Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes (Review)

Cheater F, Baker R, Gillies C, Hearnshaw H, Flottorp S, Robertson N, Shaw EJ, Oxman AD

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[Intervention Review]

Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes

Francine Cheater[2], Richard Baker[3], Clare Gillies[4], Hilary Hearnshaw[5], Signe Flottorp[6], Noelle Robertson[7], Elizabeth J Shaw[1], Andrew D Oxman[8]

[1]National Institute for Health and Clinical Excellence, Manchester, UK. [2]School of Healthcare Studies, University of Leeds, Leeds, UK. [3]Clinical Governance R and D Research Unit, Department of General Practice and Primary Health Care, University of Leicester, Leicester, UK. [4]University Division of Medicine for the Elderly, University of Leicester, Leicester, UK. [5]Centre for Primary Health Care Studies, University of Warwick, Coventry, UK. [6]Norwegian Knowledge Centre for the Health Services, Oslo, Norway. [7]School of Psychology (Clinical Section), Leicester University, Leicester, UK. [8]Norwegian Knowledge Centre for Health Services, Oslo, Norway

Contact address: Elizabeth J Shaw, National Institute for Health and Clinical Excellence, Level 1A, City Plaza, Piccadilly Plaza, Manchester, M1 4BD, UK. beth.shaw@nice.org.uk. (Editorial group: Cochrane Effective Practice and Organisation of Care Group.)

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ABSTRACT

Background

Strategies to implement change in health professional performance have variable impact. A potential explanation is that the barriers to implementation are different in different settings and at different times. Change may be more likely if the strategies were specifically chosen to address the identified barriers.

Objectives

To assess the effectiveness of strategies tailored to address specific, identified barriers to change in professional performance.

Search strategy

We searched the Cochrane Effective Practice and Organisation of Care Group (EPOC) specialised register and pending files until end of December 2002. English language articles only were included.

Selection criteria

Randomised controlled trials (RCTs) that reported objectively measured professional practice or health care outcomes in which at least one group received an intervention designed (or tailored) to address prospectively identified barriers to change.

Data collection and analysis

Two reviewers independently extracted data and assessed quality. We also contacted study authors to obtain any missing information. Quantitative and qualitative analyses were undertaken.

Main results

We included 15 studies. For Comparison 1 (an intervention tailored to address identified barriers to change compared to no intervention or an intervention(s) not tailored to the barriers), there was no consistency in the results and the effect sizes varied both across and within studies.

A meta-regression of a subset of the included studies, using a classical approach estimated a combined OR of 2.18 (95% CI: 1.09, 4.34), p = 0.026 in favour of tailored interventions. However, when a Bayesian approach was taken, meta-regression gave a combined OR of 2.27 (95% Credible Interval: 0.92, 4.75), which was not statistically significant.

Authors' conclusions

Interventions tailored to prospectively identify barriers may improve care and patient outcomes. However, from the studies included in this review, we were unable to determine whether the barriers were valid, which were the most important barriers, whether all barriers were identified and if they had been addressed by the intervention chosen. Based on the evidence presented in this review, the effectiveness of tailored interventions remains uncertain and more rigorous trials (including process evaluations) are needed. Further research needs to address explicitly the questions of identifying and addressing barriers.

PLAIN LANGUAGE SUMMARY

Are strategies tailored to overcome barriers to changing health care professional behaviour effective?

Some strategies to change the practice or behaviour of health care professionals are successful in improving health care while others are not. One explanation may be that there are different barriers to change in different settings and at different times. Change may be more likely if the strategies are specifically chosen to address the identified barriers. Barriers could be related to the individual (e.g. uncertainty about the risks of a procedure); related to social issues (e.g. peer pressure to perform a certain way); or related to the organisation (e.g. no access to equipment). And to successfully change behaviour, barriers should be identified and a strategy developed to overcome those barriers. In other words, it is thought that strategies tailored to overcome barriers should be more effective to change behaviour than non-tailored strategies or no strategy at all.

Fifteen studies evaluated tailored strategies for behaviour change in health care professionals. The results were mixed. It is therefore, unclear whether tailored strategies are more effective than non-tailored strategies or no strategy. Due to a small number of studies, it is also not possible to determine whether strategies tailored to overcome organisational barriers are more effective than those that were not. It is also not clear whether all barriers or important barriers were identified and addressed by the strategies. More research about how to identify and overcome barriers is needed.

BACKGROUND

Strategies to disseminate and implement change in the performance of health care professionals have variable impact. For example, although strategies to disseminate and implement clinical practice guidelines can promote compliance with recommended practices, effectiveness varies not only between different strategies, but also when the same strategy is used on different occasions (Grimshaw 2004). Further research is needed to develop a coherent theoretical framework of health professional and organisational behaviour and behavioural change (Grimshaw 2004).

A small number of frameworks or models have already been proposed. The framework presented by Moulding and colleagues (Moulding 1999) was based on five theories of social and behavioural change and proposed a five step process; an assessment of the professional's stage of readiness to change, an assessment of the specific barriers to guideline use, the determination of the appropriate level of intervention, the design of dissemination and implementation strategies and an evaluation of the implementation strategies.

Moulding's framework shares some features of the model proposed by Grol and Grimshaw (Grol 1999). The model outlined several stages, based on the theoretical perspectives and empirical evidence:

1. development of a concrete proposal for change in clinical practice
2. analysis of the target setting and target professionals, and identification of the obstacles or barriers to change
3. linking of the interventions to the needs, facilitators,

and the barriers to change, and

4. development and implementation of the plan, with continuous evaluation.

Grol and Grimshaw noted, however, that the evidence base was incomplete and that many factors would influence the success of the intervention, including for example the target group's preparedness to change.

Although the two models used different theoretical bases, both included the identification or assessment of barriers to change and subsequent tailoring of interventions. The potential importance of barriers to change has been highlighted by others (Oxman 1995; Grimshaw 2001; Robertson 1996; Grol 1992). Barriers are factors that impede the implementation of change in professional practice. Grol classified them as related to the individual health professional (knowledge, skills, attitudes, habits), to the social context of care provision (reactions of patients, colleagues, authorities) or to the organisational context (available resources, organisational climate, structures, etc.) (Grol 1997). The Cochrane Effective Practice and Organisation of Care Group (EPOC) has classified barriers into the following categories:

1. information management clinical uncertainty
2. sense of competence
3. perceptions of liability
4. patient expectations
5. standards of practice
6. financial disincentives
7. administrative constraints
8. others

However, the barriers that are most important in impeding change are not clear, for example, it is uncertain whether barriers at the level of the individual tend to be more important than those at the level of organisational context.

In tailoring strategies to barriers to change, the important barriers must be identified and those implementation strategies most likely to be effective must be selected. Different methods may be used to identify which barriers are actually present. For example, an investigation of the perceived barriers facing each individual health professional can be undertaken by interviews of the professionals. If some information about the likely barriers is available, an alternative would be investigation by questionnaire of samples of professionals. Investigation of the organisation or systems of work through observation or interviews may also be used to identify organisational barriers.

Methods are needed for tailoring interventions to the barriers after they have been identified. These can vary from reliance on informal judgement about what is likely to be effective to the use of behavioural or organisational theories to explain the meaning of barriers and how they may be overcome.

OBJECTIVES

The objective of this review was to assess the effectiveness of planning and delivering interventions tailored to address specific, prospectively identifybarriers to change in professional practice and health care outcomes.

To address this question, we considered the following two comparisons:

1. An intervention tailored to address identified barriers to change compared to no intervention or an intervention(s) not tailored to the barriers.
2. An intervention targeted at both individual and social or organisational barriers compared with interventions that are targeted at only individual barriers.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs)

Types of participants

Study participants were health care professionals responsible for patient care. Studies that included students only were excluded.

Types of interventions

Studies included at least one group that received an intervention tailored to address explicitly specified barriers to change which were identified prospectively through observation, focus group discussions, interviews or surveys of the involved health care professionals, and/or through an analysis of the organisation or system in which care is provided. Studies that used gap analysis only were excluded and studies of educational interventions based on an identified lack of knowledge and designed to improve knowledge only were also excluded.

An intervention was defined as tailored if it was chosen after the identification of barriers and in order to overcome those barriers. Consequently, the identification of barriers must have been undertaken before the design and delivery of the intervention. If the timing of the identification of barriers was not clear, the study authors were contacted for clarification.

In addition, studies had to involve a comparison group that did not receive a tailored intervention or a comparison between an intervention that was targeted at both individual and social or organisational barriers, compared with an intervention targeted at only individual barriers.

Types of outcome measures

Objectively measured professional performance (excluding self-report) or patient outcomes in a health care setting or both. Studies that measured knowledge or performance in a test situation only were excluded. For those studies that met the inclusion criteria, we also collected information about professional and patient satisfaction and changes in knowledge or attitudes. However, studies that reported changes in knowledge or attitudes only were excluded.

Search methods for identification of studies

See: EPOC Review Group search strategy.

All the RCTs in the EPOC register were handsearched until the end of June 2001 (including pending studies) to determine if they met the inclusion criteria defined above. We also searched the register and pending files using keywords ("tailor$" or "personalised" or "personalized") from June 2001 until end of December 2002. As the concept of tailored interventions has gained recognition, searching using appropriate keywords was considered an effective identification strategy for recently published papers. We also scanned reference lists of included studies for additional studies. No additional searches were done. English language papers only were included.

We ran an updated search in June 2004 and identified studies are listed in the STUDIES AWAITING ASSESSMENT or ONGOING STUDIES sections.

Data collection and analysis

Two reviewers independently assessed studies for inclusion, discrepancies being resolved by a third reviewer. Two reviewers assessed the quality of included studies using the criteria described by EPOC for RCTs (*see* EDITORIAL INFORMATION under GROUP DETAILS for METHODS USED IN REVIEWS). The EPOC Data Collection Checklist was used to assess quality and extract data. Given the potential heterogeneity of the targeted behaviours, skills and organisational factors relevant to the review, we did not base study inclusion on a minimum cut-off for methodological quality. The quality of each of the included studies is presented in the RESULTS section.

For all of the studies included in the review an overall quality rating (high, moderate or low protection against bias) was assigned based on the following criteria: concealment of allocation, blinded or objective assessment of primary outcome(s) and completeness of follow-up of professionals and no important concerns in relation to baseline measures, reliable primary outcomes or protection against contamination. We assigned a rating of high protection against bias if the first three criteria were scored as done and there were no important concerns related to the last three criteria, moderate if one or two criteria were scored as not clear or not done and low if more than two criteria were scored as not clear or not done (adapted from Jamtvedt 2003).

Two reviewers independently extracted the data from included studies by using the EPOC Data Collection Extraction Checklist. Study investigators were contacted if data were missing from a study or further clarification was needed.

We grouped included studies according to the two comparisons identified above under Objectives. For each comparison, a results table is presented including the main results in natural units as reported in the study and, where possible, effect sizes with post-intervention differences, 95% confidence limits and p values.

We assessed all the included studies for inclusion in a meta-analysis. Four studies did not report a suitable binary outcome and were therefore excluded. The authors of the other studies were contacted for further data. As all the trials were cluster randomised, data at the cluster level were needed to enable the clustering effect to be accounted for in the analysis. The primary binary outcome of each study was used and a pooled odds ratio was calculated to estimate the combined effect size.

The meta-analysis was fitted using the software package Winbugs 1.4. The results were adjusted for clustering in the trials that gave data at the cluster level, by fitting multi-level models. We calculated the average intra-class correlation coefficient from these trials and used this to adjust for clustering in those trials where only summary data were available. We also adjusted for baseline data in the analysis.

We also summarised the methods that were used to identify barriers to change and qualitatively assessed the processes that were used to identify barriers and tailor interventions to address them. This analysis was exploratory in nature with the aim of clarifying alternative approaches to identifying barriers prospectively and tailoring interventions, assessing the effectiveness of tailored interventions on professional performance and patient outcomes and informing future research.

Details of the excluded studies are shown in the Characteristics of Excluded Studies table. The most common reason for exclusion was the absence of a systematic, prospective identification of barriers to change.

RESULTS

Description of studies

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

Fifteen trials met the inclusion criteria.

Health care setting and characteristics of health care professionals

Seven studies were carried out in a primary care or community setting (Ross-Degnan 1996; Santoso 1996; Hux 1999; Baker 2001; Goodwin 2001; Flottorp 2002; Langham 2002). Avorn and colleagues (Avorn 1983) targeted office based physicians, but no details were given as to whether these were primary or secondary care physicians. Three studies were based in secondary care (Soumerai 1998; Leviton 1999; Sehgal 2002), one in both secondary and tertiary care (Davies 2002) and one in public health clinics (Evans 1997). One study was based in practices contracted to managed care organisations (Matchar 2002) and one was conducted in residential care (Avorn 1992).

Ten studies had been undertaken in North America (including two in Canada), two in the UK (Baker 2001; Langham 2002), two in Indonesia (Ross-Degnan 1996; Santoso 1996) and one in Norway (Flottorp 2002).

In seven studies, the interventions were targeted at physicians only (Avorn 1983; Hux 1999; Leviton 1999; Baker 2001; Goodwin 2001; Matchar 2002; Sehgal 2002). In three studies, the interventions were targeted at all staff involved in providing care (Avorn 1992; Evans 1997; Langham 2002). One study targeted physicians and nurses (Soumerai 1998) and one nurses only (Davies 2002). One study targeted general practitioners and practice assistants (Flottorp 2002) and another targeted pharmacists and counter assistants (Ross-Degnan 1996). Santoso and colleagues aimed the intervention at prescribers of treatments for diarrhoea, including both physicians and paramedical prescribers (Santoso 1996).

Targeted behaviours

In six trials, the behaviour addressed was the management and treatment of specific conditions: depression in adults (Baker 2001), asthma in children (Evans 1997), urinary tract infections and sore throat (Flottorp 2002), cardiovascular disease (Langham 2002), anticoagulation treatment in the elderly (Matchar 2002) and adults receiving dialysis (Sehgal 2002).

Prescribing behaviour was targeted in six trials. Avorn and colleagues aimed to reduce the use of three specific drugs (Avorn 1983) and to reduce the prescribing of psychoactive medications in residential homes (Avorn 1992). Three trials aimed to improve the appropriateness of prescribing of antibiotics (Hux 1999), drugs for acute diarrhoea (Santoso 1996) and for patients admitted with an acute MI (Soumerai 1998). Leviton and colleagues targeted the use of corticosteroids for all women at risk of a premature delivery (Leviton 1999).

Other behaviours addressed were the use of electronic fetal monitoring (Davies 2002), provision of preventive services (Goodwin 2001) and over-the-counter sales of treatments for diarrhoea in children (Ross-Degnan 1996).

Characteristics of the intervention

Details of all interventions can be found in the Characteristics of the Included Studies table. Only one study described an intervention used to address solely organisational barriers (Matchar 2002).

Prospective identification of barriers to change

Six studies identified the barriers through face-to-face interviews with healthcare professionals (Avorn 1983; Avorn 1992; Ross-Degnan 1996; Baker 2001; Goodwin 2001; Langham 2002) and six studies used focus groups with professionals (Ross-Degnan 1996; Santoso 1996; Evans 1997; Hux 1999; Leviton 1999; Flottorp 2002). Questionnaire surveys were used in two studies (Davies 2002; Matchar 2002). Focus groups with patients were used in two studies (Santoso 1996; Flottorp 2002). Other methods included workshop discussion of the barriers (Davies 2002; Flottorp 2002), observation by a nurse facilitator (Goodwin 2001), telephone interviews (Leviton 1999; Flottorp 2002), brainstorming by implementation researchers (Flottorp 2002), suggestions of guideline developers and practitioners in pilot practices (Flottorp 2002), review of records and an analysis of the factors that influence adequate care (Sehgal 2002) and consensus of opinion leaders (Soumerai 1998). Although the majority of the studies used a single method to assess the barriers, six studies used a mix of two methods (Ross-Degnan 1996; Santoso 1996; Leviton 1999; Goodwin 2001; Davies 2002; Flottorp 2002).

Influence of prospective identification of barriers on intervention design

Over half of the studies described in differing levels of detail how the barriers identified influenced the design and delivery of the intervention. In two studies, the interventions were targeted to the barriers present at the individual level; in one study a psychological theory was used to explain behaviour and this theory was then used to choose an implementation method (Baker 2001) and in the second study information was provided based on the specific barriers identified for each patient (Sehgal 2002). Flottorp and colleagues used tables of identified barriers with the source of identification, the suggested interventions and rationale and any additional comments. The interventions were then selected by two of the authors using an iterative process and prior evidence of effectiveness. The extent to which the authors felt the barriers were addressed was also documented (Flottorp 2002). Other approaches included selecting topics on the basis of the results of focus groups (Hux 1999), using barriers to develop themes for the intervention (Langham 2002), revising the training and support to help staff resolve problems and concerns that impeded the introduction of the new treatment programmes (Evans 1997) and setting up a clinic to address barriers to optimal care (Matchar 2002). In one study (Goodwin 2001), the intervention approach differed for each practice based on the knowledge gained by the facilitator about each practice. In the remaining studies, no details

of how the barriers influenced the design or implementation of the interventions were given. For example, Santoso and colleagues (Santoso 1996) stated that interventions were planned to overcome the identified barriers, but no details were given.

Risk of bias in included studies

There was some risk of bias in all included studies. Seven studies were assessed as having adequately concealed allocation (Evans 1997; Leviton 1999; Baker 2001; Flottorp 2002; Matchar 2002; Sehgal 2002). The adequacy of concealment could not be determined from the published reports of the remaining seven trials. Six trials were assessed as unclear because although the unit of allocation was appropriate, no details of the randomisation process were given. Langham and colleagues reported that a random numbers table was used, although details about allocation concealment were not given (Langham 2002).

Blinded assessment of outcomes was reported in three trials (Ross-Degnan 1996; Baker 2001; Davies 2002). The outcome data in four trials (Hux 1999; Flottorp 2002; Matchar 2002; Sehgal 2002), although not reported as assessed blindly, were extracted from routine electronic data sources so there was little chance of assessment bias. Similarly in the Avorn trial (Avorn 1983), the data were extracted from routine pharmacy reimbursement claims. The remaining studies were assessed as unclear or partially done. Follow-up of professionals was good, with only one trial assessed as unclear (Santoso 1996). Similarly, follow-up of patients was good in those trials where this was appropriate. Only Avorn (Avorn 1992) reported considerable loss to follow-up of patients.

Overall, we assessed five studies as being of high quality and therefore with a low risk of bias (Evans 1997; Baker 2001; Flottorp 2002; Matchar 2002; Sehgal 2002). We assessed the majority to trials to be of moderate quality (Avorn 1983; Avorn 1992; Ross-Degnan 1996; Soumerai 1998; Hux 1999; Leviton 1999; Goodwin 2001; Davies 2002; Langham 2002). Only one trial was assessed as low quality (Santoso 1996).

Effects of interventions

Comparison 1: an intervention tailored to address identified barriers to change compared to no intervention or an intervention(s) not tailored to the barriers

The results of the included studies were mixed across and within studies (Table 1). Some studies showed a statistically significant improvement in all relevant outcomes. As can be seen in Table 1, study quality did not appear to affect the general conclusions. In Table 2, we calculated standardised effect sizes for those studies where a suitable binary outcome was available; these were then used in the meta-regression analyses . The ORs ranged from 1.08 to 12.25, but not all of the results were statistically significant. Again, study quality did not appear to explain the variability. The lack of consistent results may be due to many factors, including the relevance of the identified barriers or the success of the intervention to address the barriers.

Table 1. Tailored interventions: effects on professional practice & health care outcomes

Study quality	Study ID	Primary outcome(s)	Effect size	Conclusions
High	Baker 2001	(1) Adherence to guideline recommendations(several outcomes, including suicide risk assessed at diagnosis) (2) Beck depression Inventory score <11 at 16 weeks	(1) OR 5.6 (95% CI: 2.8, 11.3) (2) OR 2.5 (95% CI: 1.2, 5.2) (both ORs adjusted for baseline)	Significant benefit of intervention shown for outcome (2) and for some outcomes assessing (1)
High	Evans 1997	(1) Rate of diagnosis of asthma (2) Continuity of care (patients returning)	(1) 40/1000 vs. 16/1000, p < 0.01 (2) 42% vs. 12%, p < 0.001 (3) 52% vs. 15%, p < 0.001 (4) 71% vs 58%, p < 0.01	The intervention clinics had greater positive changes than control clinics for access, continuity and quality of care.

Table 1. Tailored interventions: effects on professional practice & health care outcomes (*Continued*)

		(3) Use of recommended treatments (inhaled ß agonists) (4) Received patient education		
High	Flottorp 2002	(1) Rate of antibiotic use (2) Rate of laboratory test use (3) Rate of telephone consultations	(1) 3% less likely to receive antibiotics after intervention in sore throat arm (p = 0.032), no change in UTI arm. (2) Women in UTI arm 5.1% (p = 0.046) less likely to have lab test after intervention. No change in sore throat arm. (3) No change	Pas- sively delivered, complex interventions targeted at identified barriers to change had little effect in changing practice.
High	Matchar 2002	(1) % time in target range (2) Rate of thromboembolic events	(1) Intervention effect: 5%, 95% CI -5% to 14%, p = 0.32 (2) No significant difference	Provision of an anticoagulation service did not improve quality of care
High	Sehgal 2002	(1) Increase in Kt/V at 6 months (2) Change in level of dialysis prescribing (3) Change in from catheter use to fistulas/grafts	(1) +0.2 intervention vs. = 0.1 control, p < 0.001 (2) +0.16 intervention vs. +0.06 control, p < 0.001 (3) 28% intervention vs 7% control, p = 0.04	The intervention resulted in increased haemodialysis dose and may substantial increase patient survival
Moderate	Avorn 1983	(1) Prescribing of targeted drugs (amount and costs)	Costs reduced in intervention arm v control by 14% (p = 0.0001)	Intervention was a useful and cost effective way to reduce unnecessary expenditure
Moderate	Avorn 1992	(1) Residents on not on psychoactive drugs	(1) Decrease of 27% in intervention arm and 8% in controls (p = 0.02)	Educational programs can reduce the use of psychoactive drugs in nursing homes, without adversely affecting behaviour
Moderate	Davies 2002	(1) Rate of electronic foetal monitoring (2) Time spent practising labour support	(1) Reduced significantly in intervention secondary hospital (p < 0.001) and control tertiary hospital (p < 0.001) (2) Increased in intervention tertiary hospital (p < 0.001) and decreased in control secondary hospital (p < 0.001)	Mixed results, tailored intervention appeared to have limited effects

Table 1. Tailored interventions: effects on professional practice & health care outcomes (*Continued*)

Moderate	Goodwin 2001	(1) Rate of up-to-date preventative services	(1) Intervention: 31% to 42 %, control: 35% to 37% (p = 0.015)	Global preventive service delivery rates were increased by intervention
Moderate	Hux 1999	(1) Median antibiotic cost (2) Antibiotic choice - first line	(1) Change of $0.05 intervention v. $3.37 control, p<0.002 (2) Change of 2.6% v. -1.7%, p<0.01	Significant benefits of intervention.
Moderate	Langham 2002	(1) Adequate recording of three risk factors.	(1) Difference of 10.5%, (95% CI -3.9 to 24.9) between information and no information and 6.6% , (95% CI -8.9 to 22.0) between evidence and no evidence	Information or evidence alone did not increase risk factor recording. A combination of both should be considered for future interventions
Moderate	Leviton 1999	(1) Use of corticosteroids	(1) Use increased by 108% in active dissemination hospitals and by 75% in usual dissemination hospitals (p < 0.01)	Active, focused dissemination increases the effectiveness of usual dissemination.
Moderate	Ross-Degnan 1996	(1) Sales of oral rehydration salts	(1) Increased by 21% in Indonesia in intervention arms compared to controls (p < 0.05)	Face to face training can result in significant short-term improvements.
Moderate	Soumerai 1998	(1) Appropriateness of the prescribing of selected drugs (aspirin in eligible elderly patients)	(1) Median change +0.13 in intervention and -0.03 in controls (p = 0.04)	Intervention can accelerate adoption of some beneficial therapies.
Low	Santoso 1996	(1) Prescribing of oral rehydration solution (2) Prescribing of anti-microbials (3) Prescribing of anti-diarrhoeals	(1) Increase after intervention, but not significantly (2) Significant reduction in antimicrobial usage for both face-to-face and seminar interventions. (3) Significantly reduced after both interventions.	Small group face-to-face intervention did not appear to offer greater impacts over large seminars, with both methods showing improvement in appropriate drug use.

Table 2. Effect sizes at follow-up used in the meta-regression (adjusted for clustering)

Study ID	Outcome	Effect size
Avorn 1992	Residents not on antipsychotic drugs	OR 0.93 (95% CI: 0.66, 1.31)
Baker 2001	Beck depression inventory < 11	OR 1.09 (95% CI: 0.70, 1.71)
Davies 2002	No electronic fetal monitoring	OR 12.25 (95% CI: 7.22, 20.77)
Evans 1997	Returning asthma patients from previous year	OR 2.88 (95% CI: 2.18, 3.81)
Flottorp 2002	Antibiotics not prescribed	OR 1.26 (95% CI: 1.15, 1.38)
Leviton 1999	Use of antenatal corticosteroids	OR 1.59 (95%CI: 1.41, 1.78)

Meta-analysis of a sub-set of included studies

Three of the trials reported results on the primary binary outcome for each cluster separately. A hierarchal model was fitted for each of these studies, producing an odds ratio adjusted for the clustering effect. Where only summary results were reported across all clusters, the intra-class correlation coefficient (ICC) was estimated by calculating the ICC for the three studies that had individual cluster data, fitting ANOVA models and then calculating an average ICC by meta-analysis using Fisher's transformation approach. The design effect was calculated in order to apply a simple method to adjust binary data for clustering effects, where effectively the variance of the odds ratios are increased by multiplying them by the design effect. Using this method, adjusted odds ratios could be calculated for the three studies that had only reported summary data. Once an odds ratio adjusted for clustering (Table 2) had been calculated for each study a meta-analysis model could be fitted to the data, using either the adjusted odds ratio (Baker 2001; Davies 2002; Evans 1997), or adjusting the study data using the design effect (Avorn 1992; Flottorp 2002; Leviton 1999). All models were also adjusted for baseline data as all six studies had measured outcomes at baseline and at follow-up. The classical meta-analysis model was fitted in STATA using the metareg command and with the baseline odds ratios fitted as a covariate. The Bayesian model was fitted using WinBUGs. Uninformative priors were used for this approach.

A classical meta-analysis of a subset of the included studies estimated a combined OR of 2.18 (95% CI: 1.09, 4.34), p = 0.026 in favour of tailored interventions. However, when a Bayesian approach was taken, meta-regression gave a combined OR of 2.27 (95% CI: 0.92, 4.75), which was not statistically significant. The use of Bayesian methods enabled all parameter uncertainty, especially that regarding the between-study variation, to be fully accounted for in the final pooled effect estimate.

Barriers identified

In Table 3, we have presented a summary of the barriers identified in the studies and how the interventions were tailored to overcome these. Because not all studies reported all, if any, of the barriers identified, we were not able to analyse these further. Nevertheless, some barriers were identified in more than one study.

Table 3. Identified barriers and intervention strategies used

Study ID	Barriers identified	Intervention(s)
Avorn 1983	A complete list of identified barriers was not reported, but patient demand was highlighted as a 'perceived problem'	Insights gained from interviews were incorporated into the educational intervention. Patient information brochures were designed to facilitate the change in drug use.

Table 3. Identified barriers and intervention strategies used (*Continued*)

Avorn 1992	Factors that influenced prescribing decisions, but no details were reported.	Education: topical summaries and face-to-face educational sessions. The educational materials were produced after the interviews with nurses, nursing assistants and physicians, but no further details were given.
Baker 2001	No details given, but one example was given. If a GP reported anxiety and uncertainty about suicide assessment, then the intervention would be tailored to address this barrier.	Interventions were tailored to the barriers identified at the level of the individual. No details of the different strategies were reported, but the example given was of providing scripts to use when assessing suicide risk.
Davies 2002	Factors identified as preventing implementation were: lack of staffing, negative staff attitudes, physical environment, and a lack of management support	Although a 'tailored program' was offered, there was no explicit detail on how the interventions addressed the perceived barriers to change. However, resources (including staffing) were discussed in the intervention hospitals, and meetings with key administrators to discuss dissemination strategies were convened.
Evans 1997	Asthma was viewed as an episodic disease, rather than as a chronic disease that could be controlled by preventive care. Staff expressed concern that expanding the provision of care would strain resources.	Training focused on the preventive aim of the clinics. Additional administrative support was provided.
Flottorp 2002	Most common barriers were: loss of income, changing routines, fear of missing serious disease, patient expectation, and not enough time to read and study the guidelines.	Interventions designed to address these included (in same order) : increased fees, support for change and patient information, computer based decision support, patient information, and brief versions of the guidelines with computer based reminders and incentives.
Goodwin 2001	No details given.	The facilitator used the knowledge of the practice to present various tools and approaches in different ways tailored to the individual practice's requirements.
Hux 1999	No details given.	The content of the educational bulletins was selected on the basis of barriers identified in the focus groups.
Langham 2002	Practice teams identified the barriers as difficulties in recording patient information and understanding and accessing evidence.	Interventions designed to address the barriers were allocated to practices randomly. The practices were then able to further tailor the allocated interventions to their own individual requirements.
Leviton 1999	Barriers were the uncertainty of risks and benefits of treatment and the timing of treatment.	A chart reminder system was used to prompt the prescribing of treatment in a timely way. Other components of the intervention also addressed the issues of risks/benefits and timing.

Table 3. Identified barriers and intervention strategies used (*Continued*)

Matchar 2002	Barriers included: lack of reminder about possibility of treatment, fear of adverse events (bleeding), difficulty in monitoring treatment, wanting to avoid fragmentation of care and loss of clinical autonomy by referral. Also, reimbursement and political barriers were identified.	The service intervention addressed these as follows: identification of suitable patients for treatment and discussion of these with the physician, literature review to determine absolute risks, transfer of responsibility of monitoring to the anti-coagulation service, ensuring that the referring physician maintained responsibility for the patient's care, modification of protocols as required by referring physician so level of control/autonomy was as desired. Also, ensuring that the service was revenue neutral and the use of local opinion leaders.
Ross-Degnan 1996	Barriers were: reluctance to discourage use of anti-diarrhoeals, patient preference, prescribing practice of local doctors, feeling that ORS were 'first aid' and not treatment, pharmaceutical company influence, personal preference and experience.	The motivations and constraints identified then became key themes of the educational programme.
Santoso 1996	Misconceptions were: the need for medications to stop diarrhoea, strong belief in the efficacy of treatment, the use of drugs as placebos, and patient expectation and satisfaction.	Corrective messages were incorporated into the educational intervention to address these misconceptions.
Seghal 2002	Barriers identified were: under-prescription of dialysis, use of catheters (as opposed to fistulas or grafts), and shortening of the treatment time for patients.	The presence of the specific barriers was assessed in each patient, and then information and recommendations on improved practice on the barriers present were then discussed with both the patient and the physician.
Soumerai 1998	The most common barriers stated were concerns about the risks of bradycardia and hypotension, and fears of treatment related bleeding in older patients.	Education was provided to address these concerns and feedback on performance given. In addition, all opinion leaders instituted system changes including revising protocols and clinical pathways.

Comparison 2: an intervention targeted at both individual and social or organisational barriers compared with interventions that are targeted at only individual barriers

Matchar 2002 was the only trial that addressed solely organisational barriers, but two other studies did report interventions that addressed barriers at an organisational level. Evans 1997 identified that the expansion of services would be a strain on resources and the intervention included the provision of additional administrative support to manage the expansion. Langham 2002 identified that difficulty in recording information was a barrier to optimal care and the intervention included training and assistance in the organisation of patient information, including the setting up of a disease register and the provision of templates for the recording of risk factors. Two trials identified organisational barriers, but either did not provide enough detail to determine whether these were targeted by the intervention (Davies 2002), or the intervention did not fit into the EPOC classification (Flottorp 2002).

As can be seen in Table 1, the results of these studies were mixed. Of the two studies assessed as high quality, Evans 1997 showed some benefit of the intervention which was targeted at both individual and organisational barriers and Matchar 2002, where the intervention was targeted at organisational barriers only, showed no improvements in the primary outcomes. Langham 2002, assessed as of moderate quality, showed no significant improvements when both individual and organisational barriers were addressed.

DISCUSSION

Comparison 1: an intervention tailored to address identified barriers to change compared to no intervention or an intervention(s) not tailored to the barriers

Overall, the results were mixed with variation in the direction and size of effect. The result of pooling six studies suggested that the intervention arms of the trials had a better outcome. However, there was large statistical uncertainty around this result and not all studies were included. Furthermore, the quality of the studies was not uniformly high. The aim of this review was to assess the effect of tailoring interventions, but the considerable variation in the reporting of how barriers had influenced the design of the intervention prevented firm conclusions from being drawn. Even after authors had been contacted for additional information where relevant, in only five studies were sufficient details identified describing how barriers had influenced the intervention design and implementation. Future studies of tailored interventions must clearly describe how barriers to change are identified and explicitly describe how those barriers subsequently inform the design of implementation strategies.

The studies used a range of methods for identifying barriers but the relative effectiveness of the different approaches used to identify barriers was unclear. Furthermore, interventions may or may not be generated and tailored in response to specific individual, team and organisational barriers. For example, Flottorp and colleagues used a combination of literature review, brainstorming, focus groups, small group discussions and interviews to generate a barriers checklist from which interventions were tailored (Flottorp 2002). In contrast, Baker and colleagues identified specific barriers at the individual level through interviews only and tailored interventions accordingly (Baker 2001). Due to the heterogeneity, and in some cases, inadequate reporting of studies in this review, the relative effectiveness of the two approaches was unclear.

Not all studies reported the barriers in detail. However, we noted that some barriers were identified in more than one study (for example, patient expectation or demand). Nevertheless, it is not possible to determine from these studies which barriers are most common, most important in impeding change or most amenable to change.

The selection of interventions often relied on the judgements of the investigators and was not informed by any theories of behavioural or organisational change. Most implementation studies are atheoretical and there was little evidence on whether selecting strategies informed by theory were any more or less effective than those that were not. In this review some studies (Avorn 1983; Evans 1997; Baker 2001; Davies 2002; Flottorp 2002) stated explicitly that they had used theoretical frameworks, but it is not clear whether this potentially more complex approach is more effective.

Most interventions were multifaceted and included an active component (for example, educational outreach). The two studies (Hux 1999; Langham 2002) that relied on passive methods of implementation (for example, mailed feedback and guidelines) tended to show smaller effects. The additive benefits of tailoring the choice of intervention in comparison with tailoring the characteristics of a particular intervention, was unclear.

Finally, with the exception of one study (Flottorp 2002), information on the process of implementation was not reported; that is describing how and why an intervention was effective or ineffective. Such information is crucial in order to explain variation in change or absence of change. In the context of this review, information about the process of implementation would have helped to shed light on how and in what ways tailoring interventions supported change.

Comparison 2: an intervention targeted at both individual and social or organisational barriers compared with interventions that are targeted at only individual barriers

It was not possible to undertake a statistical analysis for this comparison. In view of the small number of studies, limited to a small number of organisational settings, it is not possible to determine whether interventions targeted to include organisational barriers are more effective than interventions that exclude targeting of organisational barriers.

Limitations of the review

Only 15 studies were included in this review and it is possible that a small number of relevant studies were overlooked. However, the comprehensive search strategy used to create the EPOC Register is designed to identify studies of interventions designed to improve professional practice and the delivery of effective health services. Furthermore, we minimised the risk of missing relevant studies by obtaining the full text if there was any uncertainty from the abstract only. The potential significance of barriers to change in implementation research has been recognised only relatively recently, and the number of studies may increase. It was noticeable that the more recently published studies tended to report more detail about the barriers and tailoring of interventions.

The meta-analysis of studies with available data aimed to combine quantitative evidence from studies that investigated a common question and to generate a single pooled estimate of the effect size averaged across all studies. We used a Bayesian approach because the included trials were reported heterogeneously especially with respect to the allowance of clustering. This approach enabled us to use information from some studies in the meta-analysis to inform the values of the intraclass correlation coefficient (ICC) and thus the design effect in those other studies which did not appropriately allow for the effect of clustering. The ability to use such external evidence was a particular advantage as the amount of information

available on the ICC from a single trial is limited, especially if the number of clusters is small.

In conclusion, interventions tailored to prospectively identify barriers may improve care and patient outcomes. However, from the studies included in this review, we were unable to determine whether the barriers were valid, which were the most important barriers, whether all barriers were identified and if they had been addressed by the intervention chosen. Based on the evidence presented in this review, the effectiveness of tailored interventions remains uncertain and more rigorous trials (including process evaluations) are needed. Further research needs to address explicitly the questions of identifying and addressing barriers. Remaining research questions also include clarification of the most appropriate methods to identify all relevant barriers, methods to tailor interventions to address those barriers and which barriers are amenable to which interventions. The relative effectiveness of different methods of identifying barriers should also be evaluated. Furthermore, the theoretical basis for intervention studies of any kind should be stated explicitly so that results can be interpreted in an informed way.

AUTHORS' CONCLUSIONS

Implications for practice

The evidence presented in this review does not support mandatory or unevaluated use of tailored interventions. Decisions about whether the tailored interventions approach is likely to be effective for specific problems should be made based on knowledge of the problem and setting and other practical considerations.

Implications for research

Evidence about the effectiveness of tailored interventions is not conclusive, so further research into the use of tailored interventions to overcome identified barriers to change is needed. Key issues for future studies include the design of high quality studies to address specific questions around the identification of the barriers (for example, what are the most appropriate methods of identifying the barriers, do the barriers need to be identified in the intervention population or can barriers be generalised from one group to another, are the barriers valid, have all barriers been identified) and the tailoring of the intervention (for example, how does the intervention address the barriers? Who should choose the intervention? Do all barriers have to be addressed?). In addition, a process evaluation of the study would improve our understanding of why things may or may not have worked.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

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

Avorn 1983

Methods	RCT Follow-up: professionals: DONE patients: N/A Blinded assessment: DONE (data from routine pharmacy reimbursement claims) Baseline: UNCLEAR Power calculation: UNCLEAR Reliable outcomes: DONE Protection against contamination: DONE Barriers identified using: Face-to-face interviews with professionals
Participants	Professionals: US office-based physicians reimbursed by Medicaid (n = 435). Included if issued 20 or more prescriptions per year from 2 drug groups, or 30 or more from one group. Patients: N/A
Interventions	(1) Printed materials only (2) Printed materials plus academic detailing (3) Usual care (control)
Outcomes	(1) Prescribing of targeted drugs (amount and costs)
Notes	Generally well-designed study

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Avorn 1992

Methods	RCT Follow-up: professionals: DONE (prescribing) patients: NOT DONE (significant loss to follow-up) Blinded assessment: UNCLEAR (prescribing) Baseline: UNCLEAR Power calculation: UNCLEAR Reliable outcomes: UNCLEAR Protection against contamination: DONE Barriers identified using: Face-to-face interviews with professionals.
Participants	Professionals: Staff in US hospitals (numbers unclear) Patients: Nursing home residents prescribed psychoactive medications (n = 823)
Interventions	(1) Educational outreach for physicians. Pharmacist visits to physicians whose prescribing of psychoactive drugs exceeded as specified threshold. Training sessions for other nursing home staff. (2) Usual care (control)
Outcomes	(1) Psychoactive medication use. (2) Patient functioning - researcher assessed, staff assessed, and patient assessed.
Notes	Functioning tests only applied to a sample of patients.

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Baker 2001

Methods	RCT Follow-up: professionals: DONE patients: N/A Blinded assessment: DONE Baseline: UNCLEAR Power calculation: DONE Reliable outcomes: DONE Protection against contamination: DONE Barriers identified using: Face-to-face interviews with professionals.
Participants	Professionals: 64 UK general practitioners. Patients: Adults with a new episode of depression (n = 780)

Baker 2001 (*Continued*)

Interventions	(1) Provision of guidelines and summary of evidence, supplemented with an interview to determine obstacles to implementation. Interventions were then delivered to individuals addressing the identified barriers. (2) Provision of guidelines and summary of evidence (control)
Outcomes	(1) Adherence to guideline recommendations. (2) Beck Depression Inventory score at specified intervals
Notes	Maybe some element of improved recording. Authors suggested may be underpowered to detect an effect for some of the recommendations.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Davies 2002

Methods	RCT Follow-up: professionals: DONE patients: DONE Blinded assessment: DONE Baseline: DONE (differences in staffing levels, event rates, equipment) Power calculation: DONE Reliable outcomes: DONE (for observation only, not reported for data extraction) Protection against contamination: DONE Barriers identified using: Questionnaire survey of professionals. Workshop discussions with professionals.
Participants	Professionals: Nurses in two US secondary and tertiary obstetric hospitals (n = 135) Patients: Women who gave birth (low risk) in the study hospitals (n = 1566). Excluded if labour induced, premature birth (< 37 weeks), no labour or c-section, breech, multiple birth, stillbirth, no foetal health surveillance (gave birth within 1 hr of admission)
Interventions	(1) Workshops and dissemination (policy meetings, written information, multidisciplinary grand rounds, discussions) (2) Usual care (control)
Outcomes	(1) Rate of electronic foetal monitoring (EFM) (2) Time spent practising labour support (3) Self-efficacy (not reported)
Notes	

Davies 2002 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Evans 1997

Methods	RCT Follow-up: professionals: DONE patients: DONE Blinded assessment: PARTIALLY DONE (routine data extracted from electronic database, but data input by staff aware of intervention status) Baseline: DONE (no differences observed) Power calculation: DONE (not reported) Reliable outcomes: DONE Protection against contamination: DONE Barriers identified using: Focus groups with professionals.
Participants	Professionals: All staff in US child health clinics, including technicians, public health assistants, clerical workers (n = 134), providing preventive care to children. Patients: Children < 12 years with asthma (n = 6000 approx).
Interventions	(1) Learning groups (rationale, role play, protocols, communication skills, screening). Tutorial for physicians. Support visits and continued education. (2) Usual care (control)
Outcomes	(1) Rate of diagnosis of asthma. (2) Continuity of care. (3) Use of recommended treatments. (4) Patient education.
Notes	IV worked; tailoring only adjusting standard program but was based on theories of organisational change

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	A - Adequate

Flottorp 2002

Methods	RCT Follow-up: professionals: DONE patients: N/A Blinded assessment: DONE (extracted from computer systems) Baseline: DONE Power calculation: DONE Reliable outcomes: DONE Protection against contamination: DONE Barriers identified using: Opinion of guideline developers. Brainstorming of implementation researchers. Focus groups with professionals. Focus groups with patients. Pilot study. Small group discussions. Telephone interviews with professionals.
Participants	Professionals: General practitioners and practice assistants in practices in Norway (n = 113) Patients: Patients over 3 years old with diagnosis of sore throat (n = 12,369), and non-pregnant women with diagnosis of urinary tract infection (n = 5737).
Interventions	(1) Summary of guideline recommendations. Patient educational material. Computer based support and reminders. Increased fees for telephone consultations. Printed material to facilitate discussions. Interactive courses for GPs and practice assistants. CME point for participators. (2) Usual care (all GPs received a published version of both guidelines)
Outcomes	(1) Rate of antibiotic use (2) Rate of laboratory test use. (3) Rate of telephone consultations.
Notes	Good quality study. Tailoring of interventions was limited and may not have been ideally planned or resourced (comment made by authors). Process evaluation gave valuable insight into the methods used.

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	A - Adequate

Goodwin 2001

Methods	RCT Follow-up: professionals: DONE patients: DONE Blinded assessment: UNCLEAR (done by different members of research team who may have been aware of the practice status) Baseline: DONE (differences observed but unlikely to affect the outcomes) Power calculation: DONE Reliable outcomes: DONE Protection against contamination: UNCLEAR (but unlikely due to geographical location) Barriers identified using: Face-to-face interviews with professionals. Assessment (observation and field notes) by nurse facilitator.
Participants	Professionals: US family physicians (n = 154). Patients: Patients who received preventive services/care (n = 10,172 patient visits)
Interventions	(1) Feedback. Printed material, including tools and suggested approaches to increasing preventive service delivery. (2) Usual care (control)
Outcomes	(1) Rate of up-to-date preventive services - summary score and as individual scores for screening, counselling, and immunisations.
Notes	Reasonable, well-designed study. Increase may be due to increased recording. Selection bias may be present.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Hux 1999

Methods	RCT Follow-up: professionals: DONE patients: N/A Blinded assessment: DONE (routine data source) Baseline: DONE (no differences reported) Power calculation: UNCLEAR Reliable outcomes: DONE Protection against contamination: DONE Barriers identified using: Focus groups with professionals
Participants	Professionals: Primary care physicians in Canada (n = 251) Patients: N/A

Hux 1999 (*Continued*)

Interventions	(1) Mailed feedback on antibiotic prescribing plus educational guideline-based materials. (2) Usual care (control)
Outcomes	(1) Median antibiotic cost. (2) Antibiotic choice - first line
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Langham 2002

Methods	RCT Follow-up: professionals: DONE patients: DONE Blinded assessment: UNCLEAR Baseline: DONE Power calculation: NOT DONE (underpowered) Reliable outcomes: UNCLEAR Protection against contamination: DONE (by practice) Barriers identified using: Face-to-face interviews with professionals
Participants	Professionals: Primary health care teams in UK (n = 17) Patients: Patients with cardiovascular disease (n = 1261)
Interventions	(1) Information (2) Evidence (3) Information and evidence (4) Training and assistance in priorities not related to cardiovascular disease (control)
Outcomes	(1) Recording of risk factors (2) Use of aspirin
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Leviton 1999

Methods	RCT Follow-up: professionals: DONE patients: DONE Blinded assessment: NOT DONE Baseline: DONE (differences in the frequency of abnormal foetal conditions and foetal distress) Power calculation: DONE Reliable outcomes: DONE Protection against contamination: DONE Barriers identified using: Focus groups with professionals. Telephone interviews with key informants.
Participants	Professionals: Obstetricians and fetal-maternal specialists in 27 US hospitals (n = 1600). Patients: Women at risk of pre-term delivery (n = 6661 abstracted records).
Interventions	(1) Active dissemination. Educational outreach using opinion leaders and nurse coordinator. Opinion leader grand round lecture. Chart reminder. Group discussion to facilitate consensus management. Feedback of performance. (2) Standard dissemination of recommendations by professional organisation (control)
Outcomes	(1) Use of corticosteroids
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Matchar 2002

Methods	RCT Follow-up: professionals: DONE patients: DONE Blinded assessment: DONE (automated laboratory results and blinded for rate of events) Baseline: DONE (no differences observed) Power calculation: DONE Reliable outcomes: UNCLEAR Protection against contamination: DONE Barriers identified using: Questionnaire survey of professionals.
Participants	Professionals: Physicians working in 6 US managed care organisations Patients: Patients receiving anticoagulation treatment for atrial fibrillation (n = 1165). Excluded if < 65 years of age, no documentation of AF, had mechanical heart valves, had a life expectancy of < 6 months, not able to be assigned to a single cluster.

Matchar 2002 (*Continued*)

Interventions	(1) Introduction of anticoagulation service. (2) Usual care (control)
Outcomes	(1) Time in target range (INR) (2) Rate of thromboembolic events (3) Time to follow up
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Ross-Degnan 1996

Methods	RCT Follow-up: professionals: DONE patients: N/A Blinded assessment: DONE Baseline: UNCLEAR Power calculation: UNCLEAR Reliable outcomes: DONE Protection against contamination: DONE Barriers identified using: Focus groups with professionals. Face-to-face interviews with professionals.
Participants	Professionals: Staff in 87 community pharmacies in Indonesia (numbers unclear). Patients: Mothers of children with diarrhoea (1 per pharmacy). Although the mothers were 'simulated patients', the pharmacy staff were unaware that this was a test situation.
Interventions	(1) Outreach education and promotional, printed material for patients. (2) Usual care (control)
Outcomes	(1) Sales of oral rehydration salts (2) Sales of anti-diarrhoeals (3) Number of questions asked by counter staff
Notes	Lack of detail reported.

Risk of bias

Item	Authors' judgement	Description

Ross-Degnan 1996 (*Continued*)

Allocation concealment?	Unclear	B - Unclear

Santoso 1996

Methods	RCT Follow-up: professionals: UNCLEAR patients: DONE Blinded assessment: UNCLEAR Baseline: UNCLEAR Reliable outcomes: UNCLEAR Protection against contamination: DONE Barriers identified using: Focus groups with professionals and patients/users.
Participants	Professionals: Primary care prescribers in health centres in Indonesia (n = 1350). Patients: Children < 5 years with acute diarrhoea. Excluded if diagnosed with specific diarrhoea or diarrhoea lasting > 14 days (n = 5400 prescriptions)
Interventions	(1) Small face-to-face group discussions led by moderator trained in management of diarrhoea and group work plus written information. (2) Formal seminars and written materials. (3) Usual care (control)
Outcomes	(1) Prescribing of oral rehydration solution. (2) Prescribing of anti-microbials. (3) Prescribing of anti-diarrhoeals. (4) Levels of knowledge.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Sehgal 2002

Methods	RCT Follow-up: professionals: DONE patients: DONE Blinded assessment: DONE (automated test results) Baseline: DONE (no differences observed) Power calculation: DONE Reliable outcomes: DONE (automated test results) Protection against contamination: UNCLEAR (although physicians and thier patients were assigned to either group, contamination may have occurred between patients at the same facility) Barriers identified using: Analysis of factors identified through record review and correlation with inadequate treatment
Participants	Professionals: 44 US nephrologists Patients: Adults receiving dialysis for at least 6 months who were deemed to be treated inadequately (n = 169)
Interventions	(1) Feedback and recommendations to both doctors and patients addressing specific barriers identified. Patient education. (2) Usual care (control)
Outcomes	(1) Change in Kt/V (measure of dialysis dose) (2) Change in level of prescribing. (3) Change in catheter use. (4) Change in treatment time. (5) Quality of life.
Notes	Contamination may have occurred between patients at the same facility.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Soumerai 1998

Methods	RCT Follow-up: professionals: DONE patients: DONE Blinded assessment: UNCLEAR Baseline: DONE (no differences observed) Power calculation: UNCLEAR Reliable outcomes: DONE Protection against contamination: DONE Barriers identified using: Consensus of opinion leaders.
Participants	Professionals: Doctors and nurses in 36 US hospitals (numbers unclear). Patients: Acute MI admissions (n = 5347) excluding patients who died, were transferred from a non-study hospital, or had a previous acute MI in the past 2 weeks.
Interventions	(1) Small and large discussion groups lead by a local opinion leader. Informal consultations, educational materials, and revisions of protocols and clinical pathways. 2. Mailed performance feedback (control)
Outcomes	(1) Appropriateness of the prescribing of selected drugs.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

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

Aucott 1996	Not RCT - retrospective cohort trial
Brown 1994	No systematic, prospective identification of barriers
Cranney 1999	Knowledge in test situation only.
Dietrich 1994	No systematic, prospective identification of barriers
Du Pen 2000	No systematic, prospective identification of barriers
Gregory 1999	No objective assessment of performance.

(*Continued*)

Hadiyono 1996	No systematic, prospective identification of barriers
Hargraves 1996	Not RCT - retrospective observational study
Hendryx 1998	No systematic, prospective identification of barriers
Katon 1992	No systematic, prospective identification of barriers
Lipkus 2000	Intervention targeted at patients
Schned 1995	No systematic, prospective identification of barriers
Soumerai 1993	Barriers not identified in target population
Stross 1983	Only limited assessment of barriers
SUPPORT Team 1995	No systematic, prospective identification of barriers
Thompson 2000	No systematic, prospective identification of barriers
van der Weijden 1998	No systematic, prospective identification of barriers
Wyatt 1998	No systematic, prospective identification of barriers

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

Fretheim 2003

Trial name or title	RaPP-trial
Methods	
Participants	General practices in Norway
Interventions	Tailored intervention including educational outreach, audit and feedback, computerised reminders, risk assessment tools, patient information, and telephone follow-up to practices.
Outcomes	(1) Proportion of prescriptions for drugs other than thiazides for people prescribed antihypertensives for the first time. (2) Proportion of patients in whom CV risk has NOT been assessed and treatment for hypertension or cholesterol levels was initiated.

Fretheim 2003 (*Continued*)

	(3) Proportion of patients with a recorded level of cholesterol or BP that does not satisfy treatment goals, when treated for at least three months. Other outcomes to be assessed.
Starting date	Intervention to be implemented from May/Dec 2002 for 12 months. Due to collected data May/Dec 2003.
Contact information	Atle Fretheim (atle.fretheim@shdir.no
Notes	

Gulmezoglu 2004

Trial name or title	Cluster RCT of an active, multifaceted information dissemination intervention based on The WHO Reproductive health library to change obstetric practices (ISRCTN14055385)
Methods	
Participants	Hospitals in Mexico and Thailand
Interventions	Interactive workshops about the WHO Reproductive Health Library
Outcomes	(1) Changes in clinical practice as recommended by the WHO RPL
Starting date	No detail given
Contact information	AM Gulmezoglu (gulmezoglum@who.int)
Notes	

DATA AND ANALYSES

This review has no analyses.

WHAT'S NEW

Last assessed as up-to-date: 24 May 2005.

27 May 2008	Amended	Converted to new review format.

HISTORY

Protocol first published: Issue 2, 1999

Review first published: Issue 3, 2005

25 May 2005	New citation required and conclusions have changed	Substantive amendment

CONTRIBUTIONS OF AUTHORS

Richard Baker and Francine Cheater were responsible for the planning of the review.

Francine Cheater was responsible for the initial searches of the EPOC register.

Francine Cheater and Beth Shaw were responsible for obtaining full text articles and recording study data.

All reviewers assessed whether studies were relevant and extracted study data.

Clare Gillies was responsible for the statistical analysis.

First draft of the review was prepared by Beth Shaw and Francine Cheater, and the final draft was completed by Richard Baker. Other authors contributed during the development process.

DECLARATIONS OF INTEREST

Richard Baker and Signe Flottorp are authors of two of the included studies.

SOURCES OF SUPPORT

Internal sources

- Directorate for Health and Social Welfare, Norway.
- Clinical Governance Research and Development Unit, University of Leicester, UK.

External sources

- Norwegian Medical Association Quality Assurance Fund, Norway.
- Leicestershire Primary Care Trusts, UK.

INDEX TERMS

Medical Subject Headings (MeSH)

Outcome and Process Assessment (Health Care) [*standards]; Professional Practice [*standards]; Randomized Controlled Trials as Topic

MeSH check words

Humans