Randomised controlled trial of the impact of guidelines, prioritised review criteria and feedback on implementation of recommendations for angina and asthma

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SUMMARY

Background: *Guidelines are frequently used in an attempt to influence the performance of health professionals, and a national agency has been established in England and Wales to develop and disseminate guidelines. Professionals prefer short guidelines that highlight key recommendations, but whether such guidelines are more likely to be implemented is unknown.*

Aim: *To determine the relative impact of the dissemination of full guidelines, reduced guidelines in the form of prioritised review criteria, and review criteria supplemented by feedback.*

Design of study: *Cluster randomised controlled trial, with an incomplete block design.*

Setting: *Eighty-one general practices in Leicestershire, Lincolnshire, Northamptonshire, North Derbyshire, and Nottinghamshire.*

Method: *The practices received one of the study interventions, either for care of adults with asthma or for care of people with angina. Data were collected before and after the interventions, the process measures being adherence to ten recommendations about asthma and 14 about angina, and outcome measures being scores in response to an asthma symptom questionnaire or the Seattle Angina Questionnaire, and levels of patient satisfaction.*

Results: *There were no consistent differences between the interventions in stimulating improvements in performance as indicated by adherence to the recommendations for asthma or angina. Patients with angina in practices that had received criteria or criteria plus feedback reported better symptom control.*

Conclusion: *The dissemination of guidelines in the format of prioritised review criteria does not increase adherence to recommendations in comparison with the traditional guideline format, and the further provision of feedback has minimal additional effect.*

Keywords: *guidelines; review criteria; feedback; audit; asthma; angina.*

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Introduction

GUIDELINES are increasingly being used in an attempt to improve the performance of health professionals, and a national institute has been established in England and Wales to review health care technologies and produce guidelines.[1] However, the provision of guidelines does not automatically lead to changes in performance.[2,3] Although general practitioners (GPs) have expressed a preference for short, concise formats,[4] few studies have investigated the relative impact of different formats. Systematically developed evidence-linked guidelines are based on reviews of the best available evidence, supplemented by the views of a guideline panel when the evidence is incomplete,[5] but such guidelines can be lengthy and detailed. In devising a new approach to the development of review criteria, we have suggested that such criteria should be prioritised, not only according to the strength of evidence, but also to their impact on outcome.[6] The rationale is that recommendations with little supporting evidence of benefit should not be included in any dissemination process, so that practitioners can concentrate on those that really matter. Accordingly, the number of criteria will be fewer than the number of recommendations in the equivalent traditional guideline. This approach may also be used to devise guideline recommendations, enabling them to be presented in a short format in accordance with the expressed preferences of practitioners.

Various strategies are available to strengthen the impact of guidelines, but none is consistently effective.[7] In United Kingdom (UK) general practice, feedback of information about performance has been one of the most commonly used implementation methods.[8] Participating practices collect data, usually from clinical records, and the findings are collated to provide feedback to each practice to enable comparisons of performance with local peers. In a review of 37 trials of audit with feedback, effectiveness varied from none to moderate effectiveness,[9] but few studies had been undertaken in general practice in the UK. Therefore, this study was undertaken to determine whether recommendations, in the form of systematically developed prioritised audit criteria, are more effective in stimulating improvements in the performance of primary health care teams than recommendations in the format of standard guidelines, and whether the addition of feedback to criteria increases effectiveness.

HOW THIS FITS IN

What do we know?

General practitioners express a preference for guidelines that are short and to the point, and feedback is one of the most common methods used to promote the adoption of guideline recommendations. We conducted a randomised controlled trial of guidelines for the management of adults with asthma or angina in 81 practices, the guidelines being presented in full versions or in the form of prioritised review criteria that highlighted only those recommendations that were most important.

What does this paper add?

Neither feedback nor the presentation of guidelines in a prioritised form led to increased implementation of the guideline recommendations. In the absence of multifaceted tailored interventions, a prioritised guideline format, with or without feedback, cannot be relied upon to implement change in general practice care.

Method

The interventions

The three interventions compared in this study were evidence-based guidelines alone, the guideline recommendations in prioritised review criteria format alone, and review criteria supplemented with feedback. The dissemination of guidelines alone has little, if any, effect,[10] and therefore a group with no intervention at all was not included. The guidelines were those for the primary care management of asthma[11] and stable angina[12] developed by the North of England Guideline Development Project, using methods to explicitly link recommendations to evidence. The guidelines were up to date at the time of commencement of the study. The full asthma and angina versions used in the study contained 51 and 59 recommendations respectively, graded A to C according to recommendation strength.

The review criteria were developed directly from the guidelines to ensure they had comparable content, although they were selective and in a different format. The inclusion of recommendations in criteria format was determined by the strength of guideline recommendation and the inclusion of specific clinical guidance, rather than merely a comment on the evidence, and the recommendation related to the majority of patients, rather than to small subgroups. Ten criteria for asthma and 14 for angina were included, as they met all the inclusion rules indicated above. The review criteria were worded to contain clear instructions about the appropriate care to be delivered, and they were presented on a single sheet of card and prioritised as either 'must do' or 'should do'.[6] Feedback on actual practice performance was prepared from the results of the first data collection and presented as text, tables, and charts comparing details of individual practice performance with other participating practices. Details of all three types of intervention were posted to every GP in the participating practices according to intervention group, and no other interventions were offered.

Participants

The local research ethics committees in Leicestershire, Lincolnshire, Northamptonshire, North Derbyshire, and Nottinghamshire gave approval for the study. All 517 general practices were invited to take part and those that agreed were randomly assigned a particular intervention for each of the two study conditions, using a balanced incomplete block design.[13] To randomise the participating practices to the nine blocks in the study, each practice was allocated a unique code number, and the SPSS random samples procedure was used to allocate the codes to create nine blocks, with nine practices in each block.

Fresh samples of patients were drawn in each data collection, practices on each occasion being asked to identify patients with asthma or angina from their diagnostic registers, supplemented by searches for patients receiving specific asthma or angina medication. From those identified, random samples of 30 patients with angina and 35 with asthma were drawn using random number lists.[13] In small practices that did not have this number of patients with angina, all patients were included. Information about the study, requests for consent to participation, and the study questionnaires, were posted to the patients who were included. A single posted reminder was sent to non-responders.

Process and outcome measures

The primary study outcome measure was data about the process of care, collected by review of patient records supplemented by patient questionnaires. A data extraction recording form was developed and piloted, and qualified nurses were trained to collect the data. The data collectors were not told which practice received which intervention. The reliability of data extraction was tested, first during training and again during both actual data collections. In each test, two data collectors independently extracted data from the same sample of 10 records (a total of 20 records per data collector), and levels of agreement were calculated as percentages of identically extracted items. The first data collection was undertaken between August 1998 and January 1999, and the second data collection between August 1999 and January 2000. Data were collected only from the records of those patients who gave consent to record review.[14] The patient questionnaires were used to obtain information not routinely entered in records. For angina, this information included self-medication with aspirin, advice given by the practice team about use of medication, assessment of compliance, and smoking advice. For asthma, the questions included advice about smoking and passive smoking, and use of, and compliance with, medication. In determining adherence to guideline recommendations relating to these topics, adherence was assumed if either the patient, the clinical record, or both, indicated that care was in accordance with the particular recommendation. To enable an assessment of the extent to which dissemination of full guidelines alone led to changes in care, data were also collected relating to five recommendations in the angina guidelines that had not been included as review criteria.

The secondary study outcome measures were patients' symptoms and satisfaction with care. Two patient symptom

questionnaires were used: the asthma symptoms questionnaire,[15] in which a high score indicates severe symptoms, and the Seattle Angina Questionnaire,[16] in which a low score indicates severe symptoms. Minor modifications were made to the wording of the angina questionnaire to make it appropriate for British patients. Patient satisfaction with care was assessed using two questions from the validated Seattle Angina Questionnaire; for angina, the question asked about satisfaction with explanations given by the doctor, and whether taking medication had been bothersome; for asthma, the question asked about satisfaction with explanations and whether everything possible was being done to treat the asthma.

Sample size and analysis

There were nine possible combinations of conditions and interventions in the incomplete block design. Randomisation was done by cluster,[17,18] and to detect a change of adherence to a guideline recommendation of 15% (from 53% to 68%), with a power of 90% and significance of 5%, and employing an intra-practice correlation of 0.1, with a cluster size of 18 patients with each condition per practice, and 81 practices (nine replicates of the incomplete block), the sample required was 486 patients for each intervention per study condition. Eighty-one practices were included because the inclusion of more would not have much reduced the numbers of patients required per practice, but would have increased the cost of the study.

Data collection was carried out initially before administration of the interventions, and then for a second time using the same procedures after approximately 12 months. We sought to determine the changes in adherence to the guideline recommendations and outcomes between data collections in each of the intervention groups. Binary variables (adherence to guideline recommendations) were analysed using generalised estimating equations with robust standard errors and an exchangeable correlation structure.[19] Continuous variables (outcomes) were analysed using multilevel models with a random effect at the practice level.[20] Both unadjusted and adjusted (accounting for baseline differences) odds ratios with 95% confidence intervals were calculated. Generalised Wald tests were used to calculate *P*-values for differences between the interventions after adjustment.[21]

Results

Ninety-four practices expressed interest in taking part in the study, but 11 of them asked to view the guidelines before confirming their decision. Since this would have given them the opportunity to begin implementing the guidelines, these practices were eliminated. Two practices withdrew before the first data collection. Therefore, 81 practices agreed to take part and all of them completed the study.

The numbers of patients in each study group who were invited to take part and gave consent to record review are shown in Table 1. Sixty-four per cent and 63% of the patients with asthma returned questionnaires in the first and second data collections, respectively. Seventy-two per cent of the patients with angina returned questionnaires in both data collections. There were no differences between patients who consented and those who did not for mean age, sex, sever-

ity of symptoms, or satisfaction with care.[14] In the first data collection, patients with asthma in the practices that received feedback had a lower mean age. Data were collected from the records of 85% and 93% of consenting patients in the first and second data collections, respectively. The characteristics of the practices are shown in Table 2. The groups were similar, although more practices in the group that received feedback about their care of patients with angina had a computerised angina register. Levels of agreement between pairs of data collectors rose from approximately 80% at first assessment to over 90% for all variables except year of diagnosis of asthma, which was 50% when first assessed, subsequently improving to 80%.

Process of care

In Table 3 information is presented on levels of adherence to ten recommendations for the management of asthma before and after the study interventions. Similar levels of adherence were recorded in all of them, with the following exceptions: the proportion of patients in whom the number of daily doses of beta-2 agonist had been checked rose from 11.2% to 22.5% in the guidelines group, and from 15.5% to 20.7% in the criteria-with-feedback group; the proportion of patients treated with the cheapest inhaled steroid rose from 35.0% to 46.2% in the criteria group and from 43.0% to 58.9% in the criteria-with-feedback group. The recording of smoking status also rose in the criteria and criteria-with-feedback groups. There were small reductions in symptom scores in the groups that received guidelines or criteria, and a small increase in the group receiving feedback. Patient satisfaction levels showed no differences.

The corresponding results concerning adherence to the recommendations for angina are shown in Table 4. The proportion of patients with raised blood pressure managed in accordance with the British Hypertension Society's guidelines increased from 39.2% to 48.0% in the group receiving criteria with feedback, but did not improve in the other groups. The proportion of patients whose compliance with medication had been checked increased from 27.5% to 30.9% in the guidelines group, but fell in the criteria and criteria-plus-feedback groups. The proportion of patients given information about when to use their nitrate medication increased from 84.1% to 93.8% in the group that was given guidelines, but there was less improvement in the criteria and criteria-plus-feedback groups. For some recommendations there were improvements in all groups, i.e. with regard to cholesterol being checked at diagnosis, blood pressure being checked at diagnosis and in the past 12 months, prescription of the cheapest beta-blocker, and aspirin use.

Scores for angina stability, angina frequency, and disease perception improved in the criteria and criteria-with-feedback groups in comparison with the guideline group, and there was a decrease in the taking of medication being reported as bothersome in the criteria-only group (Table 4). There were no differences between study groups for the five recommendations that had only been included in the guidelines in traditional format (Table 5). The intra-class correlations for the asthma variables ranged from 0.02 to 0.45. Three were below 0.1, and four others between 0.1 and 0.14. For angina, correlations ranged from 0.00 to 0.11.

Table 1. Numbers of patients included in each data collection and with each study condition.

	Asthma			Angina		
	Guidelines	Review criteria	Criteria plus feedback	Guidelines	Review criteria	Criteria plus feedback
First data collection						
Patients invited to take part	896	889	894	780	792	818
Questionnaires returned	568	580	571	536	577	597
Consented to record review	510	521	508	496	525	534
Eliminated (diagnosis not confirmed from records)	27	11	19	29	37	11
Patients included	483	510	489	467	488	523
Males (%)	234 (48.4)	216 (42.3)	201 (41.1)	296 (63.4)	308 (63.1)	273 (52.2)
Mean age (SD)	50.1 (18.1)	49.3 (17.9)	45.3 (17.8)	69.5 (9.6)	68.6 (9.6)	68.6 (9.8)
Second data collection						
Patients invited to take part	958	950	914	787	818	807
Questionnaires returned	587	606	587	572	583	580
Consented to record review	531	541	537	533	536	527
Eliminated (diagnosis not confirmed from records)	14	17	11	12	11	8
Patients included	517	524	526	521	525	519
Males (%)	228 (44.1)	269 (47.5)	226 (43.0)	287 (55.1)	315 (60.0)	303 (58.4)
Mean age (SD)	48.6 (19.2)	46.6 (19.8)	46.7 (18.6)	70.4 (9.7)	69.9 (10.6)	70.7 (10.2)

SD = standard deviation.

Table 2. Characteristics of practices in each intervention group for each study condition.

	Guidelines	Review criteria	Criteria plus feedback
Asthma			
Number	27	27	27
Mean practice list size (SD)	5771 (3597)	5689 (2790)	5892 (3621)
Mean number of full-time GPs (SD)	2.5 (1.6)	2.7 (1.4)	2.6 (1.6)
Mean number of part-time GPs (SD)	0.7 (1.1)	0.4 (0.6)	0.4 (0.6)
Mean number of patients aged 65 years or more (SD)	899 (625)	894 (525)	988 (782)
Mean Jarman score (SD)	0.4 (11.1)	7.2 (12.4)	3.9 (13.7)
Fundholding	19	13	19
Teaching	5	7	6
Asthma clinic	26	22	19
Computerised asthma register	18	21	18
Angina			
Number	27	27	27
Mean practice list size (SD)	5933 (3783)	5664 (2742)	5754 (3462)
Mean number of full-time GPs (SD)	2.5 (1.7)	2.7 (1.5)	2.5 (1.5)
Mean number of part-time GPs (SD)	0.4 (0.6)	0.6 (1.0)	0.5 (0.8)
Mean number of patients aged 65 years or more (SD)	878 (677)	976 (670)	920 (608)
Mean Jarman score (SD)	0.3 (13.1)	6.2 (12.2)	3.9 (12.0)
Fundholding	14	16	21
Teaching	4	8	6
Coronary heart disease clinic	10	9	7
Computerised angina register	13	20	24

SD = standard deviation.

Discussion

Summary of main findings

There were some differences in relation to some of the process variables, although a small number of statistically significant results might be expected by chance, as a relatively large number of variables were investigated. For angina, there were small improvements in outcome in the group that received feedback, but the clinical significance of this finding is unclear. For five recommendations for angina that were not included as criteria, the dissemination of guidelines alone had no impact in comparison with no intervention at all. It is unlikely, therefore, that the dissemination of the large number of recommendations contained in the traditional guidelines induced improvements in aspects of care that were not measured in the study. There were improvements in adherence to some recommendations in all intervention groups, including five of the 14 recommendations for angina. In view of the attention given to management of ischaemic heart disease in primary care in recent years, this finding is likely, at least in part, to reflect general secular trends in clinical practice, but in the absence of a group of practices that did not receive the guidelines it is not possible to be certain that this was the explanation. Nevertheless, the findings do indicate that none of the three interventions (guideline recommendations in traditional format, in the format of review criteria, or criteria supplemented by feedback) was more effective than any of the others in improving the care of people with asthma or angina.

Table 3. Adherence to recommendations about asthma, relevant to most patients, before and after the study interventions, and mean symptom and satisfaction scores.

Recommendation	Intervention			P-value
	Guidelines	Review criteria	Criteria plus feedback	
The records show that asthma has been diagnosed on the basis of either: nocturnal cough and wheeze; allergen-induced cough/wheeze alleviated by beta-2 agonist; or exercise-induced cough/wheeze alleviated by beta-2 agonist				
Before (%)	79/428 (18.5)	113/451 (25.1)	110/400 (27.5)	
After (%)	97/490 (19.8)	142/480 (29.6)	135/473 (28.5)	0.82
If symptoms are equivocal, diagnosis has been based upon a PFR diurnal variation of over 20% or upon a reversibility in PFR of over 15% after use of beta-2 agonists or steroids				
Before (%)	26/349 (7.4)	32/338 (9.5)	40/290 (13.8)	
After (%)	37/393 (9.4)	30/338 (8.9)	39/338 (11.5)	0.70
Patients diagnosed as suffering from asthma have been prescribed a beta-2 agonist				
Before (%)	347/428 (81.1)	386/451 (85.6)	349/400 (87.2)	
After (%)	396/489 (81.0)	403/479 (84.1)	405/472 (85.8)	0.89
In patients using beta-2 agonists, compliance has been checked				
Before (%)	285/347 (82.1)	335/386 (86.8)	300/349 (86.0)	
After (%)	324/396 (81.8)	328/403 (81.4)	345/405 (85.2)	0.36
The number of daily doses of beta-2 agonist required by the patient has been checked				
Before (%)	39/347 (11.2)	59/386 (15.3)	54/349 (15.5)	
After (%)	89/396 (22.5)	68/403 (16.9)	84/405 (20.7)	0.21
Patients have been treated with cheapest beta-2 agonist (salbutamol)				
Before (%)	201/347 (57.9)	180/386 (46.6)	205/349 (58.7)	
After (%)	204/396 (51.5)	189/403 (46.9)	230/405 (56.8)	0.75
Patients have been treated with cheapest inhaled steroid (beclomethasone)				
Before (%)	134/301 (44.5)	117/334 (35.0)	128/298 (43.0)	
After (%)	149/334 (44.6)	163/353 (46.2)	211/358 (58.9)	0.044
Patient's inhaler technique has been checked and recorded				
Before (%)	53/412 (12.9)	61/442 (13.8)	93/385 (24.2)	
After (%)	66/488 (13.5)	54/479 (11.3)	97/471 (20.6)	0.56
Patients have been advised to avoid passive smoking				
Before (%)	97/428 (22.7)	76/451 (16.8)	73/400 (18.2)	
After (%)	105/490 (21.4)	82/480 (17.1)	95/473 (20.1)	0.72
Patient's current smoking status has been established and recorded (in past 12 months)				
Before (%)	120/428 (28.0)	114/451 (25.3)	110/400 (27.5)	
After (%)	146/490 (29.8)	158/480 (32.9)	165/473 (35.2)	0.74
Mean symptom score (SD)				
Before	36.2 (23.9), n = 406	34.0 (22.0), n = 424	30.4 (20.5), n = 378	
After	34.1 (22.7), n = 453	33.1 (21.8), n = 440	33.8 (22.3), n = 443	0.02
Patients are satisfied that everything possible was done to treat asthma				
Before (%)	357/420 (85.0)	364/446 (81.6)	338/395 (85.6)	
After (%)	410/478 (85.8)	379/466 (81.3)	390/463 (84.2)	0.83
Patients are satisfied with explanations given by the doctor about asthma				
Before (%)	327/417 (78.4)	337/444 (75.9)	321/394 (81.5)	
After (%)	377/471 (80.0)	354/462 (76.6)	366/457 (80.1)	0.75

PFR = peak flow rate; SD = standard deviation.

Strengths and limitations of the study

This is a large study of three interventions commonly used to facilitate the implementation of guideline recommendations in general practice. A control group that received no intervention was not included, since it is already clear that dissemination of guidelines alone has little or nor effect.[7,10]

The incomplete block design reduced the possibility of Hawthorne effects,[22] and the practices in each of the study groups had similar characteristics. It should be noted, however, that the staff in the practices and the patients that took part were volunteers. Care was also taken to ensure that practices received discrete study interventions. Since the information contained in clinical records is often incomplete,

Table 4. Adherence to recommendations about angina and scores for the Seattle Angina Questionnaire.

Recommendation	Intervention			P-value
	Guidelines	Criteria	Criteria with feedback	
The records show that the diagnosis of angina is based upon either: characteristic symptoms of angina (restrostenal chest pain precipitated by physical/emotional exertion and/or pain/discomfort felt alternatively or additionally in the arms, epigastrium, jaw or back); or suggestive symptoms of angina supported by positive investigations				
Before (%)	272/407 (66.8)	310/399 (77.7)	326/431 (75.6)	
After (%)	342/492 (69.5)	394/500 (78.8)	327/480 (68.1)	0.23
The records show that patients diagnosed with angina have had their serum cholesterol checked				
Before (%)	204/407 (50.1)	184/299 (46.1)	213/431 (49.4)	
After (%)	274/492 (55.7)	300/500 (60.0)	265/480 (55.2)	0.26
If cholesterol was raised on the first test, then cholesterol level has been tested since the initial test				
Before (%)	96/133 (72.2)	92/126 (73.0)	108/150 (72.0)	
After (%)	139/188 (73.9)	157/203 (77.3)	129/151 (85.4)	0.17
Patients diagnosed as having angina have had their blood pressure measured and recorded, either at diagnosis or in the past 12 months				
Before (%)	357/407 (87.7)	359/399 (90.0)	388/431 (90.0)	
After (%)	465/492 (94.5)	471/500 (94.2)	457/480 (95.2)	0.54
Patients found to have raised blood pressure have been managed in accordance with British Hypertension Society guidelines				
Before (%)	70/182 (38.5)	80/163 (49.1)	73/186 (39.2)	
After (%)	92/231 (39.8)	72/204 (35.3)	96/200 (48.0)	0.019
Smoking status is recorded in notes at diagnosis or in past 12 months				
Before (%)	76/407 (18.7)	100/399 (25.1)	70/431 (16.2)	
After (%)	107/492 (21.8)	112/500 (22.4)	89/480 (18.5)	0.27
Patients' compliance with anti-anginal medication has been checked				
Before (%)	112/407 (27.5)	137/399 (34.3)	150/431 (34.8)	
After (%)	152/492 (30.9)	159/500 (31.8)	131/480 (27.3)	0.018
Patients have been prescribed the cheapest beta-blocker				
Before (%)	102/147 (69.4)	108/142 (76.1)	115/167 (68.9)	
After (%)	249/299 (83.4)	227/277 (82.0)	220/267 (82.4)	0.45
Patients have been prescribed 75–300 mg of aspirin per day, unless there are contraindications				
Before (%)	283/407 (69.5)	267/399 (66.9)	287/431 (66.6)	
After (%)	360/492 (73.2)	367/500 (73.4)	355/480 (74.0)	0.76
Advice has been given by the GP to use a nitrate to relieve or avoid angina episodes				
Before (%)	329/397 (82.9)	345/386 (89.4)	365/416 (87.7)	
After (%)	421/481 (87.5)	427/483 (88.4)	409/461 (88.7)	0.32
GP has given information about when to take nitrate				
Before (%)	297/353 (84.1)	320/357 (89.6)	345/387 (89.2)	
After (%)	376/401 (93.8)	376/410 (91.7)	354/388 (91.2)	0.0037
Blood pressure tested in the past 12 months				
Before (%)	276/375 (73.6)	268/355 (75.5)	310/387 (80.1)	
After (%)	429/491 (87.4)	402/499 (80.6)	410/477 (86.0)	0.18
Smoking status recorded in past 12 months				
Before (%)	13/391 (3.3)	29/369 (7.9)	20/409 (4.9)	
After (%)	31/487 (6.4)	45/497 (9.0)	28/478 (5.9)	0.43
Weight/body mass index recorded in past 12 months.				
Before (%)	100/392 (25.5)	91/374 (24.3)	121/409 (29.6)	
After (%)	175/492 (35.6)	142/498 (28.5)	141/480 (29.4)	0.29
Scores for the Seattle Angina Questionnaire Physical limitation				
Before *n,* mean (SD)	388, 55.5 (22.6)	375, 57.0 (22.93)	402, 57.4 (23.3)	
After *n,* Mean (SD)	436, 56.9 (23.2)	455, 54.2 (23.6)	428, 55.4 (23.0)	0.15

SD = standard deviation. Table continued on following page.

Table 4 continued. Adherence to recommendations about angina and scores for the Seattle Angina Questionnaire.

Recommendation	Intervention			*P*-value
	Guidelines	Criteria	Criteria + feedback	
Angina stability				
Before *n,* mean (SD)	384, 53.8 (23.6)	386, 50.6 (23.8)	414, 51.2 (21.8)	
After *n,* mean (SD)	464, 52.2 (24.5)	475, 55.0 (24.5)	460, 53.3 (24.6)	0.028
Angina frequency				
Before *n,* mean (SD)	366, 80.8 (35.8)	365, 72.1 (36.5)	406, 73.3 (34.3)	
After *n,* mean (SD)	469, 78.9 (33.9)	465, 83.0 (34.2)	443, 76.7 (33.2)	0.0012
Disease perception				
Before *n,* mean (SD)	384, 57.0 (28.1)	380, 50.8 (29.0)	411, 51.4 (27.5)	
After *n,* mean (SD)	468, 54.2 (28.3)	470, 57.4 (27.5)	458, 54.9 (27.9)	0.0030
Has taking medication for chest pain, chest tightness or angina been bothersome?				
Before (%)	26/374 (7.0)	47/376 (12.5)	31/400 (7.8)	
After (%)	36/455 (7.9)	30/468 (6.4)	33/438 (7.5)	0.032
Satisfaction with explanations given by doctor about chest pain, chest tightness or angina				
Before (%)	365/398 (84.2)	327/387 (84.5)	348/420 (82.9)	
After (%)	411/478 (86.0)	429/489 (87.7)	401/467 (85.9)	0.91

SD = standard deviation.

Table 5. Adherence to recommendations not included in criteria format.

Recommendations not included in criterion format	Intervention			Adjusted odds ratios		*P*-value
	Guidelines	Review criteria	Criteria plus feedback	Criteria versus guidelines	Criteria plus feedback versus guidelines	
Records show that patients diagnosed as having angina have had their haemoglobin checked						
Before (%)	93/380 (24.5)	101/367 (27.5)	107/396 (27.0)			
After (%)	128/490 (26.1)	133/496 (26.8)	132/479 (27.6)	0.87 (0.57–1.33)	0.94 (0.62–1/44)	0.81
Records show that patients diagnosed as having angina have had their thyroid function checked						
Before (%)	36/378 (9.5)	41/364 (11.3)	38/395 (9.6)			
After (%)	52/488 (10.7)	43/495 (8.7)	39/463 (8.3)	0.66 (0.33–1.30)	0.74 (0.35–1.56)	0.45
The records show that patients diagnosed as having angina have had their blood glucose checked						
Before (%)	56/378 (14.8)	62/367 (16.9)	55/395 (13.9)			
After (%)	82/487 (16.8)	70/496 (14.1)	62/478 (13.0)	0.68 (0.36–1.27)	0.78 (0.41–1.51)	0.46
The records show that the patients have had an exercise ECG						
Before (%)	123/353 (34.8)	134/350 (38.3)	158/377 (41.9)			
After (%)	169/484 (34.9)	163/489 (33.3)	177/474 (37.3)	0.78 (0.40–1.52)	0.82 (0.47–1.44)	0.72
The records show that the patients have had resting ECGs						
Before (%)	264/375 (70.4)	297/373 (79.6)	302/397 (76.1)			
After (%)	307/487 (63.0)	346/498 (69.5)	274/475 (57.7)	0.75 (0.34–1.65)	0.54 (0.22–1.33)	0.41

data from records was supplemented with information obtained from patients. Consequently, the findings are unlikely to be explained by inconsistencies or changes in the recording habits of the participant primary health care teams. Caution should be used in drawing conclusions from the *P*-values because of the large number of variables included in the study, and it would be appropriate to accept only a level of 1% as significant. In interpreting the findings, emphasis has been placed on the confidence intervals.

The study included large numbers of practices and patients, and the intra-class cluster correlations were at or below the level that had been selected in calculating sample size, except for some asthma variables. Therefore, the study was sufficiently powered to detect clinically relevant effects owing to the interventions in relation to the majority of the variables. Although it is conceivable that small effects owing to the interventions were not detected, such small effects would have little, if any, practical utility. It is reasonable to conclude, therefore, that the study findings are likely to provide reliable evidence about the comparative effectiveness

of these interventions when used in general practice.

Relationship to other research findings

The impact of the format of guidelines has not been adequately studied in the past, and in this study format did not influence adherence to recommendations. In contrast to GPs' expressed preferences for short formats,[4] the provision of such formats did not increase adherence. Although it is possible that formats other than those tested in this study would have been more effective, the findings suggest that, in the absence of other interventions, the format of guidelines produced by national agencies, such as the National Institute for Clinical Excellence in England and Wales, is unlikely to have a direct impact on performance. A potential explanation for the lack of difference in effectiveness is that GPs may have scanned the traditional guidelines, in effect summarising them for themselves. The short format would have reduced the time required to read the guidelines, but it would not have lessened the practical burden of adhering to them.

Perhaps surprisingly, the addition of feedback did not increase adherence to the recommendations. Feedback is a constituent of audit, and one of the commonest methods used in the implementation of guidelines. However, audits undertaken in general practice in the UK typically include other interventions in addition to feedback.[8] The study does suggest that reliance on feedback alone as an implementation strategy should generally be avoided.[9]

Implications for future research

Other interventions that affect the clinical consultation may be more effective; for example, there is some evidence that computer-based reminder systems can improve the provision of preventive measures.[7] A recent trial of the implementation of the two guidelines included in this study of the impact of a computerised support system for clinical decision making showed that this approach was not effective.[23] Therefore, simple and effective solutions to the implementation of recommendations for the management of chronic illnesses appear to be difficult to find. The use of complex, multifaceted interventions that take account of the work environment and the context in which guidelines are disseminated may have more potential.[7,24] However, since the use of complex, multifaceted interventions is likely to be costly, future research could usefully be focused on the costs, in addition to the effectiveness of different combinations of multifaceted interventions.

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