

Research into practice I

From best evidence to best practice: effective implementation of change in patients' care

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Major difficulties arise when introducing evidence and clinical guidelines into routine daily practice. Data show that many patients do not receive appropriate care, or receive unnecessary or harmful care. Many approaches claim to offer solutions to this problem; which ones are as yet the most effective and efficient is unclear. We aim to provide an overview of present knowledge about initiatives to changing medical practice. Substantial evidence suggests that to change behaviour is possible, but this change generally requires comprehensive approaches at different levels (doctor, team practice, hospital, wider environment), tailored to specific settings and target groups. Plans for change should be based on characteristics of the evidence or guideline itself and barriers and facilitators to change. In general, evidence shows that none of the approaches for transferring evidence to practice is superior to all changes in all situations.

Continuous development of health-care innovations presents a constant promise of more effective and safe patients' care. About 10 000 new randomised trials are included in MEDLINE every year,¹ and 350 000 trials have been identified by the Cochrane collaboration.² However, major difficulties arise in introducing these innovations into routine daily practice. One of the most consistent findings in research of health services is the gap between evidence and practice.³ Results of studies in the USA and the Netherlands^{4,5} suggest that about 30–40% of patients do not receive care according to present scientific evidence, and about 20–25% of care provided is not needed or is potentially harmful.

Traditional approaches to improve uptake of research findings have focused on better availability and presentation of evidence by identifying, synthesising, and disseminating evidence to doctors in practical accessible formats—eg, reviews in clinical journals, clinical guidelines, better access to electronic sources of information, continuing medical education (CME) courses, and conferences. Although this strategy may be all that is needed to ensure the uptake of some simple changes, most innovations require further efforts. Most clinicians can barely keep pace with the rapid advances in health-care knowledge. Shaneyfelt⁶ calculated that general internists would need to read 20 articles a day all year round to maintain present knowledge. Although the availability of systematic reviews and guidelines reduces the need for doctors to read original studies, they still find it difficult to keep up with such syntheses.⁷

Even if doctors are aware of the evidence and are willing to change, to alter well established patterns of care is difficult, especially if the clinical environment is not conducive to change. A key challenge for policymakers and health-care professionals in this complex area is to create a professional setting to pursue quality of care: this topic will be analysed in the third report in this series.⁸ The difficulty of introducing innovation in patients' care makes a critical

platform on which to identify the most effective and efficient approaches to achieve change in practice. There are many different strategies to changing practice of health care; all claim to offer solutions to the main difficulties in care provision.⁹

In this report, we provide a brief overview of present knowledge and thinking about approaches to changing medical practice. We focus on three basic issues in influencing the uptake of evidence: attributes of evidence, barriers and facilitators to changing practice, and effectiveness of dissemination and implementation strategies.

We used updated versions of individual reviews when these have been available. These reviews have used vote-counting methods that add up the number of positive and negative comparisons and conclude whether interventions were effective on this basis.¹⁰ These methods do not provide an adequate estimate of the potential effect size of interventions. We have done a systematic review of 235 assessments of guideline dissemination and implementation strategies;¹¹ we used a more explicit analytical approach, deriving a single effect size—eg, proportion of patients receiving appropriate treatment—for every study and summarising the range of effects and median effect across studies for each intervention. We added data from this new review. We used a case study looking at approaches to improve hand hygiene in hospital settings. For this case study, we searched MEDLINE from 1990 with hand hygiene specific terms and methodological terms to identify systematic reviews and evaluative designs.

How do characteristics of evidence affect its uptake?

Characteristics of research evidence might affect whether it is used in clinical practice. Some research findings are easily adopted. For example, conservative treatment in children with acute otitis media proved to be as effective as myringotomy. Publication of this finding in a scientific journal was sufficient for almost all doctors to stop doing this procedure within a short time, probably because the study was triggered by practitioners' scepticism of the benefits of the established practice.¹² However, change is rarely as easy if the innovation requires complex changes in clinical practice or better collaboration between disciplines or changes in the organisation of care.

Development and dissemination of clinical guidelines to improve quality of care is a frequent activity

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internationally.¹³ Although thousands of guidelines are available, some are better adhered to in practice than others.^{4,5} This difference could be caused by various reasons, such as type of health problem addressed, method of development used, content of the recommendations, the source of dissemination, or the format and layout.¹⁴

Four studies have looked at how the attributes of clinical guidelines might affect compliance in practice.¹⁵⁻¹⁸ Results suggest that better compliance was associated with: type of health problem (compliance was better for guidelines for acute care than for those for chronic care); better quality of evidence supporting the recommendations; compatibility of the recommendation with existing values; less complexity of the decision-making needed; more concrete description of the desired performance; and fewer new skills and organisational change needed to follow the recommendations. However, these characteristics accounted for less than 20% of the variation in performance.¹⁶ Some of these attributes are non-modifiable—eg, the topic of the guideline.

Quality of guidelines could be improved if people developing them would apply criteria for the best guidelines, as described in published work,¹⁹ or internationally validated criteria for optimum guidelines of the AGREE instrument.^{20,21} In conclusion, features of the evidence of a guideline or an innovation itself could determine adherence in practice to a certain extent, and taking these features into account could increase the change of effective implementation.

Complexity of performance change: the case of hand hygiene

Reduction in hospital-acquired infections is one of the priorities in health care in many countries. These infections are estimated to affect about one in 11 patients, with 13% mortality and a lengthened stay in hospital of a factor of 2.5.²² The extra cost per patient with an infection in the UK is about £3000. Between 15% and 30% of infections are considered preventable—eg, by improved hand hygiene.

We have been aware of the importance of handwashing since the mid 1800s, when Ignaz Philipp Semmelweis discovered the importance of hand hygiene for safe obstetric care. Results of studies have confirmed its importance.²²⁻²⁴ The benefits of handwashing are said to be so great “that if hand hygiene were a new drug it would be used by all”.²² Nevertheless, compliance by health-care workers in general, and doctors in particular, is known to be poor.^{25,26} Doctors generally are aware of the

evidence but overestimate their own handwashing practices.²⁵⁻²⁷

Most countries and many hospitals have guidelines on prevention of infections, but they are frequently not followed. So, despite well-established evidence that has been disseminated properly, performance in practice is poor. What is the problem?

Barriers and facilitators to evidence uptake

Analyses of barriers to changing practice, such as a review of 76 studies in doctors,²⁸ have shown that obstacles to change in practice can arise at different stages in the health-care system, at the level of the patient, the individual professional, the health-care team, the health-care organisation, or the wider environment.²⁹⁻³¹ Most theories on implementation of evidence in health care emphasise the importance of developing a good understanding of such obstacles to develop an effective intervention.²⁹

If we return to our example of handwashing, although this behaviour is simple to undertake, it is difficult to integrate it into routine practices in diverse clinical environments, in view of the competing demands that health-care professionals face. Fortunately, several different theories from different disciplinary perspectives provide insights into why non-compliance happens, and can offer potential solutions.²⁹ For example, cognitive theories suggest that absence of adherence to hand hygiene could be attributable to doctors' poor knowledge about the results of their poor hygiene, and that better information about the evidence base might promote better compliance. Adult-learning approaches consider that people need to experience a problem with infections in practice first before they are motivated to change. They need to reflect on solutions themselves and discuss difficulties with hand hygiene routines with their colleagues. Behavioural theories, by contrast, suggest that performance is mainly influenced by external stimuli, and can be changed by feedback, incentives, modelling, and external reinforcement. Social influence theories focus on the absence of social norms promoting hand hygiene within the wards and a lack of leadership in management that prevents following of guidelines for the best hand hygiene. Group interactive educational sessions, local consensus, or opinion leaders setting examples would fit within these theories. Marketing theories emphasise the importance of a clear and attractive message adapted to the target audience about the importance of regular handwashing. However, organisational theories would suggest that poor hand hygiene is not an individual doctor problem but a system failure attributable to inadequately organised care processes and a culture that is not oriented at collaboration and improvement of care.

The value of these different theoretical perspectives was highlighted in a study to identify difficulties experienced in following hand-hygiene recommendations in a national guideline on prevention of infections in hospitals.²⁹ We undertook a survey of 120 doctors and nurses in seven hospitals and nursing homes, and showed problems at different levels (table 1): cognitions (not convinced of the evidence), motivation (fear for irritation of the hands), and working routines of the individual professionals; interaction within the team (no mutual accountability and control, no leadership); and functioning of the hospital (workload, facilities). Analysis of published work on hand hygiene also identified several barriers to improved performance that reflect these theoretical perspectives, such as a high workload, organisation at the ward, access to facilities, irritation of the skin, lack of knowledge of the evidence, and an absence of institutional policies.³²⁻³⁴

| Change at level of | Focus of factors | Difficulties, obstacles to change | Number (%) of people seeing this obstacle as a problem |
|---------------------------|---------------------------------|--------------------------------------|--|
| Individual professional | Cognitions | I seldom see any complications | 73 (61%) |
| | | Lack of hard evidence | 52 (43%) |
| | Attitudes and motivation | Gives irritation of hands | 97 (81%) |
| | | Costs too much time | 60 (50%) |
| Routines | I forget it during rush hours | 78 (65%) | |
| | I fall back in old routines | 59 (49%) | |
| | Social influence and leadership | Nobody controls | 60 (50%) |
| Team or unit | Management is not interested | Management is not interested | 54 (45%) |
| | | It is not feasible in normal work | 73 (61%) |
| Hospital or health centre | Organisational | No guidelines in hospital on hygiene | 59 (49%) |
| | | Absence of facilities | 50 (42%) |
| | Resources | | |

Table 1: Difficulties experienced by doctors and nurses (n=120) in following guidelines for hand hygiene

Example of barriers to implementation of evidence³¹**Practice environment (organisational context)**

- Financial disincentives—eg, lack of reimbursement
- Organisational constraints—eg, lack of time
- Perception of liability—eg, risk of formal complaint
- Patient's expectations—eg, expressed wishes related to prescription

Prevailing opinion (social context)

- Standards of practice—eg, usual routines
- Opinion leaders—eg, key persons not agreeing with evidence
- Medical training—eg, obsolete knowledge
- Advocacy—eg, by pharmaceutical companies

Knowledge and attitudes (professional context)

- Clinical uncertainty—eg, unnecessary test for vague symptoms
- Sense of competence—eg, self confidence in skills
- Compulsion to act—eg, need to do something
- Information overload—eg, inability to appraise evidence

Our main conclusion is that different theoretical perspectives are valuable when considering potential barriers to change and strategies to promote change. Barriers to change can act at different levels (individual, team, organisation);³⁵⁻³⁷ it is important to understand these and tailor strategies to them (panel).

Transfer of evidence into practice: interventions

The number of original studies and systematic reviews about the effectiveness of different interventions to change clinical practice is growing, which can help in selection of appropriate strategies.³⁸⁻⁴¹ Main conclusions from an overview of 54 reviews^{11,42,43} are outlined below.

Change is possible when a well-designed intervention is used; most interventions studied had some effects (average of about 10% for main targets). However, none of the interventions is superior for all changes in all settings.

There is more evidence on professional-oriented interventions (education, reminders, feedback) than on those aimed at the organisation or the patient. Economic assessment of performance strategies is scarce, as is information on patients' outcomes. Implementation of many studies could be improved.

Different types of changes seem to need discrete types of interventions, but we do not have a good understanding of the probable effectiveness of different interventions for changes in other settings. Interventions targeted at specific obstacles to change seem to be more effective than interventions that are not.

Frequently used change interventions*Educational strategies*

At least nine systematic reviews have addressed distribution of educational materials to professionals (table 2).^{55,58,60,61,70,77,78,85,96} However, the number of studies with enough power, correct analysis, and substantial effects was small, leading reviewers to conclude that the effects of educational materials is limited.⁶⁰ A systematic review of guideline implementation strategies noted a median improvement of 8% across four cluster randomised trials.¹¹ In view of the feasibility and low costs of these interventions, printed educational materials could be important as part of a more comprehensive approach. Many reviews included CME activities. Large conferences and courses showed mixed effects; small group interactive education with active participation⁵⁹ showed positive effects. At least eight reviews addressed educational outreach by experts or trained facilitators.^{58,66,70,77,78,85,92,96} This approach proved to be especially effective for improving prescribing behaviour⁸⁵ and prevention in primary care.⁷⁰ Thomson⁹² reviewed 18 trials and noted that the effect sizes for educational outreach are moderate and could be improved by use of additional interventions. Use of local opinion leaders, looked at in three reviews, resulted in mixed effects,⁹¹ whereas the feasibility of identifying opinion leaders in different settings is uncertain.

Audit and feedback

16 reviews^{47,53,58,61,70,74,75,77,78,83-85,88-90,95,96} judged audit and feedback and noted mixed effects (table 2). This intervention seemed to be effective when targeting test ordering and prevention, but the effect size could be moderated by type of feedback, its source and format, and frequency or intensity of presentation.⁴² Feedback is recommended in combination with education, outreach visits, or reminders.⁹⁶

Use of reminders and computers

A general effect of reminders was noted in an analysis of 14 reviews.^{44,53,58,67,68,70,74,77,83-85,95-97} In the second review by Grimshaw,¹¹ reminders had the largest average effect (13%) of all interventions studied. They seemed to be especially influential for prevention (vaccination, cancer screening). Other reviews focused on use of computers and computerised decision support.^{46,71,72,80,94} A review by Balas⁴⁶ of almost 100 trials showed that about 75% had substantial improvements, particularly for provider prompts, computer-assisted treatment plans, and patients' prompts. Results of different systematic reviews suggest that computerised decision support is more likely to be effective

| Strategy | Number of reviews* | Number of studies | Conclusions |
|---|--------------------|-------------------|--|
| Educational materials | 9 | 3-37 | Mixed effects |
| Conferences, courses | 4 | 3-17 | Mixed effects |
| Interactive small group meetings | 4 | 2-6 | Mostly effective, but limited numbers of studies |
| Educational outreach visits | 8 | 2-8 | Especially effective for prescribing/prevention |
| Use of opinion leaders | 3 | 3-6 | Mixed effects |
| Education with different educational strategies | 8 | 5-63 | Mixed effects, dependent on combination of strategies |
| Feedback on performance | 16 | 3-37 | Mixed effects, most effective for test ordering |
| Reminders | 14 | 4-68 | Mostly effective, particularly for prevention |
| Computerised decision support | 5 | 11-98 | Mostly effective for drug dosing and prevention |
| Introduction of computers in practice | 2 | 19-30 | Mostly effective |
| Substitution of tasks | 6 | 2-14 | Pharmacist: effect on prescribing; nurse: mixed effects |
| Multiprofessional collaboration | 5 | 2-22 | Effective for a range of different chronic conditions |
| Mass media campaigns | 1 | 22 | Mostly effective |
| Total quality management/continuous quality improvement | 1 | 55 | Limited effects, mostly single-site non-controlled studies |
| Financial interventions | 6 | 3-89 | Fundholding and budgets effective, mainly on prescribing |
| Patient-mediated interventions | 8 | 2-14 | Mixed effects; reminding by patients is effective in prevention |
| Combined interventions | 16 | 2-39 | Most reviews: more effective than single interventions; not confirmed in recent reviews. |

*Number of reviews that included studies addressing the interventions.

Table 2: **Overview of strategies for implementation of evidence and conclusions of reviews⁴⁴⁻⁹⁸**

for management decisions than for diagnosis, and that simple prompting systems show more positive results than knowledge-based and advanced systems.⁹⁹ Hunt (68 studies)⁷¹ and Walton⁹⁴ showed that computerised decision support is most effective for drug dosing and preventive care. In two reviews of the introduction of computers in primary care,^{47,87} neutral to positive effects on clinical performance were reported.

Substitution of tasks

Six reviews looked at expanding professional roles.^{50,66,67,70,78,88} In three of these, expanding the pharmacist's role was noted to lead to better prescribing behaviour of doctors.^{55,71,83} Results of a review on delegation of tasks to nurses showed no relevant effect,⁸⁸ and substitution of preventive tasks was effective in two others.^{67,70}

Multiprofessional collaboration

In five reviews,^{52,69,79,86,98} the effects of collaboration and teamwork were examined (table 2). These interventions proved to have a range of effects in chronic patients, eg, for cancer,⁶⁹ stroke,⁸⁶ mental health,⁵² or geriatric care,⁷⁹ resulting in a shorter stay in hospital, reduction of costs, or more patient's satisfaction. But the topics were too heterogeneous to come to final conclusions.

Mass media campaigns

Grilli⁶⁴ reviewed the effects of 22 studies of mass media on health-service use and reported that all studies showed improvements in care.

Total quality management

In one review⁸¹ of 55 studies (13 multisite, three randomised controlled trials), the effects of continuous quality improvement and quality management were investigated. Interventions used were very different. Results of single-site studies showed positive results on clinical performance, but the randomised controlled trials did not.

Financial interventions

Six reviews^{49,54,62,63,65,95} addressed financial interventions. Fundholding had, in particular, an effect on prescribing.^{62,65} Providing budgets instead of fees reduced drug costs and number of days in hospital.⁵⁴

Patient-mediated interventions

Eight reviews^{46,47,58,61,67,74,77,83} summarised results of studies on interventions directly focusing on patients to improve clinical practice, typically in the form of reminders or computerised education. Effects were noted for improved screening and vaccination rates.

Combination of interventions

In the recent review of 235 trials,¹¹ 73% of all interventions were multifaceted; 16 reviews addressed such interventions specifically.^{57-59,61,67,70,73,74,77,83,84,89,90,95-97} Some of these^{70,77,84,95} stated that combined interventions, addressing specific

| Interventions | Number of studies | Conclusions |
|----------------------------|-------------------|--|
| Education and information | 11 | Only short-term effects |
| Reminders | 7 | Modest, but sustained effects |
| Performance feedback | 9 | Effective, but effect stops if feedback is not continued |
| New soap and hand rub | 3 | Small effect for hand rub |
| Adjusted sinks | 3 | Unclear effect |
| Multifaceted interventions | 11 | Pronounced effects on practice and outcomes |

Table 3: Effects of interventions aimed at improving hand hygiene¹⁰¹

barriers to change, are more effective than single interventions, but the recent review¹¹ did not lend support to this conclusion.

In conclusion, many different interventions are available, focusing on professionals, patients, teams, or organisational factors. This fact accords with the position of family doctors, who have to integrate different levels of evidence in their care of individual patients, which is discussed in-depth in the second report of this series.¹⁰⁰ All these interventions have the potential of helping with effective transfer of evidence to practice.

Interventions aimed at improving hand hygiene

What interventions might be useful to improve hand hygiene practices? We noted one specific systematic review of 22 studies assessing interventions to improve hand hygiene.¹⁰¹ Of these, 15 took place on intensive care units and only three were randomised controlled trials. The main findings (table 3) are outlined below.

Educational interventions (training sessions, newsletters, classes, and videos) were used in 11 studies and seemed to have only a short-term effect on handwashing practice.

Reminders (posters, coloured signs, labels with messages, patients reminding staff) were assessed in seven studies and were shown to have a modest but sustained effect.

Performance feedback (personal and non-personalised, oral and written) was used in nine studies; results suggest that this intervention can improve practice, but the effect stops if feedback is not continued.

Introduction of new soap or hand rub, or adjustment of sinks, had only small or unclear effects.

Multifaceted interventions were applied in 11 studies, with programmes combining, for instance, education, written materials, feedback, and reminders. Some were hospital-wide.^{102,103} Most of these programmes had a pronounced and sustained effect on both hand hygiene practices and hospital-acquired infections.

Although some caution is needed when interpreting evidence, results show that a comprehensive plan, targeting different problems and barriers to change, with strategies at different levels (professional, team, patient, and organisation), is probably needed to achieve lasting changes in hand hygiene routines.

Conclusions and messages

Sometimes, the step from best evidence to best practice is simple; however, most of the time it is not, and we need various strategies targeting obstacles to change at different levels, which could even present conflicting values for individual practitioners.¹⁰⁰ Therefore, changes in clinical practice are only partly within doctors' control; the prevailing professional and organisational culture towards quality determines the outcome to a large extent.¹⁰⁰ Nevertheless, doctors can learn important lessons from scientific published work in the area of implementation of evidence.

Many practitioners use educational materials or didactic CME sessions to keep up-to-date. However, these strategies might not be very effective in changing practice, unless education is interactive and continuous, and includes discussion of evidence, local consensus, feedback on performance (by peers), making personal and group learning plans, etc. Professional development also needs to be built into daily patients' care as much as possible, and preferably should take place at the point of time with clinical decision-support tools and real-time patient-specific reminders to help doctors to make the best decisions. On the other hand, we have seen that obstacles to change are generally not only in the professional setting but also in the

patient, the organisation of care processes, resources, leadership, or the political environment.³⁵ As a result, additional measures and actions at the level of teams or organisations are frequently needed when developing plans for change in clinical practice. Many good examples on how to work at these levels are available. However, research on their value is still absent.

Research on organisational, economic, and political approaches to change is as yet scarce; we note a challenge for researchers here. We need more research to gain a better insight into the important processes and elements of successful change. Which strategies work for a particular type of evidence in a setting? This question implies we need to give more attention to the validation of different theories on changing professional and organisational performance (from health promotion, social sciences, organisational and management sciences, marketing, and economy) to find the crucial determinants of effective change.²⁹

We note that there are many different, sometimes competing, approaches to changing practice, which all claim to be effective. This situation can be confusing for practitioners or authorities who are motivated to improve patients' care. They need to consider that research so far shows that none of the approaches is superior for all changes in all situations; we probably need them all.

If you would like to start tomorrow to change practice and implement evidence, prepare well: involve the relevant people; develop a proposal for change that is evidence based, feasible, and attractive; study the main difficulties in achieving the change, and select a set of strategies and measures at different levels linked to that problem; of course, within your budget and possibilities. Define indicators for measurement of success and monitor progress continuously or at regular intervals. And, finally, enjoy working on making patients' care more effective, efficient, safe, and friendly.

Conflict of interest statement
None declared.

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