Interventions that change clinician behaviour: mapping the literature

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1.   INTRODUCTION

1.1   Aim of the study

The National Institute for Health and Clinical Excellence (NICE) is the independent organisation responsible for providing national guidance on the promotion of good health and the prevention and treatment of ill health. NICE produces guidance in three areas of health:

- public health - guidance on the promotion of good health and the prevention of ill health for those working in the NHS, local authorities and the wider public and voluntary sector
- health technologies - guidance on the use of new and existing medicines, treatments and procedures within the NHS
- clinical practice - guidance on the appropriate treatment

Putting NICE guidance into practice can be challenging. The audience for guidance is broad, and encompasses a wide variety of clinical and public health practitioners, working across a variety of settings including the NHS, local authorities, private and voluntary sectors. NICE has set up a programme to help support implementation, and develop tools, resources and advice to help these audiences make the necessary changes to follow guidance. This review was commissioned as part of this programme of work, as a first step in mapping the best available evidence about how to deliver guidance across this wide range of sectors.

This paper maps interventions that can be used to change health professionals' behaviour, particularly changes relating to the introduction of evidence based practice. These may be targeted at individuals or organisations or operate on a national level. The review is based on the findings of systematic and narrative reviews published between 1995 and 2006.

Section one begins by outlining barriers to change and describing popular theories that explain how the change process works. Section 2 describes the search methodology used to identify papers for inclusion in the review. Section 3 describes the results of the literature review, categorised by intervention type at an individual, organisational and national level. The final section 4, discusses the results and draws some general conclusions about the efficacy of various behaviour change strategies. An appendix detailing the studies considered for each question and their findings is attached at the end of the report.

1.2   Context

Barriers to change

Actual clinical practice often differs from that recommended by evidence, or guidelines for care. The World Health Organisation found studies showing that in the United States and Europe between 30 and 50 percent of patients fail to receive interventions that are justified by evidence on best practice. A UK specific study echoed this with the finding that only 40 percent of patients received the care recommended in guidelines for prescribing for four common conditions (Hanies et al. 2004).

Barriers at the individual, organisational and national level can stand in the way of change and obstruct the implementation of evidence-based practices. To successfully implement new ways of working, these barriers must be recognised and addressed. Cabana's systematic review identified physician knowledge, attitude and behaviour as barriers to the adoption of guidelines. Physicians lacked awareness and familiarity with guidelines or disagreed with their content. For example they believed that risks outweighed the benefits from a new procedure, that guidelines undermined their autonomy, or that a certain guideline was not applicable to their population. They also lacked skills to implement a change, found it difficult to change ingrained practices, or felt that a new procedure would not bring positive outcomes (Cabana et al. 1999). At an organisational level lack of staff, resources or managerial leadership may hinder a push for change. There are also external barriers such as the attitudes of patients (who may resist a new practice), environmental factors such as the regulatory environment (Sutherland and Leatherman 2006), and the structure of reimbursement mechanisms (Gosden 2000).

Theories of behaviour change

Numerous theories explain behaviour change and support the use of different interventions to bring about modifications in practice. However, researchers have not been able to establish one unified theory of change, applicable in all circumstances (Smith 2000). Instead a number of different theoretical approaches contribute to our understanding of the process of change (Effective healthcare bulletin 1999). Learning theories suggest that particular behaviours will be repeated if they are rewarded with incentives, and stopped if they are penalised. These theories support the use of reinforcing strategies such as audit and feedback, and the use of financial incentives and regulatory sanctions to bring about change.

Social cognition models see beliefs and attitudes as key to the way people behave. Issues such as an individual's perception of the benefits versus the costs of a particular change can be important, as well as their perception of others' views and their belief in their own ability to perform a particular new behaviour. Interventions that affect these underlying perceptions are seen as successful ways to bring about change. The 'stages of change model' suggests that individuals go through various stages during the process of making a change, and that different interventions will be effective at different stages. This theory supports the idea that the needs of particular groups should be assessed before behaviour change interventions are designed, so the intervention is tailored to specific needs.

Organisational models of change look at the different stages that organisations go through in the process of change. Important issues at the organisational level are the context in which the change is set to occur, the process through which the change will be secured and the content of the change required. These models focus on the complex nature of organisations and the need to look at internal and external barriers to change. More detail on these theories of change can be found in many of the major reviews on this subject (for example for a more detailed summary of the change theories see (Grol et al. 2005)).

2. METHODOLOGY

2.1 Search strategy

We searched the following databases for review articles on health professional behaviour change; Cochrane, Medline, Embase, PsychInfo, Assia, BNI, Cinahl, ERIC, HMIC, DARE. Using search terms such as "behaviour change", "professional practice", and "interventions" we searched for review articles published since 1995 which related to physicians, nurses and various allied health professionals. An example of the search strategy syntax used is given in appendix I at the end of this report.

Due to the broad nature of the topic being searched, locating all the relevant articles through systematic database searching was difficult. This is a problem acknowledged in a number of systematic reviews on this subject, which highlight the difficulties in searching this area due to the literature being in both generalist and specialist publications and being poorly indexed in bibliographical databases (Bero et al. 1998; Grol and Grimshaw 1999). Because of this, references were also sourced by the author through hand searching methods, particularly using the Cochrane database, and by following up bibliographic references. As the database search failed to bring up much detail on financial, organisational and national level interventions, the hand search particularly focused on finding reviews relating to these individual areas. These were added to the systematically sourced articles to maximise the number of relevant papers included in the review.

714 articles were identified by the database search of which 83 were seen to meet the inclusion criteria for this review. An additional 20 review articles were sourced by the author. The articles were systematic or narrative reviews, published between 1995 and 2006 in peer reviewed publications, which look at the effect on clinician behaviour of either single or multiple interventions. Many of the primary studies relate to physicians, but also nurses, pharmacists and other allied health professionals. The outcome measures used include rates of prescribing, immunisation or referral, specific measures of adherence to particular guidelines, and some studies use health outcome measures. Some systematic reviews include objective outcome measures (e.g. Jamtvedt et al. 2006; O'Brien MA. et al. 2001; O'Brien et al. 1997) although not all reviews give detail on the measures used in primary studies.

The articles fell into two categories; those which gave an overview of the effectiveness of a number of behaviour change interventions, and more specific articles which looked into a particular type of intervention, often in a specific setting. Due to time constraints it was agreed that we would focus on the general overview articles. Systematic reviews from the Cochrane collaboration which looked into specific interventions were also considered as these provided a methodologically high quality overview of studies in each individual intervention area. In total the findings of 49 articles have been included in this review.

One reviewer read each of the articles and extracted relevant information into an evidence framework, where findings were categorised by intervention type. Evidence tables showing the studies and their main findings are included in an appendix to this paper.

2.2   Limitations of the review methodology

This mapping review is a rapid search of the literature aiming to give a broad overview of the interventions available to change clinicians' behaviour and their effects. The broad nature of this topic and the difficulties with bibliographic indexing mean that some review articles will have been missed. This study only considers review articles. It is not possible to draw specific conclusions about the effect of particular interventions in very specific contexts. Some articles used a systematic review method, and include only studies meeting stringent methodological criteria. Other articles are narrative reviews which look across the major studies in this area but do not apply such rigorous selection criteria. Some papers are reviews of the systematic review literature. A number of the papers in this study reference many of the same individual studies or reviews in their research. However, the frequency of citation of particular conclusions does not reflect the size of the evidence base.

As the literature search focused on peer reviewed journals some important research in the grey literature may have been missed.

3. RESULTS

INDIVIDUAL LEVEL INTERVENTIONS

3.1 Educational materials

Summary points

- Educational materials are generally viewed as ineffective in influencing clinician behaviour, despite being the most regularly used intervention.
- Some recent systematic reviews do however identify modest effects and, as this intervention is cheap to implement, the changes it brings may be cost effective.
- Education is a necessary but not sufficient condition for behaviour change and is more effective if combined with other reinforcing strategies to form part of a multifaceted intervention.

Educational materials are the most commonly used, and probably the cheapest behaviour change intervention. They can take the form of written recommendations for care, audiovisual material, web publications or educational computer programmes. Their success depends on the assumption that there are relatively few barriers to changing behaviour; individuals will digest information provided and use it to guide their practice (Wensing and Grol 2005a).

Thirteen reviews specifically looked at the effectiveness of educational materials in changing behaviour [1]. They found passive information dissemination to be ineffective. Major systematic reviews which looked across healthcare professions came to this conclusion (e.g. (Effective healthcare bulletin 1999; Oxman et al. 1995), as did reviews specifically relating to nurses, midwives and allied health professionals (Thomas et al. 1999) and physicians (Smith 2000).

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[1] (Alvanzo et al. 2003; Bauchner et al. 2001; Bero et al. 1998; Effective healthcare bulletin 1999; Freemantle 2006; Grimshaw et al. 2004; Grimshaw et al. 2001; Grol 2002; Grol and Grimshaw 2003; Oxman et al. 1995; Smith 2000; Thomas et al. 1999; Wensing and Grol 2005a)

However a recent review by Jeremy Grimshaw and colleagues suggests that educational materials are effective in changing clinician behaviour (Grimshaw et al. 2004). They considered 235 studies of the benefits and costs of various guideline development, dissemination and implementation strategies, and concluded that although the distribution of educational materials had only a modest impact on clinician behaviour, this could be important if replicated in everyday practice. Printed educational materials are low cost and may bring cost effective changes in practice despite their limited effect (Wensing and Grol 2005a).

The format and layout of educational materials can affect how influential they are in changing behaviour and there is a body of literature which looks at this specifically. Our review does not analyse this in detail, but from the limited amount of literature on this that was bought up in our search user friendly formats, guidelines that gave clarity about the roles different health professionals play in their implementation, and those that are less complex, and more specific about the changes required appear to be more effective (Hanies et al. 2004; Richens et al. 2004).

Bauchner et al (2001) asked doctors why they changed their behaviour and found that any form of information could contribute to change. Educational materials may be a necessary but not sufficient requirement for change to occur (Bauchner et al. 2001). They can raise awareness of a desired behaviour even if they do not, on their own, cause change to occur (Grimshaw et al. 2001). This implies that educational materials may be effective when part of a multifaceted behaviour change strategy.

Combination with other interventions

The literature finds that educational materials do appear to be more effective when part of a multifaceted behaviour change strategy that includes a number of different interventions (Bauchner et al. 2001; Wensing and Grol 2005b). However, there is little evidence about which strategies are best used with educational materials. Wensing and Grol found that when different types of educational intervention (e.g. educational materials, educational meetings, out-reach visits, patient educational materials) were combined, they were more effective than when used alone. It may be that written educational materials create a "foundation" for behaviour change, making healthcare professionals more open to change, while the reinforcing strategies of outreach or patient educational materials (discussed later in the paper) address barriers to change and so facilitate modifications in clinicians' behaviour (Wensing and Grol 2005b). If healthcare professionals are knowledgeable about a

required change, then educational materials will not add to the effectiveness of a behaviour change strategy as there is no 'lack of knowledge' barrier for them to address (Grimshaw et al. 2001; Wensing and Grol 2005b).

3.2   Educational meetings

Summary points

- Large scale didactic meetings are generally seen as ineffective, especially if trying to change complex behaviours.
- Smaller-scale interactive meetings are seen as more effective, although the attributes that make them so are not known.
- Cost-effectiveness of this intervention is not known and it is also unclear whether short-run effects continue in the longer-term.

The literature identifies two forms of educational meeting; large-scale didactic meetings such as lectures and conferences where information is relayed to a passive audience, and smaller-scale meetings which are more interactive, possibly a workshop set-up or small training session where participants take an active role in their education and learning.

Sixteen reviews specifically looked at the effectiveness of educational meetings in changing health professionals' behaviour [2]. Large scale meetings were seen as generally ineffective in bringing about behaviour change (e.g. (Berenholtz and Pronovost 2003; Davis and Taylor-Vaisey 1997; O'Brien MA. et al. 2001; Oxman et al. 1995)) and as the behaviours they seek to change become more complex they become less effective in bringing about those changes (O'Brien MA. et al. 2001).

Small-scale meetings were found to be more effective than didactic methods in many reviews (e.g. (Bauchner et al. 2001; Berenholtz and Pronovost 2003; Grol and Grimshaw 2003; O'Brien MA. et al. 2001; Oxman et al. 1995). They have been demonstrated to be particularly effective in outpatient settings (Grol 2002). However, although there is clearly a link between the level of interactivity in an educational session and its effectiveness in

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[2] (Bauchner et al. 2001; Berenholtz and Pronovost 2003; Bero et al. 1998; Davis and Taylor-Vaisey 1997; Freemantle 2006; Grol 2002; Grol 2001; Grol and Grimshaw 2003; O'Brien MA. et al. 2001; Oxman et al. 1995; Poses 1999; Richens et al. 2004; Sitza 2002; Smith 2000; Wensing and Grol 2005a; Zwarenstein et al. 2000)

changing behaviour, the review literature contains little evidence on the specific attributes that make a session successful. For example, the optimal length for the educational sessions is unclear (Bauchner et al. 2001).

There are fewer studies into the effectiveness of small-scale meetings compared to larger educational sessions (Wensing and Grol 2005a) and there are calls for more research into this area, especially into their cost effectiveness (O'Brien MA. et al. 2001). Although small-scale meetings have been demonstrated to be more effective than passive educational strategies, they are clearly more expensive to implement and maintain (Berenholtz and Pronovost 2003; Grol 2001). It is also unclear whether the short-run effects they create are sustained in the longer term.

3.3   Educational outreach visits

Summary points

- Outreach visits to professionals in their practice were found to be effective, most notably in changing prescribing behaviour but also in the delivery of preventative services and the management of common problems in general practice.
- The effect of outreach visits on more complex behaviours is unclear.
- Outreach visits may be particularly effective if combined with social marketing techniques.
- Cost effectiveness is not known but this intervention can be expensive and time consuming to implement.

Educational outreach visits (also known as academic detailing) were originally used in the pharmaceutical industry to influence the prescribing behaviour of pharmacists. A trained individual visits a care provider in their own practice setting and offers information, support and instruction (Wensing and Grol 2005a). Fourteen reviews looked into how educational outreach visits influence clinician behaviour [3].

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[3] (Alvanzo et al. 2003; Bauchner et al. 2001; Bero et al. 1998; Effective healthcare bulletin 1999; Freemantle 2006; Grimshaw et al. 2004; Grimshaw et al. 2001; Grol and Grimshaw 1999; Grol and Grimshaw 2003; O'Brien et al. 1997; Oxman et al. 1995; Richens et al. 2004; Smith 2000; Wensing and Grol 2005a)

Many of the reviews found that this intervention did affect behaviour, particularly prescribing (Bero et al. 1998; Effective healthcare bulletin 1999; Grimshaw et al. 2001; Grol and Grimshaw 2003; O'Brien et al. 1997; Oxman et al. 1995). Outreach visits also improved the delivery of preventative services such as smoking cessation (Oxman et al. 1995) and the management of common problems in general practice (O'Brien et al. 1997). However Grol and Grimshaw, in their summary of systematic reviews on behaviour change, note that the effect of outreach visits on more complex behaviours is unclear. For example it is not known whether outreach visits could be effective in improving the management of chronic diseases or depression (Grol and Grimshaw 1999).

This intervention is expensive and also time consuming to implement, and its cost effectiveness is not known (Alvanzo et al. 2003; Bauchner et al. 2001). It is also unclear how much its results diminish over time, or what are the optimal number of visits (Alvanzo et al. 2003; O'Brien et al. 1997). One study reviewed by Alvanzo and colleagues found that the effect of outreach doubled when a repeat visit was carried out, implying that repeating this intervention may improve its effectiveness (although again, this would add to it's cost) (Alvanzo et al. 2003). The identity of the outreach visitor may also have an impact on effectiveness (Richens et al. 2004).

Combinations with other interventions

Outreach visits appear to be particularly effective when used as part of a multifaceted intervention (Wensing and Grol 2005b). Wensing and Grol cite one review where 12 of the 13 studies considered showed positive effects, mainly on prescribing behaviour. Outreach was successfully combined with social marketing techniques, where the target population for the intervention is surveyed/mapped, barriers are identified and the intervention is tailored to their needs. However more research and development work is needed into how this should be done (Effective healthcare bulletin 1999; O'Brien et al. 1997). Feedback, reminders and interventions aimed at patients are also effective when combined with outreach visits (Wensing and Grol 2005b).

3.4 Opinion leaders

Summary points

- Studies show that the use of opinion leaders to disseminate information has mixed effects on behaviour.
- It is not always clear what the opinion leader does in each study, making general conclusions difficult.
- It is unclear how those wishing to disseminate information can accurately identify who the local opinion leaders are.

Local opinion leaders are individuals seen as "authorities" who use their respected influence to promote behaviour change. They can be involved in changing behaviour in a number of ways ranging from signing a letter, to delivering speeches and lectures or undertaking outreach visits (Wensing and Grol 2005a). The case for their effectiveness is based on the theory of diffusion of innovations, first developed by Rogers, which suggests that ideas are spread by imitation (Greenhalgh et al. 2004).

Eleven reviews looked at opinion leaders' role in changing behaviour [4] and the majority reported they have mixed effects (Bero et al. 1998; Effective healthcare bulletin 1999; Grol and Grimshaw 2003; O'Brien MA. et al. 1999; Oxman et al. 1995), although some reviews saw them as having mainly positive effects (Greenhalgh et al. 2004; Wensing and Grol 2005a). Studies have shown, for example, that opinion leaders positively influenced the treatment of arthritis and respiratory diseases, and helped to increase the use of vaginal delivery following previous caesarean section (O'Brien MA. et al. 1999).

Several reviews call for more research on the impact of local opinion leaders. The precise activities of local opinion leaders are unclear in the trials assessing their effectiveness which makes comparison and general conclusions difficult. It is also unclear how to identify local opinion leaders and reviews call for more research to understand this and to identify the circumstances in which opinion leaders are likely to be most effective (Greenhalgh et al. 2004; O'Brien MA. et al. 1999).

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[4](Bauchner et al. 2001; Bero et al. 1998; Effective healthcare bulletin 1999; Greenhalgh et al. 2004; Grimshaw et al. 2004; Grol and Grimshaw 2003; O'Brien MA. et al. 1999; Oxman et al. 1995; Richens et al. 2004; Thomas et al. 1999; Wensing and Grol 2005a)

3.5 Audit and feedback

Summary points

- The literature finds mixed effects from audit and feedback, mainly small to moderate positive effects.

- There is little clear evidence on what form of audit and feedback should be used and when it should be delivered.

- There is little methodologically sound evidence on the key attributes of this intervention, and how these impact on effectiveness. However, key issues seem to include who provides the feedback, its timeliness, the data's quality, relevance of content, level of clinician buy-in, and the active or passive nature of the feedback.

- The format should be based on pragmatic factors and local circumstances

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The audit and feedback process involves retrospective reporting of information to individuals or organisations about their actions. The information is collected from actual practice in order to increase insight into particular actions. Data can be collected either through internal audit, where clinicians are involved in data collection, or external audit where others collect and collate the information. The feedback can be on outcomes of care, costs, or other elements of clinical performance and it may be comparative among peers or non-comparative (Van der Weijden and Grol 2005).

Sixteen reviews looked at the use of audit and feedback to change behaviour, although often in little detail [5]. Most reviews reported mixed effects, which were generally in the range from small to moderate (Alvanzo et al. 2003; Bero et al. 1998; Freemantle 2006; Grimshaw et al. 2004; Grimshaw et al. 2001; Grol and Jones 2000; Grol and Grimshaw 2003; Jamtvedt et al. 2006). A Cochrane systematic review of audit and feedback studies found that there was no empirical basis for deciding how audit and feedback should be provided, and recommends that the format should be based on pragmatic factors and local circumstances (Jamtvedt et al. 2006).

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[5] (Alvanzo et al. 2003; Bauchner et al. 2001; Berenholtz and Pronovost 2003; Bero et al. 1998; Davis and Taylor-Vaisey 1997; Effective healthcare bulletin 1999; Freemantle 2006; Grimshaw et al. 2004; Grol and Jones 2000; Grol and Grimshaw 1999; Grol and Grimshaw 2003; Jamtvedt et al. 2006; Oxman et al. 1995; Poses 1999; Smith 2000; Van der Weijden and Grol 2005)

Despite this, a number of reviews mention characteristics that have an impact on the effectiveness of feedback interventions. The reviews find feedback to be more effective when there is a low level of baseline compliance with the action on which information is being reported (Jamtvedt et al. 2006). Clinician buy-in before the feedback process began is also important (Alvanzo et al. 2003). A number of reviews see good quality data as important (Alvanzo et al. 2003; Van der Weijden and Grol 2005), as audit had little effect where professionals had concerns about the quality of the measures and data used (Berenholtz and Pronovost 2003). The source, volume and format of data may impact on its effectiveness but Wensing and Grol note that the studies they reviewed said little about the ideal format and content of the data. The barriers to adherence need to be understood and content adapted to address those barriers (Van der Weijden and Grol 2005).

The manner in which feedback is delivered is also considered by reviewers. Several reviews suggest that timely feedback occurring concurrently with practice is the most effective (e.g. (Davis and Taylor-Vaisey 1997; Jamtvedt et al. 2006; Van der Weijden and Grol 2005)). The person who actually gives the feedback should be respected by those receiving it (Van der Weijden and Grol 2005). Reviewers note that it is often unclear whether the clinicians involved in studies passively received feedback or were more actively involved in discussion about its implications. A review suggests that the effects of feedback might be larger if clinicians are actively involved, although lack of evidence makes this difficult to assess (Jamtvedt et al. 2006). Another review suggests that small group meetings with peers to discuss the data might increase the effectiveness of the audit, and that individual level feedback may be more effective than that reported at group level. Feedback may be more effective if used in situations where individuals do not realise that their practice deviates from what is required (Van der Weijden and Grol 2005).

Combining this intervention with others

Some reviews suggest the effectiveness of this intervention can be increased by combining it with others (Smith 2000; Wensing and Grol 2005b), although one systematic review found that when part of a multifaceted intervention the contribution of audit and feedback to overall effectiveness was low (Jamtvedt et al. 2006). Wensing and Grol found that combining feedback with education was particularly effective in improving the delivery of preventative services in primary care. Studies they reviewed also showed that combining feedback with financial incentives and the delegation of tasks to nurses could be effective, although in some studies the effects were small and not significant (Wensing and Grol 2005b).

3.6   Reminders (including computer decision-support)

Summary points

- Reminders can be moderately effective in changing behaviour, particularly when computer decision-support is used to influence prescribing and the delivery of preventative care services.

- Reminders are more effective if designed to specifically address barriers to change.

- There are concerns that computer decision support may not cope with the complexities of patient-doctor decision making.

This intervention involves the communication of a piece of information to remind a professional to undertake or avoid a certain action. The reminder may be given before or during contact with the patient. It might take the form of stickers on medical notes, posters in the work place, or computer decision support which provides patient-specific reminders or recommendations during a consultation (Van der Weijden and Grol 2005).

Fourteen reviews looked at this behaviour change intervention [6]. It was generally found to be effective in changing clinician behaviour (Alvanzo et al. 2003; Bauchner et al. 2001; Bero et al. 1998; Davis and Taylor-Vaisey 1997; Dijkstra et al. 2006; Effective healthcare bulletin 1999; Grimshaw et al. 2004; Grol and Grimshaw 2003; Oxman et al. 1995; Richens et al. 2004; Smith 2000; Thomas et al. 1999; Van der Weijden and Grol 2005; Wensing et al. 2005b), although some reviews found mixed effects (Alvanzo et al. 2003; Van der Weijden and Grol 2005). The heterogeneity of the behaviours studied make generalisations difficult (Van der Weijden and Grol 2005) but there is evidence of computer decision support being effective in improving prescribing behaviour (Bero et al. 1998; Van der Weijden and Grol 2005), the provision of preventative care (Bauchner et al. 2001; Bero et al. 1998; Grol and Grimshaw 2003), general clinical management of patients (Bero et al. 1998), adherence to test ordering guidelines, and disease management (Van der Weijden and Grol 2005). One review found decision-support was not effective in helping with diagnosis (Bero et al. 1998). Reviews found that it was effective in outpatient settings (Alvanzo et al. 2003), had neutral to positive impacts in primary care (Grol and Grimshaw 2003), but only mixed results in

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[6](Alvanzo et al. 2003; Bauchner et al. 2001; Bero et al. 1998; Davis and Taylor-Vaisey 1997; Dijkstra et al. 2006; Effective healthcare bulletin 1999; Grimshaw et al. 2004; Grol and Grimshaw 2003; Oxman et al. 1995; Richens et al. 2004; Smith 2000; Thomas et al. 1999; Van der Weijden and Grol 2005; Wensing et al. 2005b)

inpatient settings (Alvanzo et al. 2003). In relation to nurses, Thomson notes that reminders have not yet been proven to be effective in helping nurses with the implementation of guidelines (Thomas et al. 1999).

Despite these generally positive findings, Wensing and colleagues note that the initial optimism about computer decision-support changed in the 1990s when it became clear that the decision-making process between doctor and patient was sometimes too complex to be supported by limited computer software (Wensing et al. 2005b).

Although much of the literature focuses on computer decision-support, it is not necessary for reminders to be computer generated for them to be effective. Alvanzo and colleagues note that oral and written reminders are also effective (Alvanzo et al. 2003).

The literature discusses factors that improve the intervention's success. Reminders are more effective if given at the point of decision making, and more frequent interventions are likely to be more effective, but researchers believe more research is needed in this area (Van der Weijden and Grol 2005). It is unknown if the effect of reminders continues after they are stopped (Smith 2000; Van der Weijden and Grol 2005). Reminders may be more effective for those who are still in training than for more established clinicians. The barriers to adherence need to be understood and content adapted to address those barriers (Van der Weijden and Grol 2005).

Combinations with other interventions

Wensing and Grol cite studies showing that reminders to physicians can be successfully combined with information or reminders for patients. Combining reminders with continuing medical education appears to have less effect, but the authors conclude that reminders could usefully reinforce learning from education to reduce relapse into previous behaviour patterns (Wensing and Grol 2005b).

3.7   Patient-mediated interventions

Summary points:

- Passing information to patients through mass media may be effective in changing clinician behaviour, although it is unclear whether this effect is due to patients or clinicians themselves making use of the information, and the methodological quality of studies in this area is low.

- There is some evidence that providing educational materials for patients can help the implementation of guidelines.

- Direct-to-patient advertising by pharmaceutical companies appears to affect patient demand for drugs, but there are no rigorous evaluations of this.

- The impact of public reporting of clinician performance is unclear, although there is some evidence implying it affects an organisation's behaviour.

Patient-mediated interventions focus on providing information for the public, who use the knowledge to influence their healthcare provider either through demanding certain services or procedures, or to make choices which alter the demand for an organisation's services and cause it to change its behaviour to attract or retain patients.

Eleven reviews looked at patient mediated interventions although often in little detail [7]. One type of patient mediated intervention is the provision of information to patients through the mass media, and this has been found to be effective in changing clinician behaviour (Grilli et al. 2002; Van der Weijden and Grol 2005). A systematic review by the Cochrane Collaboration looked specifically at mass media interventions and 19 of the 20 studies included found that this intervention was effective in changing health service utilisation (Grilli et al. 2002). Both planned media campaigns and unplanned coverage were effective. The authors conclude that mass media communication channels should be considered by those seeking to encourage effective use of services and discourage use of ineffective ones. The authors do note however that the methodological quality of studies in this area was variable. Also, it is difficult to tell whether the observed change in health service utilisation is due to the mass media encouraging health professionals to change their behaviour or to consumers

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[7](Berenholtz and Pronovost 2003; Bero et al. 1998; Davis and Taylor-Vaisey 1997; Ganju 2003; Grilli et al. 2002; Grol 2001; Grol and Grimshaw 2003; Hanies et al. 2004; Oxman et al. 1995; Wensing et al. 2005b; Wensing et al. 2005a)

changing their behaviour. There is a lack of evidence about how long the effect of mass media campaigns lasts, and cost effectiveness. The authors call for more research into how media messages should be formatted to have most effect and to discover whether this method increases use of health services in those who will benefit most from them.

Educational materials distributed directly to patients are thought to help change clinician behaviour as patients are more likely to cooperate with a new practice they know about, making it easier for clinicians to implement a change. However, the effect of patient educational materials on clinician care processes is difficult to determine as most studies report patient outcome changes rather than process changes (Wensing et al. 2005a). There is however some evidence that patient educational materials are effective in helping the implementation of guidelines on diabetes, preventative strategies, smoking cessation, and depression (Davis and Taylor-Vaisey 1997). The impact of using the internet to provide information for patients has not been widely researched (Grilli et al. 2002). Wensing et al found just one review that showed that internet information had positive effects on health outcomes, although its methodological quality was poor and its effect on health service use unexplored. Direct-to-patient advertising by pharmaceutical companies appears to affect patients' demand for drugs, but there are no rigorous evaluations in this area (Wensing et al. 2005a).

Two reviews look at the impact of public reporting on clinicians' performance on the behaviour of patients (Grol 2001; Wensing et al. 2005a). They found that the information provided is often not relevant to the decisions patients have to make and it is difficult for patients to decipher the meaning of publicly reported indicators (Wensing et al. 2005a). One randomised control study quoted by Grol found that people did not use or trust the information, but it did influence quality improvement within organisations (Grol 2001).

ORGANISATIONAL LEVEL INTERVENTIONS

3.8   General points

Summary points:

- There is less research into organisational level interventions than those targeted at individuals, possibly due to difficulties establishing a comparable control group.

- Research suggests organisational changes can affect individual's behaviour, although its impact is context specific and there is no one 'magic bullet' for changing behaviour.

- To facilitate adoption of new processes, organisations need adequate resources (time, people), strong management and leadership, and good systems of communication. They should tailor behaviour change interventions to local circumstances and rigorously evaluate and monitor progress. Organisations also need to consider cost effectiveness.

The interventions considered in the first section of this paper were directed at individual clinicians, but changes in the management and structure of organisations can also affect the behaviour of individuals. Many reviews note that information is sparse on organisational interventions to change behaviour (Dijkstra et al. 2006; Greenhalgh et al. 2004; Solberg 2000). Although most reviews on behaviour change implicitly acknowledge the importance of the organisational level (through mentioning the importance of addressing contextual issues) it is rarely explicitly studied (Solberg 2000). This is despite the fact that a number of reviewers believe organisational interventions hold the key to effective change (Solberg 2000) (Bauchner et al. 2001). The lack of studies in this area may be due to difficulties establishing a comparable control group, as all organisations differ in some way (Van der Weijden and Grol 2005).

Unlike the literature on individual level interventions, there was no one body of review evidence on how behaviour change works at the organisational level. The relevant material had to be extracted from literature on guideline implementation, the implementation of evidence-based working practices, the diffusion of innovations within organisations, and general literature on change management, organisational development and quality improvement.

Research does suggest that changes at the organisational level can effectively change individual clinicians' behaviour (e.g. (Dijkstra et al. 2006; Van der Weijden and Grol 2005; Wensing et al. 2005b)). But, as with initiatives targeted directly at the individual, it appears that there is no one 'magic bullet' that helps the implementation of change (Dijkstra et al. 2006). The effect of different interventions is influenced by the context within which they are applied, making it difficult to draw general conclusions. Knowledge of the organisational and political setting is needed to select an appropriate intervention within each context (Wensing et al. 2005b).

The literature suggests a number of ways in which organisations can ensure that new processes are efficiently adopted. Firstly adequate resources should be available including dedicated funding and human resource capacity and competence (Greenhalgh et al. 2004; Richens et al. 2004). It is important that individuals have enough time to implement changes. Nurses often mention lack of time as a barrier to the implementation of evidence based practice and to the diffusion of innovations within organisations (Dicenso 2003; Greenhalgh et al. 2004; Shirley 2006; Sitza 2002). Secondly, issues of cost effectiveness should be considered when selecting strategies (Greenhalgh et al. 2004). Thirdly, strong leadership is needed (Wensing et al. 2005b) with the management showing clear commitment to the implementation process (Greenhalgh et al. 2004) and the implementation being made an organisational priority (Richens et al. 2004). There is some evidence that programmes of total quality management can affect behaviour, but a review of 55 studies quoted by Wensing and colleagues concluded there was still insufficient evidence to draw clear conclusions. There was some evidence of improvements in nursing homes but little evidence for effectiveness in primary care (Wensing et al. 2005b).

Fourthly, good systems of communication are required, with the change message properly designed and communicated through appropriate channels. Good intra and inter organisational communication channels are important especially if the change is complex (Greenhalgh et al. 2004). Fifthly, interventions should be tailored to local organisational demographics, structure and culture. Some adaptation or reinvention may be required to apply a change to local circumstance (Greenhalgh et al. 2004). Finally, evaluation and monitoring progress is important. Some reviews suggest that guideline adherence should be a part of organisation's financial and quality assurance systems (Freemantle 2006), with progress towards defined goals and milestones rigorously monitored and accurate and timely feedback provided to relevant individuals on their progress (Greenhalgh et al. 2004).

3.9   Specific organisational changes

> **Summary points**
> - There is some evidence that changing professional roles can affect behaviour; particularly expanding pharmacist roles and prescribing behaviour.
> - Evidence on the effect of delegating tasks to nurses is mixed.
> - Improving collaboration between professions may help the implementation of change but it is not clear how collaboration is encouraged.
> - The development of good office systems can help practice development in preventative care and chronic disease management.

Four reviews specifically looked at the effect on behaviour of changing professional roles (Freemantle 2006; Grol and Grimshaw 2003; Thomas et al. 1999; Van der Weijden and Grol 2005). Expanding the role of pharmacists was found to have a positive impact on prescribing behaviour (Freemantle 2006; Grol and Grimshaw 2003; Van der Weijden and Grol 2005). The delegation of tasks to nurses was shown to be of mixed or no effect in a number of reviews (Grol and Grimshaw 2003; Van der Weijden and Grol 2005), although Thomson asserts that the extension of nurses professional roles may be effective in increasing guideline adherence (Thomas et al. 1999).

Two reviews discussed multi-professional collaboration. Some studies show that improving collaboration between professions has positive effects on the process of care and patient outcomes (Wensing et al. 2005b), although one reviewer comments that the effects are too heterogeneous to allow generalised conclusions (Grol and Grimshaw 2003). The number of controlled studies in this area is low, and isolating the impact of improved collaboration from other factors is difficult (Wensing et al. 2005b). It is also not clear from the review literature how collaboration is improved in each study, making it difficult to conclude which interventions would best bring about change.

One review considered the effectiveness of introducing a disease management system where delivery of care was organised around the patient (for example with a unit dedicated to the treatment of patients suffering from stroke). They concluded that evidence on the effectiveness of this was inconclusive with one study showing positive effects, one mixed and one negative effects (Wensing et al. 2005b). It has been suggested that teaching

hospitals may create a better environment for change as they are 'learning organisations', and evidence supports this for inpatient but not outpatient settings (Dijkstra et al. 2006).

One review found that developing good office systems may be key to practice improvement and development in preventative care and chronic disease (Solberg 2000).

NATIONAL LEVEL INTERVENTIONS

Regulation

Summary points
- Regulation is associated with improvements in healthcare quality.
- UK studies show that targets are associated with reduced waiting times for in-patient and emergency care and national standards are associated with improvements in quality.
- Mandatory reporting is linked with better patient care, but may discourage the treatment of high-risk patients.
- There is significant evidence linking certification status with improved quality of care and improved patient outcomes in general and specialist physicians.
- There is little evidence linking formularies to the quality of care.

The literature on regulation and its impact on clinicians' behaviour and patient care was not picked up by the search strategy. The literature is sparse and based on observational studies. This section relies on a recently published grey literature review which notes that most of the evidence is US based and may not be directly transferable to the UK (Sutherland and Leatherman 2006).

The aim of regulation is to improve performance and quality, provide assurance that minimum standards are achieved and provide accountability for levels of performance and value for money (Sutherland and Leatherman 2006).

There are two types of institutional regulation: targets and external oversight. Target setting defines and communicates an expected level of performance. It directs attention and resources to identified objectives, may lead to greater persistence in face of obstacles, and also encourages strategy development. Targets can focus on outcomes, process, inputs or

outputs. To be effective a target must be realistically achievable and sufficiently ambitious within a set timescale. The number of targets must be modest. External oversight refers to surveillance and enforcement to ensure minimum standards are met and includes accreditation, inspection, audit, review, licensure, and certification.

UK evidence suggests that targets have been associated with reduced waiting times for inpatient care, urgent ambulance calls, and access to accident and emergency services. UK studies also suggest that the development of national standards is associated with improvements in quality. The prospect of or actual inspection acts as a catalyst for improvement in a regulated organisation. However evaluations of UK agencies are unable to evaluate their impact on quality because of methodological problems. There is uneven evidence on whether accrediting organisations results in improved quality care. Mandatory reporting on clinical performance informs patients, physicians and institutions about relative performance. US studies show mandatory performance reporting has a positive effect on patient care, but can discourage treatment of high risk patients.

Professional regulation aims to ensure a minimum standard of care, assure patients or providers that medical professionals are deserving of trust and finally improve the quality of care by providing guidance about best practice and encouraging improvements in performance through measurement and feedback. Most countries have a system to control entry into the medical profession and a registered list of physicians who are licensed to practice. Types of professional regulation include licensure, registration, certification, revalidation and recertification, and credentialing. A recent review suggests that certification rather than licensure is linked to better quality care and better patient outcomes (Sutherland and Leatherman 2006). Certification recognises levels of knowledge, skill and competence beyond the minimum level needed for the legal permit or license to practice. Recertification and validation are ongoing affirmation of continuing competence.

There is little evidence on the impact of licensure on the quality of care among physicians. Some studies show a correlation between a higher proportion of licensed or registered nurses and higher quality of care and better patient outcomes, but this may reflect their higher training levels rather than quality issues.

A significant body of evidence shows that over time the skills and knowledge of medical professionals erode with potentially serious consequences for the quality of care. A substantial body of evidence links certification status with improved quality of care and better

patient outcomes in general practitioners and specialist physicians. Numerous studies also show an association between a lack of certification and disciplinary action.

Formularies are lists of preferred drug products that limit the number of options available for prescription in an attempt to balance quality and effectiveness with affordability and cost effectiveness. There is little robust evidence on the impact of formularies on the quality of care.

Financial payment systems

Summary points

- Fee-for-service payment systems encourage primary care physicians to maximise the quantity of care to increase their income.
- Capitation and salaried payment systems can contain cost per patient as primary care physicians will change their prescribing patterns, refer patients for secondary care or select low risk patients to reduce their costs and increase their income.

The review evidence is not robust enough to be applied in every policy context and authors point to methodological problems in comparing across different health systems and call for further evaluation of different payment schemes to determine the impact of changing payment systems on clinician behaviour (Chaix-Couturier et al. 2000; Giuffrida 1999; Gosden 2000; Gosden et al. 2001).

With fee-for-service systems payment is made for every item of service delivered. Target payment systems pay physicians a lump sum for delivering a certain quantity or level of care. Capitation systems make payments for every patient for whom care is provided. Salaried systems pay physicians a salary linked to hours worked and professional status.

Payment systems such as fee-for-service and target payments, which link physicians' remuneration to health care output, create incentives for physicians to maximise the quantity of care to increase their incomes. With fee-for-service primary care physicians may try to maintain or increase their income by inducing demand for services leading to unnecessary treatments; or concentrate on profitable fee-paying services only. Reviews show that fee-for-service payment systems result in more primary care visits or contacts, visits to specialists and diagnostic and curative services but fewer hospital referrals and repeat prescriptions compared with capitation. Compliance with a recommended number of visits is higher under

fee-for-service compared with capitation payment. Fee-for-service results in more patient visits, greater continuity of care, and higher compliance with a recommended number of visits, but patients are less satisfied with access to their physician compared with salaried payment (Chaix-Couturier et al. 2000; Gosden 2000). Target payments can mean that primary care physicians provide the target level of care only, but may provide no care if they risk not meeting the target (Giuffrida 1999) .

Capitation and salaried systems encourage primary care physicians to reduce their costs. With capitation primary care physicians can contain costs per patient by selecting low risk patients, referring patients to secondary care or offering generic rather than named prescription drugs or providing preventive care. Salaried primary care physicians can contain costs by selecting low risk services, using referrals and prescriptions and minimising the number of consultations (Chaix-Couturier et al. 2000; Gosden 2000; Gosden et al. 2001). The evidence is mixed on the impact of capitation on the number of hospital and specialist visits compared with fee-for-service. Salaried payment results in a lower number of primary care visits compared with capitation (Gosden 2000).

Hybrid systems do exist (Robinson 2001) but the search strategy did not produce any reviews on the effects of combining different economic models on physician behaviour and the quality of care.

Information and feedback systems about prescribing behaviour increase physicians' awareness of costs and help change prescribing behaviour, especially shifting from named to generic drugs. No review level studies were found evaluating this issue (Bloor and Freemantle 1996).

MULTIFACETED INTERVENTIONS

> **Summary points**
> - Multifaceted interventions can be more effective than single strategies, especially if barriers to change are identified and the choice of interventions is tailored to address these.
> - Multifaceted interventions are more costly than single strategies and will not always be the most cost effective strategy.

Multifaceted interventions describe the use of a number of single interventions at once to bring about a change in behaviour. The use of a number of interventions can address the many barriers to change in behaviour at professional, patient, organisational and political levels (Grimshaw et al. 2001). Different interventions are also more or less effective for individual clinicians who each have individual learning styles (Bauchner et al. 2001).

Most interventions are multifaceted in nature. In one review three quarters of the studies included were multifaceted (Grol and Grimshaw 2003). Findings about multifaceted interventions have been reported in relevant sections earlier in this paper, so general points are considered here. Twelve reviews looked into the effectiveness of multifaceted interventions [8] and most concluded they are effective in changing behaviour and are more effective than using a single intervention (Bero et al. 1998; Davis and Taylor-Vaisey 1997; Grimshaw et al. 2001; Grol and Grimshaw 2003; Oxman et al. 1995). One paper found 18 reviews considering the effect of multifaceted interventions and concluded that they have moderately positive to very positive impact. However as the combination of interventions varies widely it is difficult to draw generalisable conclusions (Wensing and Grol 2005b).

Grimshaw at al (2004) disagree with these findings arguing that there is no evidence that multifaceted strategies work better than single interventions. They also find no evidence that having a larger number of interventions is better than a few. Grimshaw et al point out that few of the studies explain how they choose a particular combination of interventions. If interventions are tailored to address local barriers to change then multifaceted approaches may be more effective than individual interventions (Grimshaw et al. 2004).

The literature recommends a 'diagnostic analysis' to identify factors that influence change in each case. Once barriers are identified, the format, content and delivery of interventions can be tailored to address them (Effective healthcare bulletin 1999; Grol 2002; Oxman et al. 1995). Social marketing can be used to perform this diagnostic analysis although the literature is unclear about exactly what this involves and evidence on effectiveness is inconclusive (Oxman et al. 1995; Shaw et al. 2005).

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[8] (Bauchner et al. 2001; Bero et al. 1998; Davis and Taylor-Vaisey 1997; Dijkstra et al. 2006; Effective healthcare bulletin 1999; Grimshaw et al. 2004; Grimshaw et al. 2001; Grol and Grimshaw 2003; Jamtvedt et al. 2006; Oxman et al. 1995; Thomas et al. 1999; Wensing and Grol 2005b)

Multiple interventions may be more effective but they are also more expensive. In some cases single interventions may be more cost effective (Effective healthcare bulletin 1999). The combination of and interaction between interventions is important. If several interventions address the same barriers their use together is not necessarily more effective than the use of just one intervention. Different interventions when used together may also create a greater impact than if used separately. For example a clinician learning new techniques on a course may only apply them if changes are made within the organisation to support it (Wensing and Grol 2005b).

4.   DISCUSSION AND CONCLUSION

Many reviewers agree that there is no 'magic bullet' for changing professional behaviour (e.g. Effective healthcare bulletin 1999; Oxman et al. 1995). However, although our review cannot make precise links between particular interventions and particular kinds of behaviour change, among particular groups of people or in particular circumstances, there are some broad and general conclusions that can be drawn from the literature.

Passive forms of education appear unsuccessful in getting clinicians to modify their practice. Educational materials are generally seen as ineffective, although they may form part of a successful multifaceted change strategy, playing an important role in raising awareness of desired changes. Similarly, large scale educational meetings where participants passively receive information do not generally impact on practice. Active educational strategies appear more successful in bringing about change, for example small scale interactive meetings are more effective than large didactic sessions. Outreach visits, where professionals are visited in their own practice, and computer reminders also seem effective, particularly for changing prescribing behaviour. Audit and feedback has small to moderate effects and the impact of using opinion leaders to disseminate information is mixed. Targeting patients may get clinicians to change their behaviour and using mass media, providing patients with educational materials and direct-to-patient advertising can impact on clinical practice.

The above interventions are targeted at individuals, and several reviewers note that at best their effects are moderate (Grimshaw et al. 2004). They suggest that change is more likely to be embedded in practice if organisational and national level strategies support individual interventions and create a facilitating framework for change. Multifaceted strategies are theoretically more effective than single interventions as they allow different tools to be used to target different barriers for change. However their effectiveness depends on the context and the specifics of the multifaceted strategy. At both the national and organisational level, adequate resources, skills and knowledge facilitate successful change. Strong leadership which prioritises the change process is also key. Organisations can affect individuals' behaviour by changing professional roles, developing good office systems and promoting increased collaboration between the professions. At the national level, targets affect waiting times and standards are associated with improvements in performance and quality. Fee-for-service financial payment systems encourage clinicians to maximise the quantity of care they provide while capitation and salaried payment systems affect prescribing patterns, referrals, and patient selection as physicians try to reduce their costs.

These findings on the effectiveness and limitations of individual, organisation or national interventions are also evident in the literature specifically examining the implementation of NICE guidance. A national evaluation showed that guidance is more likely to be adopted when there is strong professional support, the professionals involved are not isolated and the evidence base is stable and convincing. Organisations are receptive to guidelines if there are no increased or unfunded costs and good systems for tracking guidance implementation (Sheldon et al. 2004). Similarly, Sutherland and Leatherman (2006) found that NICE guidance is most effective when supported by other levers of change such as strong professional support, and a stable and robust evidence base and organisations have sufficient resources to fund implementation (Sutherland and Leatherman 2006). For NICE, 'organisation' may refer to individual providers, but also, on a national level, the organisation of the NHS as a whole.

If NICE is to support professionals and healthcare organisations in implementing its guidelines it needs to decide which interventions may work effectively but also to persuade professionals and organisations of the likely positive impacts, and within organisations, change agents need to tailor implementation to local conditions.

Limitations of the findings

Although this review draws some general conclusions, these are limited by the nature of the evidence surveyed. Many reviews note the absence of methodologically high quality comparable evidence on behaviour change (e.g. (Freemantle 2006; Jamtvedt et al. 2006; O'Brien MA. et al. 1999)). This is especially apparent for organisational and national level interventions where establishing a comparable control group can be difficult or impossible. Results may also be effected by in-built bias in primary studies, as individuals agreeing to trail interventions are often 'early adopters' who are more amenable to change. A study whose intervention group contains 'early adopters' may exaggerate the effects of an intervention. Or if both control and intervention groups are 'early adopters' the study may underestimate the effect as the control group may change their behaviour (despite not being exposed to the intervention) as they are generally amenable to change (Grol and Jones 2000).

There is little literature comparing the effectiveness of interventions. Studies usually compare one intervention to no intervention at all, and few studies report data on cost effectiveness, making it difficult to choose between strategies. Many of the studies occur outside the UK and their applicability to the UK context is uncertain (Bero et al. 1998). Also

some studies question whether findings are consistent across different types of provider or different healthcare professional groups (Bauchner et al. 2001).

Many papers conclude with calls for further research, most frequently into cost effectiveness (e.g. (Berenholtz and Pronovost 2003; Grol 2001)) and also for research of higher methodological quality (e.g. (O'Brien MA. et al. 2001; O'Brien et al. 1997)), head-to-head comparisons of different interventions (Grol and Grimshaw 1999), the particular characteristics that make interventions work better (e.g. (Greenhalgh et al. 2004; Grilli et al. 2002; O'Brien MA. et al. 1999; O'Brien MA. et al. 2001)), and whether short-run effects continue in the longer-term (Van der Weijden and Grol 2005; Wensing and Grol 2005a).

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APPENDIX I: Search syntax example

Below is an example of the syntax used in our database search.

(meta ADJ analysis OR systematic ADJ review OR review OR randomized ADJ controlled ADJ trial OR controlled ADJ study OR evidence ADJ based ADJ practice OR overview OR bibliography).DE.
And
Medical-Staff.DE. or Physician#.W..DE. or Nurse#.W..DE. or Paramedical-Personnel#.DE. or clinical ADJ psychologist or clinical ADJ psychologist$ OR counsellor$ OR counselor$ or clinical governance.DE. or sexual health.DE. or clinical practice.DE.
And
Behaviour change.DE. or Attitude#.W..DE. OR Health-Personnel-Attitude.DE. OR Physician-Attitude.DE.
And
Practice-Guideline.DE. OR Clinical-Pathway.DE. OR Clinical-Protocol.DE. OR Consensus-Development.DE. OR Good-Clinical-Practice.DE. OR Clinical-Protocol.DE.
And
implement$ OR adher$ OR change OR changing