Recommendations for future studies: a systematic review of educational interventions in primary care settings

ULRICH FREUDENSTEIN

AMANDA HOWE

SUMMARY

Systematic reviews are an important part of the current move towards evidence-based practice. Independent reviewers use a variety of search strategies to identify and assess relevant articles in the field of concern. Criteria for quality must be agreed and articles evaluated accordingly. This study systematically reviewed educational interventions targeting physicians in primary care (excluding hospital clinic and academic settings) to determine their effectiveness in changing behaviour and to investigate whether studies gave information about the resource implications of the interventions described and their rationale for choosing a particular target group. Studies in English, French, or German language journals were included. The review applied the criteria of the Cochrane Collaboration for methodological quality of studies (but was not conducted under the auspices of the Cochrane Collaboration). The results showed that relatively few studies had occurred in primary care compared with academic and hospital clinic settings. Many articles did not fit the criteria for rigour of method, and those that did were very heterogeneous in method and target group. Only two studies assessed resource implications, and one study also calculated economic benefits. The review suggests that future studies should either target geographical areas or doctors with an identifiable learning need associated with patient outcome, and that studies should be evaluated on their 'intention to educate'. Evaluations of educational initiatives need to describe the resource implications versus measurable benefits of the intervention to make their studies useful to policymakers and planners of educational provision.

Keywords: systematic review; educational interventions; primary care.

Introduction

EDUCATIONAL interventions constitute one important element in the dissemination of new knowledge to general practitioners (GPs). They should be evaluated for their effectiveness and efficiency. Existing reviews of educational interventions[1-6] have focused on all settings of medical care and have not separately considered those primary care physicians outside academic centres and hospital-attached clinics. In one major review, only eight out of 102 interventions involved those primary care physicians.[5] However, this group may find it harder to become aware of new developments because of geographical location and relative professional isolation. Behavioural change may be more difficult to produce, given the constraints of a wide variation in knowledge, learning needs, restricted study opportunities, and preferred learning styles.

This study complements prior data by focusing specifically on physicians in primary care settings. With such a heterogeneous population, defined reasons for educational input and the resource implications of interventions can be crucial in the decision to favour one particular strategy. We therefore sought information on strategies used to target primary care physicians and the extent to which resource implications of interventions were made explicit.

The aims of the review were to:

- determine whether those educational interventions targeted specifically at primary care were effective,
- extract information about the resources used for educational interventions,
- categorise the ways in which the target groups for educational interventions were identified, and
- suggest criteria for high quality studies of educational interventions in primary care settings in future.

Method

The method of systematic review was chosen for its rigour and ability to identify best practice in study design, conduct, and analysis.[7] To be included, studies must report objective measures of professional performance, patient outcomes, or resource utilisation. Trials have to be randomised controlled trials (RCT), interrupted times series (ITS), or controlled before-and-after studies (CBA).

Data sources and search strategy

The electronic databases MEDLINE, BIDS EMBASE, BIDS ISI, CINAHL, and the Cochrane Database of Systematic Reviews were searched for original studies and reviews of educational interventions in primary care settings. The search covered studies published between 1981 and June 1996. Publications had to be in English, French, or German. Keywords used were: continuing education (medical or nursing), or guidelines and primary care (CINAHL, BIDS), or primary health care (MEDLINE), or general practice (BIDS, CINAHL, or family practice (MEDLINE), and trial (textword in MEDLINE, keyword in abstract and titles BIDS). The Cochrane database for systematic reviews was searched for reviews of educational interventions. The two most comprehensive reviews[1,5] shared their underlying collection of studies. Three further reviews added to the coverage within this time period.[3,6,8] The references of all studies and reviews were also searched.

Selection criteria for study inclusion

Inclusion criteria were:

- interventions aimed at physicians practising in a primary care setting,

U Freudenstein, MRCGP, MPH, specialist registrar in public health medicine, Leicester University. A Howe, MD, FRCGP, senior lecturer in general practice, University of Sheffield, Institute of General Practice and Primary Care, Community Sciences Centre, Northern General Hospital, Sheffield.

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- any educational intervention aiming to produce measurable change in the process of care or patient outcomes, and
- methods conformed to the criteria used in selection of intervention studies for systematic reviews by the Cochrane Collaboration on Effective Professional Practice (CCEPP)[7] (Box 1).

Exclusion criteria for studies were those:

- involving primary care physicians of secondary care institutions or academic teaching centres,
- not exclusively involving family physicians,
- involving only one practice,
- judging change by self-assessment with no external validation, and
- using an intervention consisting only of computerised reminders.

Selection process

Studies were identified by the basic criteria for inclusion by one reviewer. All studies matching the criteria were subjected to methodological scrutiny by both reviewers on the basis of the quality criteria for intervention studies published by the CCEPP.[7] Discrepancies were discussed and a joint decision made on the status of any disputed study.

Data extraction

Author, year, study type, sample size, method of target selection, intervention type, and results were summarised for each study. Interventions were rated as effective if the trial's null hypothesis (that there would be no difference between groups) was rejected at a probability of $P<0.05$. If $P>0.05$, we considered the intervention ineffective (although a similar result could occur by chance in one of 20 trials of the same nature).

Results

Fifty-one studies were identified that satisfied basic criteria: 21 from the search of electronic databases and 30 from references. Twenty-six studies satisfied the methodological criteria of the CCEPP.[9-35] Eighteen were randomised controlled trials, one an interrupted time series, and seven were controlled before-and-after studies. No German or French language studies were retrieved in the search (Table 1). Twenty-four studies were excluded[36-59] (listed with reasons in Table 2).

Interventions

In Table 3 the number of times a particular category of educational intervention was used (e.g. small group teaching), and the number of times a significant change of any indicator was achieved is set against the total number of times the intervention was used. Only 15 studies reported change with a direct impact on patients (e.g. changes in prescribing, changes in use of a procedure, or frequency of disease detection).

Targeting of educational interventions

Table 4 shows the different methods of choosing groups of physicians for interventions, with the number of studies reporting any change in outcome measures.

The use of volunteers was by far the commonest way of selecting participants. Six studies used a geographical location, such as a health district, to define their target. Two studies used a performance indicator. Their use of a service characterised the practices that were approached in two studies, and this was combined with a performance indicator to refine the choice in another. One unusual approach was the selection of physicians through their patients, who participated in a community survey of hypertension.

The approach to changing the behaviour of physicians through an educationally influential colleague was the most complex. The effectiveness of this strategy depended on the formal identification of an individual viewed as educationally influential by his peers.

Resources used for educational interventions

Only two studies gave approximate financial costs for their intervention.[15,17] Only one study compared estimated savings against the cost of the intervention. Another stated that resource use had been recorded but did not publish this information. Two studies estimated the approximate economic impact of the intervention without specifying the cost of the intervention.[30,31]

Discussion

This review shows evidence that educational interventions involving primary care physicians can be effective in changing clinical behaviour. However, the review suggests methodological limitations to many studies in this field:

- Few studies were sufficiently well designed to be able to gauge the patient outcomes of the participants' learning.
- The majority relied on volunteers. Primary care physicians have been shown to have difficulties in assessing their own level of knowledge adequately.[60] Those with the greatest need for educational support may not be motivated to explore

Randomised controlled trials (RCT)

1. Concealment of allocation
2. Follow-up of professionals (80–100% of randomised subjects)
3. Follow-up of patients (80–100% of randomised patients)
4. Assessment of the outcome variables blinded or outcome variables objective
5. Baseline measurements prior to intervention
6. Reliable outcome measures: there needs to be inter-rater agreement of at least 90% (or kappa 0.8) or outcome measures objective
7. Protection against contamination

Interrupted time series (ITS) studies

1. Intervention independent of other changes
2. Sufficient data points to enable reliable statistical inference (at least 12 data points recorded before and after the intervention)
3. Formal test for trend reported
4. Data collection before and after intervention identical
5. Intervention unlikely to affect the data collection
6. Assessment of outcome variables blinded or outcome variable objective
7. Dataset covers 80–100% of total providers and episodes of care in the study area.
8. Reliable primary outcome measures (as in no. 6, under RCT)

Controlled before-and-after (CBA) studies

1. Baseline measurements prior to intervention, no substantial differences across study groups.
2. Baseline characteristics similar for study and control provider
3. Primary outcome measure by blinded assessment or objective measurement
4. Protection against contamination
5. Reliable primary outcome measures (as in no.6, under RCT)
6. Follow up of 80–100% of subjects randomised
7. Outcome measures obtained for 80–100% of randomised patients.

Box 1. Methodological criteria for selection of retrieved studies.[7]

Table 1. Summary of studies included in this review.

First author, reference, type of study	Subjects (total sample), selection	Intervention	Outcome measure and outcome	Change in intervention group relative to control
Putnam RW,[48] RCT	Family physicians (16), V	Guideline development, educational visit	Recorded items in records	Improved recording of criteria of good quality care
Kendrick T,[21] RCT	General practices (16),V	Small group teaching	Numbers of admissions, numbers of referrals, drugs prescribed	Increased prescribing of neuroleptic drugs and referrals to psychiatric nurses, no difference in patient outcomes
Roter DL,[25] RCT	Family physicians, internists (69), V	Teaching of emotion, handling or problem, defining skills	Detection of depression, patient improvement	Improved recognition of emotional distress, better patient outcomes in problem-defining skills group
Bexell A,[17] RCT	Health Centres (16) G	Seminars	Prescribing	Intervention reduced prescribing of targeted drugs
Onion CWR,[23] CBA	All practices in one district (69), G	Guideline development, discussion, educational visiting	Prescribing	Increase in the difference between the district and England as a whole
Emslie C,[18] RCT	Practices (82), G	Infertility management sheet	Compliance with management sheet	Increased appropriate management
Royal College of Radiologists,[26] ITS	Practices (22), G	Guidelines, educational visiting	Number of X-rays	Greater compliance with guidelines, reduction in X-rays requested
Bearcroft PWP,[16] RCT	Practices (33), P	Guidelines	Quality of X-ray requests	Change in giving patient history details, no change in number of X-rays
Jennett PA,[20] RCT	Practices (25), V	Group discussion, newsletters, teleconference	Information from patient records	Improved recording of information
Evans CE,[19] RCT	Patients (198) and their physicians (76), V	Mailed education programme	Blood pressure control, knowledge of physicians	No change
Oakeshott P,[22] RCT	Practices (62), G	Mailed radiological guidelines	Quality of X-ray requests	Fewer X-rays of the spine ordered, greater conformity with guidelines
Avorn J,[15] RCT	Physicians (435), P	Mailed advice,mailed advice and educational visit	Prescribing	Prescribing changed
Rutz ,W[27] CBA	Physicians (18), G	Two day courses with changing topics over two years	Prescribing	Prescribing changed
McConnell TS,[9] RCT	Physicians (33), P	Educational, visiting	Prescribing rates	Prescribing changed
Dietrich AJ,[12] RCT	Physicians (98), V	Help with office systems and educational meeting	Patient experience, notes review	Improved level of cancer screening and health promotion advice in office system groups
White PT,[14] RCT	General practitioners (27), patients (565), V	Facilitated group meetings	Medication use, absence from school or work, home visits	No change
Feder G,[11] RCT	General practices (24), V	Educational visiting	Care process, prescribing costs	Recording of patient data and prescribing changed
Stross JK,[13] RCT	Doctors referring to hospitals in six communities, G	Educationally influential physicians trained in management of osteoarthritis	Pre- and post-referral management of patients	Change in pre-referral management, increase in appropriate referrals

V = volunteer, P = performance, G = geographical area; ITS = interrupted time series, CBA = controlled before-and-after study, RCT = randomised controlled trial.

Table 1 (cont). Summary of studies included in this review.

First author, reference, type of study	Subjects (total sample), selection	Intervention	Outcome measure and outcome	Change in intervention group relative to control
Wilson DM,[10] RCT	Physicians (70) V	Training in use of nicotine gum	Smoking cessation, self-reported and biochemical	Increased smoking cessation
Howe A,[29] RCT	General practitioners (19), patients (100), V	Video feedback, self-directed educational package	Detection rate of psychological distress	Improved diagnosis
Royal College of GPs,[30] CBA	General practitioners (45), V	Feedback of prescribing data, discussion group	Prescribing	Reduced cost of prescribing
Zaat JOM,[32] CBA	General practitioners (75), G	Change in laboratory order form	Tests ordered	Reduced test ordering
Winkens RAG,[31] CBA	All practices in the catchment areas, G	Feedback on tests	Tests ordered	Reduced test ordering
Fullard E,[33] CBA	General practices (6), V	Training practice staff to carry out health checks	Recording of smoking, blood pressure, obesity	Increase recording of patient information
Lassen LC,[34] CBA	Practices (108)	Feedback on prescribing	Prescribing information	Reduced cost of prescribing
Perera DR,[35] RCT	Physicians (26), V	Teaching sigmoidoscopy	Sigmoidoscopy rate	Increase in sigmoidoscopies at first but declined again after three months

V = volunteer, P = performance, G = geographical area; ITS = interrupted time series, CBA = controlled before-and-after study, RCT = randomised controlled trial.

areas in which they have the greatest scope for improvement.[28] If education is to change behaviour on a larger scale, evaluations based on the 'intention to educate' are essential to appreciate the true effectiveness of the intervention.

- Very few studies reported resource implications at any level, which is disappointing given the importance of such information for those seeking to replicate their methods.
- Effects of interventions almost certainly wane, and the studies we reviewed did not (with few exceptions[27,61] assess duration of effect.

The review has some limitations:

- Publication bias results in studies that do not trigger a measurable change are less likely to be published or even submitted for publication.[62]
- We have not given measures of effect size (such as percentage change in measured variables or variance); however, this would have added little information of practical value, as the circumstances of each study were highly varied.
- The assessors in this review were not always blinded to the conclusions of the other. There was potential for bias in the selection of studies for inclusion. However, the criteria of effectiveness were objective and clear. Moreover, the aims of this study were not based on effectiveness alone, so any reporting bias is unlikely to have interfered with the conclusions concerning targeting and resource use.
- Appropriateness of educational method, while interesting and important in impact on behaviour, were considered too difficult to assess objectively from most articles to warrant inclusion as a study using systematic review methods.

During the review we noted the effect of ongoing methodological development. When selecting the studies on methodological grounds, the relatively new guidelines of the Cochrane Collaboration were used. These had not been applied by previous reviewers.[1,2,5,6,8] Even the Cochrane guidelines have since been changed.[63] As a consequence of increasing methodological stringency, a large body of research was excluded from our consideration. Our justification was that methodological soundness of studies provided a marker of quality and reduced bias. Such exclusions may be necessary when definitive conclusions are to be drawn or professional guidelines revised. However, much useful qualitative information is excluded by strict methodological requirements, as are exploratory or descriptive studies and those without control groups. This raises interesting questions about the choice of a relevant paradigm for assessing educational interventions. There are doubtless many who would wish to admit more qualitative work or to use adult educational method as a criterion. Educational settings vary, and evaluation can be done in many different ways. Innovative method, cultural rather than clinical change, and effective dissemination strategies may also be important outcomes — each of these elements would add positive weight to an evaluation, along with participant satisfaction. The reviewers would value further debate on this point.

Conclusions

Within the United Kindgom (UK), postgraduate education is increasingly considered as a vehicle for widespread behavioural change rather than for spreading information to interested health care workers alone. This is reflected in the high priority accorded to dissemination research and information networks such as the Cochrane Collaboration and the York Centre for Reviews and Dissemination.[64] Targeting interventions is an issue for planners of policy, educationalists, and organisations responsible for

Table 2. Studies excluded from the review and reasons for their exclusion.

First author, reference, type of study	Reason for exclusion
Pond CD,[41] ITS	No test for trend, <12 data points
Yeo GT,[45] RCT	Report on subjective process variables only, evaluators not blinded
Szonyi G,[44] RCT	60% follow-up
Cowan PF,[36] ITS	Evaluation not blinded, data collection likely to be influenced by intervention, no test for trend
Palmer RH,[40] RCT	Intervention directly influenced data collection (part of the design), only 74% follow-up
Schellevis FG,[43] ITS	Baseline data collected during participative intervention development, no formal test for trend
De Santis G,[37] RCT	Less than 30% follow-up
Ray WA,[42] CBA	Baseline characteristics and differences between intervention and control groups not given
Newton-Syms FAO,[38] RCT	No apparent protection against contamination in the selection process of participants
Heale J,[46] RCT	Less than 80% follow-up
Levinson W,[47] RCT	Association between raters given, low on a number of outcome variables, kappa not given
Putnam RW,[24] CBA	No follow-up level given for patients
Kottke TE,[49] RCT	Randomisation broken for 10 of 66 physicians
North of England Study,[39] CBA	No baseline, no comparison intervention/control, records used varied in completeness, level of completeness not stated, not stated if abstraction from records was by blinded investigators
Lane DS,[50] CBA	Self report of own behaviour only
Moran JA,[56] CBA	Substantial differences between study groups at the outset
Grant GB,[52] CBA	No baseline, comparison groups intentionally different
Frame PS,[54] CBA	Single data points, no test for trend, not stated degree of rater agreement in data extraction
Hamley JG,[53] ITS	Number of data points used for assessment of trend not stated, observation period not stated, independence of other changes not stated
Grol R,[51] ITS	Inter-rater agreement kappa 0.71–0.75, two observation points only
Fleming DM,[57] ITS	Two data points only
Schaffner W,[58] CBA	Control group was merged with one of the intervention groups for analysis, comparability of new control group not given
Tracey JM,[59,72] CBA	Control and intervention group self-selected, comparability not stated, losses to follow-up occurred only in one group

Table 3. Interventions and their effectiveness.

Interventions (involving one of these elements)	Numbers of studies involving one of these methods[a]	Numbers of studies with significant change
Mailed guidelines, newsletter, audio-visual materials	8	7
Educational visit	6	6
Small group teaching	7	6
Facilitator attached to individual practice	2	2
Facilitated group meetings of physicians	3	2
Identifying and training educationally influential physicians	1	1
Restricted laboratory test ordering form	1	1

[a]Studies may be counted more than once.

Table 4. Targeting educational interventions.

Method of targeting physicians or practices	Numbers of studies involved	Numbers of studies with statistically significant changes of outcome measures
Volunteers	13	12
Geographical area	6	6
Catchment area practices of one service provider	2	2
Catchment practices of one service provider AND defined by performance indicator	1	1
Performance indicator	3	3
Primary care physicians defined by probable contact with educationally influential peer	1	1
Physicians of patients who participated in a trial	1	0

improving the quality of medical care. We already know much about the efficacy of educational interventions. What are urgently required are more studies with clear patient outcomes and evaluations based on the 'intention to educate'. Examples of such initiatives exist in the UK.[65-70] This requires larger sample sizes and much more health service-based implementation strategies with high quality evaluations attached. This would initially increase cost. Researchers have rarely been concerned with cost or cost-effectiveness of educational interventions. However, such information is essential for decision-makers in the health service as a necessary tool for planning. We recommend that more studies be carried out in defined geographical areas or with groups of doctors (or other health service staff), with a clearly identified deficit relating to patient outcomes. These studies should be accompanied by economic evaluations or should at least publish their costs.

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Address for correspondence

Dr Ulrich Freudenstein, 95 Clarendon Park Road, Leicester LE2 3AH. E-mail: uf3@le.ac.uk