: 38.2% ii) Pre: N/A Post: 25.3%	+0.15 (P-value not reported due to unit of analysis error) i) ARD +0.17 ii) ARD +0.14
Hong 1990	Correct practices of nurses of patients with a urinary catheter. Desired change: increased correct practices	Standardised lecture	204 (1)	Pre: N/A Post: 39/75	Pre: N/A Post: 83/129	+0.12 (P-value not reported due to unit of analysis error).

Two trials reported three outcomes for this comparison. The comparison single interventions were standardised lectures (Hong 1990) and audit and feedback (Lomas 1991). The trial carried out by Hong et al (Hong 1990) was judged to be at 'moderate' risk of bias and identified opinion leaders by the informant method. The study by Lomas et al (Lomas 1991) was judged to be of 'high' risk of bias and identified opinion leaders by the sociometric method.

Hong 1990 assessed one primary outcome: correct urinary catheter practices and Lomas 1991 two primary outcomes: rates of trial of labour and vaginal birth.
Across the three outcomes the RD varied from +0.12 to +0.17. The median RD for the two studies was +0.14 indicating a 14% absolute increase in compliance with desired practice for the opinion leader intervention.

Opinion leaders with one or more additional intervention compared to the one or more additional intervention(s) only (Table 3)

Table 3. Opinion leaders plus one or more intervention(s) compared to the same on or more intervention(s) only

Study	Med Eff Outcome	2nd gp intervention	# Participants (hosp/other)	Control - compliance	Intervention-compliance	Median ARD (P value)
Berner 2003	Eligible patients with unstable angina who received: i) ECG in 20 min ii) antiplatelet medication within 24 hours iii) Antiplatelet medication at discharge iv) Heparin v) Beta Blockers during hospitalisation Desired change-increase in all outcomes	Health Care Quality Improvement Program, HCQIP (Audit and feedback)	2210 (21)	i) Pre:N/A; Post: 6.6% ii) Pre: N/A; Post:-3.9% iii) Pre: N/A; Post:13.3% iv) Pre: N/A; Post:9.1% v) Pre: N/A; Post: -3.1%	i) Pre: N/A; Post: 7.2% ii) Pre:N/A; Post: 20.2% iii) Pre:N/A; Post:5.2% iv) Pre: N/A; Post:31% v) Pre: N/A; Post: 4.0%	+0.071 i) ARD +0.006 ii) ARD +0.24 iii) ARD -0.08 iv) ARD +0.22 v) ARD +0.071 (P = 0.6 *)
Guadagnoli 2000	Women who reported that their surgeon discussed treatment options for early breast cancer prior to surgery. Desired change-increased number of women who reported that their surgeon discussed treatment options.	Performance feedback	1264 (28)	Pre:69%Post: 87%	Pre: 67% Post: 83%	-0.02 (P>0.05 *NS)

Table 3. Opinion leaders plus one or more intervention(s) compared to the same on or more intervention(s) only (*Continued*)

Soumerai 1998	Improving care for patients post acute myocardial infarction. Eligible patients receiving i) Aspirin ii) B-blockers and patients who **did not** receive iii) profylactic Lidocaine Desired change: increase in all outcomes	Audit and feedback	1807 (30)	i) Pre:80% Post: 77% ii) Pre: 60% Post: 78%. iii) Pre: 75% Post: 88%	i) Pre: 77% Post: 90% ii) Pre: 49% Post: 80% iii) Pre: 81% Post: 90%	+0.13 i) ARD +0.16 (P=0.04) ii) ARD +0.13 (P = 0.02 *). iii) ARD -0.04 (P= 0.29*)
Hong 1990	Correct practices of nurses of patients with a urinary catheter.	Standardised lecture	126 (1)	Pre: N/A Post: 39/75	Pre: N/A Post: 39/51	+0.25 (P-value not reported due to unit of analysis error).
*: P value reported by author † Incorrect level of analysis. Intracluster factor not accounted						

Four trials reported 10 outcomes for this comparison. The additional interventions included standardised lectures (Hong 1990), and audit & feedback (Berner 2003; Guadagnoli 2000; Soumerai 1998). All comparisons had dichotomous outcomes. One study were judged to be of 'moderate' risks of bias (Hong 1990) and three were considered 'high' risk of bias studies (Berner 2003; Guadagnoli 2000; Soumerai 1998).

The first trial carried out by Berner 2003 assessed five primary outcomes concerned with compliance with guidelines for unstable angina. Soumerai and colleagues (Soumerai 1998) assessed three outcomes: patients receiving aspirin, beta-blockers, and patients not receiving lidocaine. In the trial by Guadagnoli (Guadagnoli 2000) one outcome was assessed: women who reported that their surgeon did not discuss treatment options for early breast cancer prior to surgery. Also Hong et al (Hong 1990) contributed one primary outcome to the analysis.

Overall, the increase in compliance with desired practice across all reported outcomes ranged from an RD of -0.08 to an RD of +0.25. The median adjusted RD for the four trials was +0.10 indicating a 10% absolute improvement in performance for the opinion leader intervention.

Opinion leaders as part of multiple interventions (opinion leaders + at least one more intervention) compared to no intervention (Table 4)

Table 4. Opinion leaders as part of multiple interventions (opinion leaders+at least one more intervention) compared to no intervention

Study	Outcome	Add Intervention	# participants (hospitals)	Control - compliance	Intervention-compliance	Median ARD (P Value)
Sisk 2004	Mothers' intention to breast feed Desired change: increased intention to breast feed	Audit & feedback + printed educational material	NOT CLEAR (18)	Pre: N/A Post: N/A	Pre: N/A Post:N/A	N/A
Berner 2003	Eligible patients with unstable angina who received: i) ECG in 20 min ii) Antiplatelet medication within 24 hours iii) Antiplatelet medication at discharge iv) Heparin v) Beta Blockers during hospitalisation Desired change-increase in all outcomes	Health Care Quality Improvement Program, HCQIP (Audit and feedback)	2210 (21)	i) Pre:44% Post 49% ii) Pre:74% Post: 75% iii) Pre:68% Post:72% iv) Pre:46% Post:56% v) Pre:61% Post: 65%	i) Pre:67% Post 68% ii) Pre:63% Post: 79% iii) Pre:69% Post:73% iv) Pre:36% Post:46% v) Pre: 56% Post: 57%	ARD 0 i) ARD -0.04 ii) ARD +0.15 iii) ARD 0 iv) ARD 0 v) ARD -0.03 (extrapolated from graph)
Leviton 1999	Patients receiving antenatal corticosteroids Desired change: increased use of antenatal corticosteroids	Audit & feedback + chart reminder + grand round.	3239 (27)	Pre: 33.0% Post: 57.6%	Pre: 32.9% Post: 68.3%	+0.11 (P <0.01 *)
Lomas 1991	Eligible women with previous history of caesarean section who (i) underwent a trial of labour and (ii) vaginal birth.	Distribution of educational material	1972 (16)	i)Pre: N/A Post: 28.3% ii)Pre: N/A Post:14.5%	i) Pre:N/A Post: 38.2% ii) Pre: N/A Post:25.3%	+0.1 i) ARD +0.10 ii) ARD +0.11 (P-value not reported due to unit of analysis error).

Table 4. Opinion leaders as part of multiple interventions (opinion leaders+at least one more intervention) compared to no intervention (*Continued*)

	Desired change: increased trIal of labour rate and vaginal birth rate					
Elliott 1997	Cancer pain management - mean pain score (pain intensity) Desired change: decreased pain score	Community outreach meetings + local TV (2/3 communities)	NOT CLEAR (6)	Pre: 11.1 (0.940) Post: 11.2 (0.961)	Pre:9.94 (0.954) Post:10.9 (0.934)	N/A
Althabe 2008	Eligible patients receiving improved care during third stage of labour: i) Patients who received profylactic oxytocin and ii) Patients who **did not** receive an episiotomy Desired change: increase for all outcomes	Interactive workshops+ training of manual skills+ one to one academic detailing+ reminders and feedback	490 (19)	i)Pre:2.6% Post:12.3% ii)Pre:56.5% Post:55.5%	i) Pre:2.1% Post:83.6% ii) Pre:58.9% Post:70.1%	+0.42 i)ARD +0.72 (P=0.01*) ii)ARD +0.12 (P<0.001*)
Cabana 2006	Asthma management (i) Mean days affected by asthma symptoms per year (ii) Mean urgent asthma office visits per year (iii) Mean ED asthma visits per year (iv) Mean hospitalisations for asthma per year Desired change: decrease in days affected by asthma symptoms, visits and	2 interactive seminar sessions (2.5 hours each) that reviewed national asthma guidelines, communication skills, and key educational messages	101 (66 private practices and 6 hospitals or government clinics)	i)Pre:28.5 Post: 20.0 ii)Pre:1.67 Post:0.77 iii)Pre:0.65 Post:0.35 iv)Pre:0.13 Post:0.07	i)Pre:30.2 Post: 14.6 ii)Pre:1.83 Post:0.75 iii)Pre:0.86 Post:0.31 iv)Pre:0.12 Post:0.06	N/A

Table 4. Opinion leaders as part of multiple interventions (opinion leaders+at least one more intervention) compared to no intervention (*Continued*)

	hospitalisations.					
Majumdar 2008	Osteoporosis care.Eligible patients with osteoporosis and previous fracture who received biophosphonate treatment within six months after fracture. Desired change: increase in biophosphonate treatment	Telephone education+ endorsed guidelines+ reminders	266(4- 2 emergency clinics+2 fracture clinics)	Pre:N/A Post:10/135	Pre:N/A Post:30/137	+0.14 (P=0.008)
McAlister 2009	Patients with coronary heart disease whose statin management 6-months post- catheterisation was improved Desired change: increase in efficacious statin treatment	OL endorsed faxed evidence summaries	NOT CLEAR (252 primary care practices)	Pre:N/A Post:79/157	Pre:N/A Post:99/165	+0.10 (NS)
Wright 2008	Cancer care in stage II colon cancer- i) mean number of lymph nodes assessed and ii) proportion of cases staged with a minimum of 12 lymph nodes Desired change: increased proportion of patients with more than 12 lymph- nodes assessed	Academic detailing, toolkit and reminder package Standardised lecture was included for both intervention and control groups.	NOT CLEAR (34)	i) Pre:12.4 (9.5) Post:14.9 (9.7) ii) Pre:47.6% Post:63.7%	i) Pre:14.3 (8.1) Post:18.1(10.2) ii) Pre:61.7% Post:75.6%	-0.02 i) not included in calculations ii) -0.02 (P= 0.99)

Table 4. Opinion leaders as part of multiple interventions (opinion leaders+at least one more intervention) compared to no intervention (*Continued*)

*: P value reported by author						

Seven trials contributed 13 dichotomous outcomes for this comparison. Two trials included solely continuous outcomes (Elliott 1997; Cabana 2006), and one trial did not provide any data (Sisk 2004).The interventions that opinion leaders were combined with were: audit and feedback (Berner 2003); chart reminders, performance feedback and grand rounds (Leviton 1999), formal meetings, audit and feedback and distribution of educational materials (Lomas 1991; Sisk 2004); community outreach meetings, local TV program (2/3 cities), community task forces and didactic educational programs (Elliott 1997), interactive workshops, training of manual skills, one to one academic detailing visits, reminders and feedback (Althabe 2008), interactive seminar sessions (Cabana 2006),guidelines, telephone education with patients and reminders (Majumdar 2008), academic detailing+ toolkit and follow up-reminders (Wright 2008), faxed evidence summaries (McAlister 2009). Four studies were judged to be of 'high' risk of bias (Berner 2003; Elliott 1997; Lomas 1991; Sisk 2004) four of 'moderate' risk of bias (Cabana 2006; Leviton 1999; Majumdar 2008; Wright 2008) and in two studies the risk of bias was 'low' (Althabe 2008; McAlister 2009).

Four of the trials assessed only one primary outcome: antenatal corticosteroids for foetal maturation (Leviton 1999); biophosphonate treatment for patients with osteoporosis (Majumdar 2008); lymph node assessment in stage II colon cancer (Wright 2008); statin management for patients with CHD (McAlister 2009). Two trials assessed two primary outcomes each: use of prophylactic oxytocin and use of episiotomy during third stage of labour (Althabe 2008) and trial of labour and vaginal birth (Lomas 1991). Berner 2003 contributed five primary outcomes to the analysis.

Across 13 outcomes the RDs ranged from -0.04 to +0.72. The median adjusted RD across the seven trials was +0.10 indicating a 10% absolute improvement in performance for the opinion leader intervention.

Effects of opinion leaders identified by different methods

In the present review, fourteen studies used the sociometric method (Althabe 2008; Berner 2003; Elliott 1997; Guadagnoli 2000; Hodnett 1996; Lomas 1991; Majumdar 2007; Majumdar 2008; McAlister 2009; Soumerai 1998; Stross 1980; Stross 1983; Stross 1985; Wright 2008), while two studies used the informant method to identify opinion leaders (Hong 1990; Leviton 1999). Two studies used a combination of two methods (Sisk 2004; Cabana 2006).

We report the effect of opinion leaders identified by different methods classified according to each of the four a-priori group comparisons.

Opinion leaders only compared with no intervention

All studies included used the sociometric method; the median adjusted RD was +0.09.

Opinion leaders compared to a single intervention

The study by Lomas 1991 used the sociometric method; the RD was +0.15. Hong 1990 used the informant method; the RD was +0.12.

Opinion leaders plus a single or more intervention(s) compared to the same single or more intervention(s)

Three studies (Berner 2003; Guadagnoli 2000; Soumerai 1998) used the sociometric method to identify opinion leaders, while Hong et al (Hong 1990) used the informant method. The effects of the three studies varied from +0.07 to +0.13 (median adjusted RD +0.07). In contrast, the trial by Hong et al yielding only one comparison, the adjusted RD for compliance was +0.25.

Opinion leaders as part of multiple interventions (opinion leaders + at least one more intervention) compared to no intervention

Six studies (Althabe 2008; Berner 2003; Elliott 1997; Majumdar 2008; McAlister 2009; Wright 2008) used the sociometric method to identify opinion leaders, while Leviton and colleagues used the informant method (median adjusted RD +0.11). The median adjusted RD was +0.1 for the six studies using the sociometric method. The two remaining trials (Cabana 2006; Sisk 2004) described two methods: Sisk 2004 used the informant method and the sociometric method (Coleman 1966). It was not possible to calculate a median RD for the Sisk trial (Sisk 2004) or for Cabana 2006 who used the informant and the self-designating method.

Comparison across all studies irrespective of comparison

Overall the median adjusted RD for studies using the sociometric method of identification was +0.10 and for the informant method was +0.15, indicating a 10% and 15% increase in desired practice respectively.

Effects of using a multidisciplinary opinion leader team or single opinion leaders to deliver the intervention

Across outcomes for studies involving multidisciplinary opinion leader teams the RDs ranged from +0.09 to +0.42, and the median adjusted RD for these trials was +0.13. Across outcomes for studies not involving multidisciplinary opinion leader teams the RDs ranged from -0.05 to + 0.18, with a median adjusted RD of +0.10.

Effects of method of delivering education and effects of fre-

quency of opinion leader involvement

We had aimed to identify whether opinion leaders were more or less effective depending on whether education was delivered formally or informally. Due to limited amount of detail, most studies could not be reliably categorised according to the educational method opinion leaders used. Too little detail was also provided on the frequency of involvement of opinion leaders, to make comparisons feasible.

Comparison between studies considered as having low risk of bias with studies judged to be at ' either moderate or high' risk of bias.

The median adjusted RD for the two studies judged to be of low risk of bias (Althabe 2008; McAlister 2009) was +0.26. For the six studies judged to be of moderate risk of bias (Cabana 2006; Hong 1990; Leviton 1999; Majumdar 2007; Majumdar 2008; Wright 2008) the adjusted RDs varied from -0.02 to +0.18, and their overall median adjusted RD was +0.1.For the ten studies (Berner 2003; Elliott 1997; Guadagnoli 2000; Hodnett 1996; Lomas 1991; Sisk 2004; Soumerai 1998; Stross 1980; Stross 1983; Stross 1985) deemed to be of high risk of bias the RDs ranged from -0.05 to +0.17, and the median adjusted RD for these studies was + 0.1.

DISCUSSION

Summary of main results

Opinion leaders alone or in combination with other interventions may successfully promote evidence-based practice, but the effectiveness varies both within and between studies. Eighteen randomised controlled trials (providing 18 comparisons) that evaluated the effectiveness of opinion leaders to disseminate and implement evidence-based medicine were included in this review. Most of the studies had methodological shortcomings indicating a risk of bias. Overall, the median absolute improvement in performance associated with the opinion leader intervention across all usable trials taken together was 12%. All four pre-specified comparisons produced positive effects. Five trials that compared opinion leaders alone to a no intervention control group reported a median adjusted RD +0.09; two trials that compared the use of opinion leaders to a single intervention produced a median adjusted RD +0.14; four trials of opinion leaders combined with one or more intervention(s) compared to the same one or more intervention(s)produced a median adjusted RD +0.10; and 10 trials that included comparisons of opinion leaders as part of multifaceted interventions compared with no intervention produced a median adjusted RD +0.10.

In the last of our comparisons (opinion leaders combined with one or more intervention(s) compared, to the same one or more intervention(s)) the interventions varied greatly in content and (probably) also to the degree that opinion leadership contributed to the intervention. Though we did not pre-specify it the best estimate of the effect of opinion leaders alone comes from the studies in comparison 1 (opinion leaders alone compared to a no intervention control) and comparison 3 (opinion leaders combined with one or more intervention(s) compared to the same one or more intervention(s)). Across these nine trials the median adjusted RD was +0.10 indicating a 10% improvement in desired practice.

The effect across 14 trials employing the sociometric method varied from -0.15 to +0.72, with a median adjusted RD of +0.1. The median RD of the two trials that used the informant method was +0.15. Our simple comparison suggest that both methods are capable of achieving the same order of effect size but it was not possible to assess the relative superiority of one or other method given the small number of trials available.

Overall completeness and applicability of evidence

We sought to identify variables associated with the effectiveness of opinion leaders. We hypothesised that informal methods of delivering education would be more conducive to successful dissemination of new innovations. However, we found that most studies lacked the necessary information to reliably categorise them according to the educational method used by the local opinion leaders. Hence, there is insufficient evidence to confirm that formalisation of the opinion leaders role can diminish the influence of opinion leaders as suggested by Ryan 2002. We were also interested in investigating whether or not the frequency of involvement of opinion leaders would affect the effectiveness of intervention, but again, too little detail was reported in the papers to make comparisons feasible.

Another factor that may affect the effectiveness of intervention is the 'intensity' of involvement of opinion leaders. Overall, it was very difficult to quantify this. In three trials (Majumdar 2007; Majumdar 2008; McAlister 2009) the intensity of the opinion leader intervention was very low, in that opinion leaders only signed patient specific evidence summaries that were faxed to the patients physician. No significant effect of the intervention was reported in Majumdar 2007 and McAlister 2009, while in Majumdar 2008 a significant difference between intervention and control groups was reported. However, this was a multifaceted intervention also involving patient education and reminders, which may explain the significant effect of intervention found in this study. This trial is a good example of a more general problem with the studies included in comparison 4 (opinion leaders combined with one or more intervention(s) compared, to the same one or more intervention(s)) - that it is impossible to separate out the effects of the opinion leader component of an intervention from the rest of a multifaceted intervention. If the aim is to better understand the effectiveness of opinion leaders then one solution to this problem, as been suggested by Doumit et al (Doumit 2006), is to

use 'gold standard' experiments i.e. trials that compare interventions that are identical across experimental arms except for the use of opinion leader. However, this would necessitate the inclusion of an additional trial arm with the added cost and complexity that would entail.

The sociometric method was the most common method for identifying opinion leaders. Most commonly, this method involved the distribution of a self-reported questionnaire to members of a professional group. The questionnaire asks respondents to rate individuals according to the extent to which they are educational influential, knowledgeable and humanistic. However, the sociometric method may be prone to incomplete identification of opinion leaders within a community if only a select number of those asked to identify opinion leaders respond. For example, in the 14 trials which used the sociometric method, responses to surveys ranged from between 30% to 67%. It is therefore unclear whether the opinion leaders identified in studies with such response rates had the potential to influence non responding study participants.

In the studies included in this review no patient outcomes were reported. Although changing health care professional behaviour to increase the use of effective clinical practices should translate into improvements in patient outcomes we did not find any studies that reported these. However, even if they did so, because of lower event rates it would be unlikely that studies would be able to be powered to detect important differences.

Quality of the evidence

This review included 18 cluster randomised controlled trials. Sixteen of the included studies were judged to have a 'high' or 'moderate' risk of bias, and two studies to have a 'low' risk of bias.

In seven (or five) studies the results were not appropriately analysed at the cluster level or by considering the intra-cluster correlation when the analysis was conducted using data from individual patients.

The results of this systematic review have other important limitations. The activities of the opinion leaders were not clearly described in most trials and few trials specified the frequency of the activities that were conducted. While we demonstrated an overall positive effect of opinion leaders, the results varied across trials and also within trials where multiple outcomes were assessed. This heterogeneity may be due to factors such as the differences in outcomes and how they were measured, differing types of clinicians and differing clinical condition studied.

Further issues relating to identifying and using opinion leaders relate to the stability of the identification of opinion leaders and the clinical spread of their influence. The issue of the identification of opinion leaders has been complicated by the discovery that individual local opinion leaders identified by sociometric method pioneered by Hiss do not seem to be reliably identified across time (Doumit 2006). Only 8% and 18% of local opinion leaders identified by pathologists and general surgeons respectively were re-identified after a two years period. Furthermore, it has also been shown that local opinion leaders identified by employing Hiss's instrument tended to be disease specific (Grimshaw 2006a). Overall, these findings indicate that it is often difficult to reliably define and identify opinion leaders.

It has been suggested that different 'opinion leaders' will be required to effect change on clinical outcomes. In four of the newly included studies multidisciplinary opinion leader teams were used to promote evidence practice (Althabe 2008; Cabana 2006; Majumdar 2007; Majumdar 2008). The median adjusted RD for the three trials reporting dichotomous outcomes was +0.18 representing 18% absolute increase in compliance with desired practice for the opinion leader intervention. But since two of the trials involved multiple interventions the effectiveness of the opinion leader teams are difficult to distinguish.

Potential biases in the review process

In this, as well as in the previous review, only interventions that had used one of four named methods for identification of opinion leaders were included. However, if other methods of identification based on 'position' or by 'judges ratings' (methods that Valente 2007 report are commonly used) were included then a larger number of trials may have been found. All references found by the electronic search were sifted and data-extracted by two review authors independently. Only RCTs were included in the review as they generally provide the strongest level of evidence of causation available (Higgins 2008). Hence we have attempted to reduce bias in the review process. Although a comprehensive search was performed (including a search of grey literature), the possibility of having missed relevant studies cannot be excluded.

In addition, there is the possible risk of publication bias, which constitutes another threat to the conclusions of this review. Studies reporting a beneficial effect of the intervention or a larger effect size may be published, while similar amount of data pointing in the other direction may remain unpublished (Hopewell 2009). We were unable to assess publication bias in this review because of the heterogeneity of the interventions assessed.

Agreements and disagreements with other studies or reviews

In a previous Cochrane systematic review evaluating the effectiveness of opinion leaders in promoting knowledge transfer by Doumit et al (Doumit 2007) the authors concluded that " the use of opinion leaders can successfully promote evidence-based practice". The present review, which includes an additional six trials, reports a 12% increase in compliance due to the opinion leader intervention, further supports this finding.

AUTHORS' CONCLUSIONS

Implications for practice

Opinion leader interventions appear to improve performance. The effectiveness of opinion leaders as a strategy appears comparable to other strategies used to disseminate and implement evidence-based practice in health care. When compared with findings from a systematic review of implementation strategies, our results demonstrate that opinion leaders appear comparable to the distribution of educational materials, audit and feedback, multifaceted interventions involving educational outreach in increasing compliance (Grimshaw 2006b). Also two more recent Cochrane systematic reviews show results comparable to ours for audit and feedback (Jamtvedt 2006) and educational outreach visits (O'Brien 2008). However, identifying opinion leaders can be labour intensive, and issues regarding the reliability and validity of identifying option leaders (Doumit 2006) might limit the wider use of opinion leaders as a knowledge transfer intervention. Further, the cost and cost effectiveness of this type of interventions are unknown.

Implications for research

Future studies should ensure that a detailed description of the intervention is provided e.g. the actual activity and delivery of education by the opinion leader (what they do, how they do it , and how frequently they do it), the method of identification of the opinion leader, etc. This would allow for replication across studies and contexts. Future work on the methods of identifying opinion leaders and the stability of identified leaders over time would usefully inform decisions on how best to identify opinion leaders.

Further research could also be directed towards identifying the context in which opinion leaders are most effective. Most studies located for this review were conducted in hospital centres (secondary care), and it is unclear whether these findings will generalise to other settings.

A general improvement in the methods used in trials examining the effectiveness of opinion leaders should be encouraged.

More trials comparing interventions that are identical across experimental arms except for the use of opinion leaders would represent the 'gold standard' experiment with which to better test the effectiveness of opinion leaders as a strategy for implementation of best practice.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

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

Althabe 2008

Methods	Cluster RCT, hospitals as the randomisation unit.
Participants	19 hospitals; Intervention:n=10; Control:n=9 Country: Argentina and Uruguay Type of targeted behaviour: General management of a problem (obstetrical care)
Interventions	Local opinion leaders + interactive workshops + training of manual skills + one to one academic detailing visits with birth attendants + reminders and feedback Method of OL identification: Sociometric Proportion of Social Network that nominated OL: NOT CLEAR Single OL or OL teams: teams of three to six birth attendants (resident physicians, staff and head obstetrician and midwifes) OL disseminated information: Informal (one to one teaching), Formal (academic detailing, dissemination of guidelines) OL frequency of involvement: NOT CLEAR Control:Standard care
Outcomes	Rate of prophylactic use of oxytocin during the third stage of labour and episiotomy. Postpartum haemorrage and perineal suturage.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	p.1930/Col 2/Para2 A balanced randomisation procedure (21) ensured that the intervention and control hospitals were balanced with respect to the rates of prophylactic use of oxytocin and episiotomy, the presence or absence of residency programs, the country and region were the hospital was located, and the annual number of births at the hospital. Of 184,756 possible ways of assigning hospitals to the intervention and control groups with acceptable balance, one sequence was randomly selected to determine the composition of the two groups.
Allocation concealment?	Yes	P 1930/Col 2/Para1 The design was a cluster-randomised trial, with hospitals as the randomisation unit.

Althabe 2008 (*Continued*)

Blinding? All outcomes	Unclear	Not stated.
Incomplete outcome data addressed? All outcomes	Yes	"Data were missing for less than 0.2% of births."
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were reported in the results.
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	P.1933/Col 2/Table 1 'The groups were similar with respect to maternal characteristics, rates of prophylactic use of oxytocin and episiotomy, and prevalence of low-birth-weight infants .
Similar baseline characteristics??	Yes	p.1933/Col 2/Table 1 'The characteristics of the hospitals and delivery staff were similar in the two groups'.
Protection against contamination??	Yes	Allocation by hospital.

Berner 2003

Methods	Cluster RCT, hospitals the randomisation unit.
Participants	21 hospitals; Opinion leader intervention n=7; HCQIP n=8;Control n=6 Country: US Type of targeted behaviour: general management of a problem (unstable angina)
Interventions	Intervention 1. Local Opinion Leaders + Audit & Feedback 2. Audit & Feedback Method of OL identification: Sociometric Proportion of Social Network that nominated OL: NOT CLEAR OL disseminated information: Formal (Conferences, Educational material); Informal: NOT CLEAR OL frequency of involvement: UNCLEAR Single OL or OL teams:single OL (physician) Control Standard dissemination
Outcomes	Adherence to unstable angina guidelines
Notes	
Risk of bias	

Berner 2003 (*Continued*)

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Pg 422 /Col1/ Para.3/line 9-14 "Using a restricted randomisation procedure based on hospital bed size, we randomly assigned the participating hospitals to one of the three intervention groups"
Allocation concealment?	Yes	It was a cluster RCT, with the hospital as the randomisation unit.
Blinding? All outcomes	Unclear	Not mentioned in the paper
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper
Free of selective reporting?	Yes	Results were presented for all outcomes presented in the methods section.
Free of other bias?	No	p.422/Col 1/Para 3 Only less than half of eligible hospitals agreed to participate which creates a greater risk of selection bias since the hospitals that declined to participate were different from the others (small and rural).
Similar baseline outcome measures??	Yes	Pg.427/Fig 1
Similar baseline characteristics??	No	Pg.425 /Col1/Para 2/ line 1-14 "Fewer control hospitals were large and teaching hospitals than either of the intervention group hospitals, and more of the hospitals that declined to participate were small and rural" Pg 427/ Table 2 "For patients, the racial and gender distribution and receipt of cardiac consultation is similar across the three groups. Pg 426/ Table 1
Protection against contamination??	Yes	Randomisation was by hospital.

Cabana 2006

Methods	Cluster RCT, randomisation by site (region).
Participants	Paediatric primary care providers in 10 regions; Intervention: n=418, Control: n=452 Country: US Type of targeted behaviour: General management of a problem (asthma care)
Interventions	Local Opinion Leaders+ continuing medical education program (Physician Asthma Care Education-PACE)-the program consisted of: 2 interactive seminar sessions (2.5 h each performed within a weeks time) that reviewed national asthma guidelines, communication skills, and key educational messages. Format included short lectures, case discussions, and a video modelling communication techniques. Method of OL identification: Two methods were used: (informative and self-designation method) Proportion of Social Network that nominated OL: Single OL or OL teams identified:a team consisting of a primary care paediatrician, paediatric sub-specialist (board-certified pulmonologist or allergist), and behavioural scientist/health educator OL disseminated information: Formal: PACE-program, 2X2.5 h interactive seminars led by the OL team (Continous Medical Education) OL frequency of involvement: 2X2.5 h Control:No intervention. Control community physicians received training once collection of evaluation data was collected.
Outcomes	Physicians self-efficacy, physicians communication practices, parents perception of physicians communication, the child's asthma symptoms, and health care utilisation, and visit time for asthma primary care visits.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Providers: p.2155/Col 2/Para2 "Because physicians who are exposed to the intervention might disseminate new information to other physicians,we randomized by site versus randomizing by physician to prevent the possibility of contamination. We matched each of the 10 sites into 5 similar pairs on the basis of population, asthma prevalence, percentage of the population that is Hispanic and/or black, climate, and managed care penetration in the health care market. Within each pair, using a coin toss, we randomly selected 1 site as a control and 1 site for the intervention." Patients: p.2155/Col 2/Para4 "Each study physician provided a list of

		their pediatric asthma patients. From these lists, we developed a registry of 3368 patients. On the basis of previous experience from similar studies,2,3 we assumed that only 40% of patients would both be eligible and consent for participation.From the 3368 patients, using a random-number generator, we randomly selected 2300 patients (only 1 child per family) to be contacted to recruit a final sample of more than 1000 patients."
Allocation concealment?	Yes	It was a cluster RCT, with randomisation by site (region)
Blinding? All outcomes	Yes	p.2151/Col 1/Para 3 "Patients and their parents were blind to physicians involvement in the intervention. Physicians were blinded to which patients were selected for the survey."
Incomplete outcome data addressed? All outcomes	Yes	
Free of selective reporting?	Yes	
Free of other bias?	Yes	
Similar baseline outcome measures??	Unclear	p.2154/Table 2. All parents were interviewed by telephone at baseline (before the seminar day)
Similar baseline characteristics??	Yes	p2153/Table 1 and p.2154/Table 1 The characteristics of the providers, the patients, the survey respondents, and households in the control and intervention groups were similar (Tables 1 and 2) and suggest that the randomization was successful.
Protection against contamination??	Yes	Because physicians who are exposed to the intervention might disseminate new information to other physicians, we randomized by site versus randomizing by physician to prevent the possibility of contamination.

Elliott 1997

Methods	Cluster RCT, the community was the unit of randomisation.
Participants	Physicians (73% - primary care specialists, 22% surgeons, 5% medical sub-specialists) and nurses (75% hospital setting) from 6 communities Intervention: n=3 and Control:n=3 Country: US Type of targeted behaviour: general management of a problem (cancer care)
Interventions	Intervention Local Opinion Leaders + community outreach meetings + local TV program (2/3 communities) Method of OL identification: Sociometric Proportion of Social Network that nominated OL: NOT CLEAR Single OL or OL teams: teams of clinicians, unclear number OL disseminated information: Informal & Formal (Conferences, Educational material) OL frequency of involvement: UNCLEAR Control Standard dissemination
Outcomes	Health professional outcomes: physicians & nurses knowledge and attitudes scores about cancer pain management (CPM). Patient outcome: pain intensity score, pain prevalence.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	p.193/Col 1/Para 2 "Three pairs of communities were matched according to the selection criteria. Within each pair, one was randomly assigned to the intervention condition and the other to the control condition."
Allocation concealment?	Yes	It was a cluster RCT, with the community as the unit of randomisation.
Blinding? All outcomes	Unclear	Not mentioned in the paper
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the result section.
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	

Elliott 1997 (*Continued*)

Similar baseline characteristics??	Yes	Pg.197/ Col1/Par 1 The six communities recruited into the study were similar in several key characteristics as follows: population (mean 32,000), number of practicing physicians (mean, 56), and miles distant from Minneapolis - St. Paul (mean, 129).There were no significant differences in variables of interest between the six communities at baseline.
Protection against contamination??	Yes	Randomisation was done at the community level.

Guadagnoli 2000

Methods	Cluster RCT, the hospital was the unit of randomisation.
Participants	Surgeons from 28 academic/community hospitals; Intervention: n=18 and Control: n= 10 Country: US Type of targeted behaviour: general management of a problem (breast cancer surgical care)
Interventions	Intervention Local Opinion Leaders + performance feedback Method of OL identification: Sociometric Proportion of Social Network that nominated OL: 50% Single OL or OL teams: single OL OL disseminated information: formal (grand rounds & dissemination of graphical material). Informal: NOT CLEAR OL frequency of involvement:UNCLEAR Control Performance feedback (distributing performance reports that contained data on the outcomes of interest).
Outcomes	Proportion of women who reported that their surgeons did not discuss surgical options prior to surgery for stage I or II breast cancer. Proportion of women who underwent breast conserving surgery.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Pg.172/Col 2/Para 2 Hospitals in Minneapolis and St.Paul were assigned as clusters to separate treatment

Guadagnoli 2000 (*Continued*)

		groups because crossover from one city to the other did not occur. Hospitals outside the metropolitan area and affiliated with a metropolitan hospital were assigned to the metropolitan hospital cluster, the without affiliations were randomly assigned to a hospital cluster. We randomly assigned a cluster of 18 hospitals to the opinion leader intervention and a cluster of 10 hospitals to the performance feedback group.
Allocation concealment?	Yes	It was a cluster RCT, with the hospital as the unit of randomisation.
Blinding? All outcomes	Unclear	Not mentioned in the paper.
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper.
Free of selective reporting?	Unclear	Do not mention the outcomes of interest in the methods section.
Free of other bias?	Yes	
Similar baseline outcome measures??	Unclear	Not mentioned in the paper.
Similar baseline characteristics??	Yes	p.173/Col2/Para2 The characteristics of patients treated at experimental and control hospitals were comparable.
Protection against contamination??	Yes	Randomisation was done at the hospital level.

Hodnett 1996

Methods	Cluster RCT, with the hospital as the unit of randomisation.
Participants	Nurses from 20 community & teaching hospitals. Intervention: n=10 and Control: n=10 Country: Canada Type of targeted behaviour: general management of a problem (labour & delivery care).
Interventions	Intervention Local Opinion Leaders Method of OL identification: Sociometric Proportion of social network that nominated OL: NOT CLEAR Single OL or OL teams: teams (in hospitals where teams of nurses rotated shifts together,

Hodnett 1996 (*Continued*)

	one nurse was allowed per team. Two hospitals had 4 EIs, two hospitals had 3, and six hospitals had 2.) OL disseminated information: NOT CLEAR OL frequency of involvement: The majority of EIs (62%) at nine hospitals reported that they worked on trial activities on every shift (10 EIs) or weekly (6 EIs). Nurses at the remaining hospital reported only monthly participation in trial activities. Control Standard dissemination
Outcomes	Health professional outcomes: amount of time nurses spent providing support to labouring women. Patient outcomes: rates of epidural anaesthesia.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	p 16/Col 1/Para 2 "Using computer generated random allocation performed by a statistician with no knowledge of the hospitals 10 hospitals were allocated to the control group and 10 to the experimental group."
Allocation concealment?	Yes	p 16/Col 1/Para 2 "Using computer generated random allocation performed by a statistician with no knowledge of the hospitals 10 hospitals were allocated to the control group and 10 to the experimental group."
Blinding? All outcomes	Yes	The data was objective.
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper.
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results.
Free of other bias?	Yes	
Similar baseline outcome measures??	No	No baseline measurements.
Similar baseline characteristics??	No	There were significant between hospital differences.

Hodnett 1996 (*Continued*)

Protection against contamination??	Yes	The hospital was the unit of allocation.

Hong 1990

Methods	Cluster RCT, with the ward as the unit of randomisation.
Participants	220 nurses from 6 medical & surgical wards in a teaching hospital.Opinion leader + lecture: n=2; Opinion leader; n=2 and Lecture: n=2 Country: China (Hong Kong) Type of targeted behaviour: general management of a problem (proper use of urinary catheter)
Interventions	Intervention 1. Local Opinion Leaders + standardised 30 minutes lectures 2. Local Opinion Leaders Method of OL identification: Informant Proportion of Social Network that nominated OL: N/A Single OL or OL teams identified:teams consisting of a staff nurse + a nursing officer OL disseminated information: Formal (Small group demonstration tutorials) OL frequency of involvement:UNCLEAR Control Standardised 30 minutes lectures
Outcomes	Proportion of nurses' actions meeting local guidelines for urinary catheter care.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	p.210/Para3 "The three male medical and three female surgical wards in the hospital were divided by a random draw into three groups."
Allocation concealment?	Yes	It was a cluster RCT, with the ward as the unit of allocation.
Blinding? All outcomes	Unclear	Not mentioned in the paper.
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper.
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results

Hong 1990 (*Continued*)

Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	p.213/Table 1
Similar baseline characteristics??	Yes	p.213/Table 1
Protection against contamination??	Yes	Randomisation was made at the level of the wards.

Leviton 1999

Methods	Cluster RCT, with the institution as the unit of randomisation.
Participants	Obstetricians from 27 tertiary care hospitals. (One hospital withdrew post randomization); Intervention: n=13 and Control: n=14 Country: US Type of targeted behaviour: general management of a problem (foetal maturation)
Interventions	Intervention Local Opinion Leaders + audit & feedback + chart reminder + clinical guideline + grand round. Method of OL identification: Informant Proportion of social network that nominated OL: N/A Single OL or OL teams identified: teams of two persons (one nurse + one physician) OL disseminated information: Informal OL frequency of involvement: UNCLEAR Control Standard dissemination of clinical guideline
Outcomes	Appropriate use of antenatal corticosteroids for foetal maturation
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Pg. 47/Col 3/Para 2 We assigned hospitals by random number table either to the active dissemination (n=13) or usual dissemination control (n=14) group.
Allocation concealment?	Yes	It was a cluster RCT, with the institution as the unit of randomisation.

Leviton 1999 (*Continued*)

Blinding? All outcomes	Unclear	p.47/Col 3/para 2 and p.48/Col 1/Para 1 "The study was not blinded because physicians in the active dissemination condition were aware of the situation, and the leadership of all hospitals were aware of the condition of assignment"
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper.
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results.
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	Pg.50/Table 1
Similar baseline characteristics??	Yes	Pg, 49/Col 3/ Para 2 There were no baseline differences between intervention and control hospitals for the following characteristics: geographic region, median number of Active obstetricians, births per hospital, NICU beds, percentage Medicaid patients, race, PROM diagnosis, GA, and indicated deliveries. Hospital characteristics were generally the same in both the NPIC and AECOM hospitals. A difference between intervention and control cases in the frequency of abnormal fetal conditions or fetal distress was significant at the patient level due to the large sample size.
Protection against contamination??	Yes	Pg. 47/Col 2/ Para 1 "To avoid diffusion of the active dissemination treatment to the control group, the unit of randomisation was the hospital."

Lomas 1991

Methods	Cluster RCT, with the community hospitals the unit of randomisation.
Participants	76 physicians (family physicians & obstetricians) from 16 community hospitals. Intervention:n=8 and Control: n=8 Country: Canada Type of targeted behaviour: general management of a problem (obstetrical care)

Lomas 1991 (*Continued*)

Interventions	Intervention 1. Local Opinion Leaders + distribution of educational materials. 2. Audit & feedback + distribution of educational material Method of OL identification: Sociometric Proportion of social network that nominated OL: 65% Single OL or OL teams identified: single OL OL disseminated information: Informal & Formal. OL frequency of involvement: action taken at least at three distinct points in time + one: UNCLEAR Control Distribution of educational material
Outcomes	Health professional outcomes: mean percent of women offered a trial of labour. Patient outcomes: mean percent of women underwent a trial of labour and vaginal births.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Pg.2202/Col 1/Para 1 " we first randomly selected and assigned 16 eligible counties to one of the intervention or the control group. One eligible hospital was then randomly selected from each county to receive an invitation to participate in its assigned study group."
Allocation concealment?	Yes	It was a cluster RCT, with the community hospitals the unit of randomisation.
Blinding? All outcomes	Unclear	Not mentioned in the paper.
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper.
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results.
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	p.2205/Cil1/Para1, p.2205/Table 1 There were no significant differences for baseline characteristics.

Lomas 1991 (*Continued*)

Similar baseline characteristics??	Yes	p.2205/Cil1/Para1, p.2205/Table 1 There were no significant differences for baseline characteristics.
Protection against contamination??	Yes	p.2202/Col1/Para1 ",the unit of randomisation and intervention was the community hospital."

Majumdar 2007

Methods	Cluster RCT, with the patient as the unit of randomisation.
Participants	171 patients with either HF or IHD; Intervention:n=87 and Control: n=84 Country: Canada Type of targeted behaviour: General management of a problem (HFand IHD care)
Interventions	Local Opinion Leaders + patient specific one age evidence summaries generated and endorsed by OL Method of OL identification: Sociometric Proportion of Social Network that nominated OL: 30% Single OL or OL teams identified: teams of five physicians (3 cardiologists, 2 general internists, none was a university based academic cardiologist) OL disseminated information: Formal (faxed evidence summaries) OL frequency of involvement: one action taken at one time-point Control: Standard care (the patients most recent medication profile was faxed the physician)
Outcomes	Increase in the use of efficacious therapies (ACE inhibitors or ARBs in HF and statins in IHD) within 6 months. Secondary outcomes: prescribing changes for HF and IHD.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	p.22e2/Col 2/Para 5 "Simple randomization with concealment of allocation was performed at the level of the physician before patient recruitment started with the use of a computer-generated sequence."
Allocation concealment?	Yes	p.22e2/Col 2/Para 5 "Simple randomization with concealment of allocation was performed at the level of the physician before patient recruitment

		started with the use of a computer-generated sequence." "Each physician was randomly allocated to the HF intervention or to HF control; physicians allocated to the HF intervention were automatically assigned to IHD-control and vice versa. This design prevented contamination within an individual physicians practice (i.e., having both an HF intervention and an HF control) while increasing generalizability and efficiency (i.e., patients from one physician could contribute to both HF and IHD substudies)"
Blinding? All outcomes	Yes	p.22e2/Col 1/Para 3 "All outcomes were ascertained in an independent and blinded fashion, and allocation was concealed from patients, investigators, data collectors, and analysts."
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper.
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results.
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	p.22e4/Col1/Para 2 "The intervention patients and control subjects were comparable, with no important differences between them (Table I)."
Similar baseline characteristics??	Yes	p.22e4/Col1/Para 2 The intervention patients and control subjects were comparable, with no important differences between them (Table I).
Protection against contamination??	Yes	Each physician was randomly allocated to the HF intervention or to HF control; physicians allocated to the HF intervention were automatically assigned to IHD control and vice versa. This design prevented contamination within an individual physicians practice (ie, having both an HF intervention and an HF control) while increasing generalizability and efficiency (i.e., patients from one physician could contribute

		to both HF and IHD substudies).

Majumdar 2008

Methods	Cluster RCT, with the patient as the unit of randomisation.
Participants	Physicians from 2 emergency departments and two fracture clinics (four hospitals); Patients;Intervention: n=137 and Control: n=135 Country: Canada Type of targeted behaviour: General management of a problem (osteoporosis)
Interventions	Local opinion endorsed guidelines sent to physicians + telephone based patient education (performed by nurses) + reminders sent to physicians Method of OL identification: Sociometric method Proportion of Social Network that nominated OL: UNCLEAR Single OL or OL teams identified: teams of five physicians OL disseminated information: Formal (dissemination of guidelines) OL frequency of involvement: at one time-point sending a signed guideline on osteoporosis care to physician Control: Usual care (provision of printed materials to patients)
Outcomes	Starting biophosphonate treatment within 6 months of the fracture. Bone mineral testing, "appropriate care" (consisting of bone mineral density testing with treatment if bone mass was low), and osteoporosis related quality of life.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	p.570/Col 1/Para 3 "In this randomized controlled trial, patients were assigned to either the intervention group or the control group. Allocation was concealed by application of variable block sizes and by use of a secure, centralized, Internet-based, computer-generated randomization system housed within the Epidemiology Coordinating and Research Centre at the University of Alberta in Edmonton."
Allocation concealment?	Yes	p.570/Col 1/Para 3 "Allocation was concealed by application of variable block sizes and by use of a secure, centralized, Internet-based, computer-generated randomization system "

Majumdar 2008 (*Continued*)

Blinding? All outcomes	Yes	p.570/Col 1/Para 3 "Patients could not be blinded to the fact that they were part of an osteoporosis quality improvement study. However, physicians were not informed that their patients were part of a study, and neither physicians nor patients were aware of the study outcomes. Research nurses collected outcomes data without knowledge of allocation status. Investigators were blinded at all times."
Incomplete outcome data addressed? All outcomes	Yes	p.571/Figure 1
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results.
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	p.572/Table 1
Similar baseline characteristics??	No	p.572/Table 1
Protection against contamination??	Yes	The study was a cluster RCT.

McAlister 2009

Methods	Cluster RCT, with the primary care physician as the unit of randomisation.
Participants	480 adults with coronary heart disease from 252 practices in Edmonton and Calgary; Opinion leader statement: n= 165; Unsigned statement:n=158 and Control: n=157 Country: Canada Type of targeted behaviour: General management of a problem (secondary care for CHD statin management
Interventions	1. Opinion Leader endorsed /signed evidence summary 2. Unsigned evidence summary Method of OL identification: Sociometric Proportion of Social Network that nominated OL: UNCLEAR Single OL or OL teams identified: single OL OL disseminated information: Formal (Faxed evidence summaries) OL frequency of involvement:action taken at one time-point Control: No intervention (physicians only received a coronary chart for their patients, which is considered somewhat more than standard care in this region)
Outcomes	Improvement in statin management (new start or dose increase) 6 months post-catheterisation

Notes		

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	p.898/Col 2/Para 1 "Randomization took place 1:1:1 following the completion of the patients angiogram using a computer-generated central randomization system with concealment of the randomization list."
Allocation concealment?	Yes	p.898/Col 2/Para 1 Although primary care physicians were not blinded to allocation status, both allocation concealment and blinding were achieved for investigators, patients, outcome assessors, and analysts.
Blinding? All outcomes	Yes	Although primary care physicians were not blinded to allocation status, both allocation concealment and blinding were achieved for investigators, patients, outcome assessors, and analysts. p.900/Col 2/Para 2 Follow-up data was collected by independent and blinded outcome assessors, clinical events were independently adjudicated by two blinded investigators (FAM and SRM) who then met to resolve discrepancies, and statistical analyses were conducted by a statistician blinded to allocation status.
Incomplete outcome data addressed? All outcomes	Yes	p.901/Col 2/Para 1 We evaluated the status of 466 patients (97%) after six months (2 patients were lost to follow up, 6 withdrew consent, 3 died and 3 were excluded due to protocol violations.
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results.
Free of other bias?	Yes	

Similar baseline outcome measures??	Yes	p.28 /Table 1 At baseline, there were no statistically significant differences between groups (Table 1).
Similar baseline characteristics??	Yes	p.28/Table 1. At baseline, there were no statistically significant differences between groups.
Protection against contamination??	Yes	This was a randomized clinical trial clustered at the level of the primary care physician to avoid contamination.

Sisk 2004

Methods	Cluster RCT, with the hospitals as the unit of randomisation.
Participants	Obstetricians, family practitioners and nurse midwives from 18 hospitals. Intervention: n=9 and Control: n=9 Country: US Type of targeted behaviour: mothers' intention to breast feed during the early postpartum period.
Interventions	Intervention Local Opinion Leaders + audit & feedback + formal meetings + printed educational material. Method of opinon leader identification: both sociometric (Coleman et al. - If you wish to discuss practice questions with other clinicians in your hospital, on whom would you most likely call?) and Informant (opinion leaders in the study were nominated also by the obstetric nurse-manager). Proportion of social network that nominated OL: 56% Single OL or OL teams identified:single OL OL disseminated information: Formal OL frequency of involvement:2 hours monthly Control Standard dissemination
Outcomes	Mothers' intention to breast feed
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Pg 414/Col 2/ Para 2 We randomly allocated hospitals between intervention and control groups and con-

Sisk 2004 (*Continued*)

		ducted the 1-year opinion leader intervention.
Allocation concealment?	Yes	It was a cluster RCT, with the hospitals as the unit of randomisation.
Blinding? All outcomes	Unclear	Not mentioned in the paper
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results
Free of other bias?	Yes	
Similar baseline characteristics??	Unclear	Mentioned that the characteristics did not differ but did not report baseline data.
Protection against contamination??	Yes	Pg 415/ Col 2/ Para 1 As the setting where obstetric providers interact, the hospital was the appropriate unit of randomisation. To avoid contamination among Binghampton and Syracuse clinicians with admitting privileges at multiple hospitals in those cities, we treated as one unit for randomisation the three hospitals in the Syracuse area versus the two in Binghampton and one in the surrounding area. We matched the 18 remaining hospitals on characteristics that might affect breast feeding or avoided contamination of the control group by clinicians in the intervention group.

Soumerai 1998

Methods	Cluster RCT, with the hospital as the unit of randomisation.
Participants	37 hospitals. 2938 patients.Intervention:n=20 and Control: n=16 Country: US Type of targeted behaviour: general management of a problem myocardial infarction)
Interventions	Intervention Local Opinion Leaders + distribution of educational materials. Method of OL identification: Sociometric Proportion of social network that nominated OL: 38% Single OL or OL teams identified: one single OL per hospital

	OL disseminated information: Informal & Formal (conferences, clinical practice guidelines, audit & feedback) OL frequency of involvement:UNCLEAR Control Audit & feedback
Outcomes	Eligible patients receiving drugs for treatment of acute myocardial infarction.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	P.1369/ "..hospitals were stratified and randomised by size from within each of the nine strata to experimental or control condition (standard care).
Allocation concealment?	Yes	it was a cluster RCT, with the hospitals as the unit of randomisation.
Blinding? All outcomes	Yes	P.1359/ Col 2/ Para 2 Hospital administrators, physicians, AMI patients and nurse abstractors were all blinded with respect to study hypothesis and experimental assignment at each hospital
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	Pg. 1361/Col 2/Para1 There were no significant differences in baseline rates of use of study drugs between experimental and control hospitals. Pg 1362/Table 2
Similar baseline characteristics??	Yes	PG.1361/Col 1/Para 3 "Table 1 presents demographic and clinical characteristics of experimental and control patients before and after the intervention. Both groups were comparable overall and

Soumerai 1998 (*Continued*)

		with respect to several characteristics that predicted use of study drugs at baseline, namely old age.(>75 years), female sex; severe co-morbidity, recent symptom-onset (6 hours) and heart failure. Pg.1361/Col 3/Table 1
Protection against contamination??	Yes	Pg. 1359/Col 1/Para 3 To minimise contamination of control hospitals, large cities (i.e. St. Paul-7 hospitals and 2536 patients) and Minneapolis (11 hospitals and 2536) were randomised as clusters, resulting in a state-wide sample of 20 experimental and 17 control hospitals

Stross 1980

Methods	Cluster RCT, with the community as the unit of randomisation.
Participants	Primary care practitioners from 6 community hospitals. 62 inpatients and 112 outpatients.Intervention: n=3 and Control:n=3 Country: US Type of targeted behaviour: general management of a problem (rheumatoid arthritis care)
Interventions	Intervention Local Opinion Leaders Method of OL identification: Sociometric Proportion of social network that nominated OL: NOT CLEAR Single OL or OL teams identified:teams of GPs, unclear number OL disseminated information: NOT CLEAR OL frequency of involvement: UNCLEAR Control Standard dissemination
Outcomes	Proportion of patients receiving appropriate care for rheumatoid arthritis.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Pg.847/Col 1/Para 1 Six communities were utilised in this program, and they were randomly assigned to a control or an intervention group.

Stross 1980 (*Continued*)

Allocation concealment?	Yes	It was a cluster RCT, with the community as the unit of randomisation
Blinding? All outcomes	Unclear	Not mentioned in the paper
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper
Free of selective reporting?	Unclear	Do not say in the methods section which outcomes they will retrieve.
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	P.847/Table 1
Similar baseline characteristics??	Unclear	P.848/Table 1
Protection against contamination??	Yes	The community was the unit of allocation.

Stross 1983

Methods	Cluster RCT, with the hospital as the unit of randomisation
Participants	Physicians from 16 community hospitals. 510 patients. Intervention:n=8 and Control: n=8 Country: US Type of targeted behaviour: general management of a problem (treatment of chronic obstructive pulmonary disease)
Interventions	Intervention Local Opinion Leaders Method of OL identification: Sociometric Proportion of social network that nominated OL: NOT CLEAR. OLs had contact with 69% (160/233) of primary practitioners & 83% with MD that cared for the intervention group. Single OL or OL teams identified:? OL disseminated information: informal education (50%) & formal consultations (50%) . OL frequency of involvement:? Control Standard dissemination
Outcomes	Proportion of patients receiving appropriate care for COPD.
Notes	
Risk of bias	

Stross 1983 (*Continued*)

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	P.140/Col 1/Para 1 "Sixteen hospitals agreed to participate and they were randomly assigned to control or intervention status.
Allocation concealment?	Yes	It was a cluster RCT, with the hospital as the unit of randomisation
Blinding? All outcomes	Unclear	Not mentioned in the paper
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	P.743/Table 3 and P.744/Table 4
Similar baseline characteristics??	Yes	P. 742/Table 1
Protection against contamination??	Yes	The hospital was the unit of randomisation.

Stross 1985

Methods	Cluster RCT, the community was the unit of randomisation
Participants	Primary care practitioners from 6 community hospitals. 114 inpatients and 472 outpatients. (Intervention: n=3 and Control: n=3) Country: US Type of targeted behaviour: general management of a problem (osteoarthritis care)
Interventions	Intervention Local Opinion Leaders Method of OL identification: Sociometric Proportion of social network that nominated OL: NOT CLEAR Single OL or OL teams identified:one single OL OL disseminated information: NOT CLEAR OL frequency of involvement:UNCLEAR Control Standard dissemination
Outcomes	Proportion of patients with osteoarthritis receiving appropriate care for 6 treatment variables and for 3 total hip arthroplasty variables.

Stross 1985 (*Continued*)

Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	P.109/Col 1?para 1 Letters were sent to all communities with these characteristics, and 6 communities agreed to participate. Three were randomly selected to be controls, while the other three were desigated as intervention communities.
Allocation concealment?	Yes	It was a cluster RCT, with the community as the unit of randomisation
Blinding? All outcomes	Unclear	Not mentioned in the paper
Incomplete outcome data addressed? All outcomes	Unclear	Not mentioned in the paper
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	P.110/Col 1/Table 1
Similar baseline characteristics??	Yes	P.109/Col 1
Protection against contamination??	Yes	The community was the unit of allocation.

Wright 2008

Methods	Cluster RCT with the hospital as unit of randomisation
Participants	42 hospitals in Ontario; Intervention: n=21 and Control: n=21 Country: Canada Type of targeted behaviour: General management of a problem (stage II colon cancer management)
Interventions	Local Opinion Leaders + standardised lecture about colon cancer lymph node assessment (by an expert OL) + academic detailing (by the expert OL) + a toolkit (to be used by the local OL) + a follow-up reminder package (sent to the intervention group by the expert OL) Method of OL identification: Sociometric Proportion of Social Network that nominated OL: 42 of 99 hospitals (42%)

Wright 2008 (*Continued*)

	Single OL or OL teams identified: single OL OL disseminated information: Formal (lecture+ posters+pocket card) OL frequency of involvement:Unclear Control: Standard care
Outcomes	The mean number of lymph nodes assessed in patients with stage II colon cancer and the proportion of stage II colon cancer cases staged with a minimum of 12 lymph nodes
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	P.1052/Col 1/Para 4 Using a computer-generated scheme we randomised 21 hospitals to the treatment arm and 21 to the control arm.
Allocation concealment?	Yes	Allocation was by hospital with hospitals as the unit of random assignment at which a local opinion leader had been identified
Blinding? All outcomes	Yes	The outcomes were objective.
Free of selective reporting?	Yes	All outcomes mentioned in the methods section were also presented in the results
Free of other bias?	Yes	
Similar baseline outcome measures??	Yes	P.1052/Col 2/Para 3 There was a baseline difference in the mean number of lymph nodes removed between the 2 arms of the study that occurred despite randomization. This factor was adjusted for in the statistical analysis. All other patient and hospital factors were equally distributed. (Table 1)
Similar baseline characteristics??	Yes	P.1052/Col 2/Para 3 No clinically important differences in either patient or tumor characteristics were identified between the colon cancer cases in the control and intervention arms 360 days before or 360 days after the standardized lecture (Table 1).
Protection against contamination??	Yes	The hospital was the unit of allocation.

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

Study	Reason for exclusion
Bloomfield 2005	Not an RCT.
Closs 1999	Method of opinion leaders identification unclear.
Denton 2001	Method of opinion leaders identification unclear.
Dijkstra 2006	Unspecified opinion leaders identification method.
Doyne 2004	Method of opinion leaders identification unclear.
Dranitsaris 2001	Method of opinion leaders identification unclear.
Elliott 2001	Primary outcome measured knowledge and attitude.
Finkelstein 2005	Unspecified opinion leader identification method.
Gifford 1999	Primary outcome measured knowledge.
Ginsburg 2005	Not an RCT.
Goldstein 2005	Did not use opinion leaders.
Hanson 2005	Not an RCT.
Harbarth 2002	Method of opinion leaders identification unclear.
Heller 2001	Unspecified opinion leader identification method.
Hogg 2005	Not an RCT.
Johnston 2007	Unspecified opinion leader identification method.
Jureidini 2009	Not an RCT.
Mant 1999	Opinion leaders not identified by peers.
McLean 2008	Not an RCT.
Mehta 2002	Opinion leaders not identified by peers.
Minto 2006	Unspecified opinion leader identification method.
Nicolas 1996	Not an RCT.

(*Continued*)

Nilsson 2001	Method of opinion leaders identification unclear.
O'Connor 2009	Unspecified method of opinion leader identification.
Obua 2004	Unspecified opinion leader identification method.
Ofman 2003	Unspecified opinion leader identification method.
Rebbeck 2006	Unspecified opinion leader identification method.
Reed 2005	Not an RCT.
Rubenstein 1999	Used expert opinion leaders.
Schectman 2003	Intervention does not involve opinion leaders.
Scholes 2006	Unspecified opinion leader identification method.
Schouten 2007	Unspecified opinion leader identification method.
Searle 2002	Improper opinion leader identification method.
Seto 1991	Duplicate publication.
Shafer 2002	Intervention does not involve opinion leaders.
Simon 2006	Unspecified opinion leader identification method.
Stevenson 2004	Primary outcome measured attitude.
Stevenson 2006	Unspecified opinion leader identification method.
Sullivan 2005	Unspecified opinion leader identification method.
Weingarten 1993	No formal process of identifying opinion leaders identified.
Wolfenden 2007	Unspecified opinion leader identification method.
Wright 2007	Unspecified opinion leader identification method.

DATA AND ANALYSES

This review has no analyses.

APPENDICES

Appendix 1. Search strategy

MEDLINE search strategy:
1. opinion leader*.tw.
2. exp Education/
3. Professional Practice/
4. Professional Role/
5. professional*.tw.
6. education*.tw.
7. or/2-6
8. exp Leadership/
9. opinion leader*.tw.
10. influential*.tw.
11. or/8-10
12. 7 and 11
13. 1 or 12
14. randomized controlled trial.pt.
15. controlled clinical trial.pt.
16. randomi*.ab.
17. placebo.ab.
18. drug therapy.fs.
19. randomly.ab.
20. trial.ab.
21. groups.ab.
22. 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21
23. (animals not (humans and animals)).sh.
24. 22 not 23
25. 24 and 13

Appendix 2. Data extraction form

Modified EPOC Group - Data Extraction Form
LOCAL OPINION LEADERS: EFFECTS ON PROFESSIONAL PRACTICE AND HEALTH CARE OUTCOMES

Data collection

Name of reviewer:

Date:

Study reference:

Trial Identifier:

Author:

Title of paper:
Full Reference:

1. Inclusion criteria

1.1 Study design

RCT designs: Yes X No

If "Yes" what (i.e. Cluster, parallel ...)?

1.2 Methodological inclusion criteria

a) The objective measurement of performance/provider behaviour or health/ patient outcome/s:
b) Relevant and interpretable data presented or obtainable

N.B. A study must meet the minimum criteria for EPOC scope, design, and methodology for inclusion in EPOC reviews. If it does not, COLLECT NO FURTHER DATA.

2. Interventions

2.1 Type of intervention (state all interventions for each comparison/study group)

a) Group 1:

b) Group 2:

c) Group 3:

Interventions are:
Opinion leader +/- (audit & feedback, reminders, outreach visits, academic detailing, marketing strategies .etc).

2.2 Method of Identification of opinion leaders

a) Sociometric method :

If yes what is the percentage of network coverage obtained for opinion leaders during the identification process (i.e. survey)? Unclear

a) Informant method

b) Self designating method

c) Observation method

e) Other methods: .....

If other method used exclude study.

2.3 Opinion Leader or Opinion Leader teams

Was a sole OL identified/selected or was a team of leaders identified at each intervention site?

Opinion Leaders (one) YES NO

Opinion Leader teams YES NO

If YES, how many OL's were selected at each intervention site and what was their occupation? (cut and paste from the paper verbatim)

2.4 Duration of the interventions:

a) Group 1:
b) Group 2:
c) Group 3:
2.5 Control(s)

3. Type of Targeted Behaviour (state more than one where appropriate)

a)

b)

c)

4. Participants

4.1 Characteristics of participating providers

a) Profession (absolute numbers or reported percentages):

b) Level of training

c) Clinical specialty

Primary Care: ·····
Secondary Care: ·····
Other (state): ·····
Unclear:·····

d) Age

Mean: ·····
Score Unclear if data not available.

e) Time since graduation (or years in practice)

4.2 Characteristics of Participating patients

a) Clinical problem (ex Hypertension ..)

b) Age

b) Gender

d) Ethnicity

e) Other (specify) ·····

4.3 Numbers included in the study (e.g. patients that entered the study)(report numbers and/or percentages when available)

State unclear if information not available

a) Episodes of care

b) Patients

c) Providers

d) Practices

e) Hospitals

f) Communities or regions

g) Proportion of eligible providers (or allocation units) who participated in the study

5. Setting

State Unclear if information not available

a) Reimbursement system

b) Location of Care

c) Academic status
Teaching vs. non teaching centres
d) Country

6. Methods

a) Unit of allocation

b) Unit of analysis

c) Power calculation
Score Done if study has sufficient statistical power to detect clinically important effects as statistically significant and record power.

7.0 Risk of bias

7.1 Was the allocation sequence adequately generated ?(cut and paste from the paper verbatim)

Score YES	If a random component in the sequence generation process is described (e.g.referring to a random numbers table)	
Score NO	If a non-random method is used (e.g.performed by date of submission)	
Score UNCLEAR	If not specified in the paper.	

7.2 Was the allocation adequately concealed?

Score YES	If the unit of allocation was by institution, team or professional and allocation was performed at all units at the start of the study; or if the unit of allocation was by patient or episode of care and there was some kind of centralised randomisation scheme; an on-site computer system or if sealed opaque envelopes were used.	
Score NO	If none of the above mentioned methods were used (or if a CBA)	
Score UNCLEAR	If not specified in the paper.	

7.3 Were baseline outcome measurements similar?

Score YES	If performance or patient outcomes were measured prior to the intervention, and no important differences were present across study groups	
Score NO	If important differences were present and not adjusted for in analysis.	
Score UNCLEAR	If RCTs have no baseline measure of outcome	

7.4 Were baseline characteristics similar?

Score YES	If baseline characteristics of the study and control providers are reported and similar	
Score NO	If there is no report of characteristics in the text or tables or if there are differences between control and intervention providers.	
Score UNCLEAR	If it is not clear in the paper (e.g. characteristics are mentioned in the text but no data were presented)	

7.5 Were incomplete outcome data adequately addressed?

Score YES	If missing outcome variables were unlikely to bias the results (e.g. the proportion of missing data was similar in the intervention and the control group, or the proportion of missing data was less than the effect size, i.e. unlikely to overturn the study results	
Score NO	If missing data was likely to bias the results.	
Score UNCLEAR	If not specified in the paper (Do not assume 100% follow up unless stated explicitly).	

7.6 Was knowledge of the allocated interventions adequately addressed?

Score YES	If the authors state explicitly that primary outcome variables was assessed blindly, or the outcomes are objective e.g. length of hospital stay. Primary outcomes=those variables that correspond to the primary hypothesis or question as defined by the authors.	
Score NO	If the outcomes were not assessed blindly.	
Score UNCLEAR	If not specified in the paper.	

7.7 Was the study adequately protected against contamination?

Score YES	If allocation was by community, institution or practice and it s unlikely that the control group received the intervention.	
Score NO	If it is likely that the control group received the intervention (e.g. if patients rather than professionals were randomised)	
Score UNCLEAR	I professionals were allocated within a clinic or practice and it is possible that communication between intervention and control professionals could have occurred (e.g. physicians within practices were allocated to intervention or control)	

7.8 Was the study free from selective outcome reporting?

Score YES	If there is no evidence that outcomes were selectively reported (e.g. all relevant outcomes in the methods section are reported in the result section)	
Score NO	If some important outcomes are subsequently omitted from the results.	
Score UNCLEAR	If not specified in the paper.	

7.9 Was the study free from other risks of bias?

Score YES	If no evidence of other risks of bias	
Score NO		
Score UNCLEAR		

8. Prospective identification by investigators of barriers to change

Investigators identified specific barriers to change in the target population, which were addressed by the intervention (Information management, Clinical uncertainty, Sense of competence, Perceptions of liability, Patient expectations, Standards of practice, Financial disincentives, Administrative constraints, Other)

9. Intervention

Description of the intervention (cut and paste from the paper verbatim, and separate the different parts of the intervention if possible).·····

Rate your assessment of the proportion of the "active ingredients" of the intervention contributed by the OL part of the intervention (on a scale from nought to 100)·····

9.1 Characteristics of the intervention

a) Evidence base of recommendation

Score DONE if recommendations appear to be based on good evidence

b) Purpose of recommendations

(Appropriate management, cost containment, other).

9.2 Nature of desired change
(Initiation of new management, stopping introduction of new management, reduction of established management, increase established management, cessation of established management, modification of established management)

9.3 Method that opinion leaders use to transfer evidence based medicine:

a) Informal education (e.g. informal one to one teaching): ·····

b) Formal education: ·····
(Conferences, community outreach education, academic detailing, dissemination of clinical practice guidelines, small group teachingetc).

c) Unclear (other):·····

9.4 What was the frequency of involvement of the Opinion Leader(s) during intervention?

9.5 Was the content of the education delivered by the OL based upon implementation of clinical practice guidelines:
Yes No Unclear
If Yes, were these evidence based:
Yes No Unclear
9.6 Timing

a) Proximity to clinical decision-making
    a) Group 1:
    b) Group 2:
    c) Group 3:
b) Frequency/number of intervention events
    a) Group 1:
    b) Group 2:
    c) Group 3:
c) Duration of intervention
    a) Group 1:
    b) Group 2:
    c) Group 3:

9.7 Setting of intervention
(In practice setting, not in practice setting)
10 Outcomes

10.1 Description of the main outcome measure(s).
a) Health professional outcomes/process measures
b) Patient outcomes

10.2 Length of time during which outcomes were measured after initiation of the intervention.
a) Group 1:
b) Group 2:
c) Group 2:

10.3 Length of post- intervention follow-up period.
a) Group 1:
b) Group 2:

c) Group 2:

10.4 Identify a possible ceiling effect:
For example, there was little room for improvement in provider performance, because it was adequate without the intervention (based on baseline measurements or control group performance).

a) Identified by investigator

b) Identified by reviewer

11. Results

State the results as they will be entered in the review, and describe how these were calculated (e.g. relative percentage differences attributable to the intervention).

a) Group 1:
b) Group 2:
c) Group 2:

FEEDBACK

Study inaccurately summarised

Summary

Ellen Hodnett commented that her study had been inaccurately summarised and pointed out the necessary corrections.

Reply

These have now been incorporated into the review.

Contributors

Ellen Hodnett

WHAT'S NEW

Last assessed as up-to-date: 4 May 2010.

Date	Event	Description
30 September 2010	New search has been performed	We included six new trials in this update.We assessed the risk of bias of all included trials using the new risk of bias tool (EPOC 2009), and we also added a summary of findings table.
12 November 2008	Amended	Minor changes

HISTORY

Protocol first published: Issue 3, 1996

Review first published: Issue 3, 1997

Date	Event	Description
30 July 2008	Amended	Converted to new review format.
15 November 2006	New citation required and conclusions have changed	Substantive amendment

CONTRIBUTIONS OF AUTHORS

GF and MPE sifted the titles for inclusion. GF,MPE, EP, GD, MAO'B, and MG data extracted the new included studies. GF and EP assessed the risk of bias in the old included studies and did complimentary data-extraction. GF led the writing of the review, and all other authors commented and approved the final version.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- University of New South Wales and Sydney South West Area Health Service, Australia.
- Institute of Population Health, University of Ottawa, Ottawa, Canada.
- Supportive Cancer Care Research Unit, Hamilton, Canada.
- Department of General Surgery, Ottawa Hospital, Ottawa, Canada.
- Department of Epidemiology & Community Medicine, University of Ottawa, Canada.
- Institute of Health and Society, Newcastle University, UK.

External sources

- Canada Research Chair in Health Knowledge Transfer and Uptake, Canada.
- NHMRC Post-doctoral Training Fellowship, Australia.
- NHR EPOC Program Grant, UK.

INDEX TERMS

Medical Subject Headings (MeSH)

*Leadership; *Policy Making; Evidence-Based Medicine; Physician's Practice Patterns; Professional Practice [*standards]; Quality of Health Care; Randomized Controlled Trials as Topic

MeSH check words

Humans