Barriers to physical activity promotion by general practitioners and practice nurses

J McKenna, P-J Naylor, N McDowell

Abstract

***Objective*—To examine the promotion of physical activity by general practitioners (GPs) and practice nurses (PNs).**

***Methods*—A questionnaire that examined the types of barriers and the levels of their influence as well as stage of change for activity promotion and for personal behaviour was mailed to 846 subjects.**

***Results*—The return rate exceeded 70% in each group with a high proportion (69%) of GPs and PNs reporting that they regularly promote physical activity with their patients. GPs were less likely to regularly promote physical activity with their patients if they indicated lack of time as a barrier (odds ratio (OR) = 0.73, 95% confidence interval (CI) 0.58 to 0.93) or lack of incentives (OR = 0.74, 95% CI 0.59 to 0.94), and more likely to promote exercise if they themselves were regular exercisers (OR = 3.19, 95% CI 1.96 to 5.18). However, for PNs longer consultation times (by 1.5 to 2 minutes) had a higher likelihood of producing regular promotion of activity (OR = 1.61, 95% CI 1.02 to 1.62). For PNs personal physical activity stage was the strongest significant predictor of promotion level, but with a stronger effect (OR = 4.77, 95% CI 1.48 to 15.35) than in the GPs.**

***Conclusion*—The main finding is that GPs in the action or maintenance stage of changing their own physical activity are three times more likely to regularly promote the same behaviour in their patients than those in the other stages; for PNs the same difference quadruples the likelihood of them promoting physical activity. Professional readiness to change is influenced by known system barriers in GPs, and not in PNs, but is more strongly predicted by personal physical activity behaviour in both groups.**

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Physical activity can act as both therapy and prevention for many health problems. A low level of physical activity is a primary risk factor for coronary heart disease[1] and is the most prevalent of the risk factors contributing to this disease. Extrapolating from the National Fitness Survey,[2] four of every five adult patients attending a general practice take insufficient exercise to maximise their health. However, just as too few patients regularly participate, only 31% of UK general practitioners (GPs) "always" and 36% "occasionally" promoted exercise with their patients in 1993,[3] despite their unique patient access and patient credibility.[4] Indeed, only 21% of GPs were involved with exercise clinics, and only then in collaboration with their practice nurses (PNs).[3] While recommendations to promote physical activity are not universally accepted among GPs,[4 5] the barriers to optimising the delivery of its promotion should be examined, as GPs are potentially major agents for changing behaviour in adults.[6]

Existing GP-based physical activity promotion projects are typically delivered by the PNs and there are concerns about the effectiveness and costs of these interventions.[7–9] Such concerns may limit staff commitment. Barriers exist to all change, including attitudinal and system barriers. Attitudinal barriers include beliefs about the efficacy, or even the status, of physical activity promotion within general practice.[8] Since existing exercise interventions produce effects that are "small" or "short-lived",[9 10] it is possible that qualities in the delivery, the context of delivery, and/or the deliverer play an important part in achieving these effects. An understanding of barriers represents the third wave in understanding the expansion of preventive services in primary care, following content development and level of provision.[11]

On the positive side is the idea that health professionals who live in a particular way—for example, exercising regularly—translate their supporting beliefs, attitudes, and behaviours to their patients.[11 12] This parallels other lifestyle areas, like smoking cessation, where doctors showed consistency between personal behaviour and counselling behaviour.[13] Patients also like consistency in their doctors; they respond more positively to exercise promotion when they perceive that the doctors "walk their talk". Of 411 patients at a family medicine centre, 70% reported that this would help their willingness to comply with the doctor's recommendation to take more exercise.[14]

System barriers[15] include time constraints, lack of incentive or reimbursement, lack of standard protocols, lack of success in the counselling role, lack of appropriate training, and the absence of a co-ordinated and systematic daily approach in practice operations.[4 16 17] Indeed, programmes have effectively changed the behaviour of doctors through teaching new skills and strategies to change the practice environment.[18]

The Transtheoretical Model of behaviour change applies to self changed behaviour, including many preventive health

Table 1 Frequency distributions for general practitioners (GP) and practice nurses (PN) by stage of change measures

Measure		Stage of change					
		Precont	*Contemp*	*Preparation*	*Action*	*Maintenance*	*Relapse*
Activity promotion	GP	4	3	135	19	223	0
	PN	3	2	32	2	157	17
	All	7	5	167	21	380	17
Own activity	GP	3	2	32	2	157	1
	PN	3	2	46	8	110	28
	All	6	4	78	10	267	29

N.B. some responses are missing from total sample.
Precont, precontemplation; Contemp, contemplation.

behaviours,[19–23] like exercise.[24–28] The model describes five discrete stages of change, ranging from precontemplation ("I don't exercise and I don't intend to start") through contemplation ("I don't exercise but I'm thinking about starting") and preparation ("I exercise once in a while but not regularly"), to action and maintenance ("I exercise regularly and have done so for longer than six months"). Relapse is an accepted element, but is not a distinct stage, instead representing recent withdrawal from one of the two action based stages. Interventions based on this model propose that developmentally appropriate methods reduce the risk of interventions being deemed irrelevant or inappropriate. The model is reliable and can predict future behaviour,[29] including patient outcomes from physician based exercise counselling.[4]

Understanding the "how" of behaviour change is central to effective coronary heart disease risk reduction in general practice.[30 31] This is double edged, reflecting the beliefs, attitudes, and intentions of both patient and GP. This makes relevant to medical settings the central concept of the model "readiness to change". While GP willingness to change impacts on changed clinical decision making,[32] there is a lack of data about how the stage of readiness to promote physical activity relates to known barriers. Therefore this study examined the barriers to this area of health promotion in GPs and PNs from the perspective of the Transtheoretical Model. As a secondary issue the existing personal physical activity behaviour of these health care providers is examined in relation to their level of promotion.

Method

A questionnaire was developed and piloted with four GPs (three separate meetings) to describe stage of change for physical activity promotion (based on Marcus *et al*[33]): "Which of the following best describes current promotion of physical activity in your practice?" The test-retest correlation for the stage measure of activity promotion, over 10 days, among 11 nurses was $r = 0.81$. The same format was used to determine personal activity behaviour. Questions based on those of Calnan and Williams[3] were also included: demographic features of practices—patient list, numbers of GPs and PNs—together with respondent age, sex, years in current role, and hours of physical activity promotion training. Barrier[15] responses were recorded on a Likert scale (1 = not at all limiting effect, 5 = very limiting effect). Odds ratios were calculated according to the dichotomised stage of change responses using logistic regression analyses. This was carried out three times: for the entire group, for GPs only and then PNs only. Data were analysed using SPSS-PC. Confidence intervals for odds ratios were calculated using the formula of Altman.[34]

Results

DEMOGRAPHICS

A sample of 574 GPs and 272 PNs in 118 general practices in a single Family Health Service Authority (FHSA) in south west England were sent a confidential questionnaire. In three mailings over eight weeks PNs achieved an 80.9% response rate (n = 196, 109 practices represented; all women), while for GPs the response rate was 73% (n = 419; 247 men, 132 women; 40 did not respond). This left a respondent sample size of 615 with mean values: age (GP = 41.2 (7.8), PN = 43.6 (7.9) years); years in role (GP = 12.2 (8.4), PN = 22.5 (8.4)); size of practice patient list 8164 (3441). The mean for length of training in physical activity promotion were: GP = 2.3 (10.6) hours (252 subjects reported 0); PN = 5.2 (15.1) hours (66 reported 0).

DEMOGRAPHY AND STAGE OF CHANGE FOR ACTIVITY PROMOTION AND FOR PERSONAL ACTIVITY

In the outcome variable "stage of change for activity promotion" distributions were uneven (table 1). Therefore it was dichotomised into pre-active (comprising precontemplation, contemplation, and preparation) and active (action plus maintenance). The same procedure was undertaken with "stage of change for own activity" (relapsers were included with the preparation based group). All analyses of stage of change were based on these dichotomised groupings. Table 1 also shows the distribution for "stage of change for personal activity".

BARRIERS TO ACTIVITY PROMOTION

Frequency distributions show that most staff felt that their promotion of physical activity was particularly limited by lack of time, lack of resources, and lack of success (table 2). Lack of time, protocols, and incentives differed significantly ($p<0.01$) by stage of change (Mann-Whitney U test). The differences were in the directions predicted by the model—that is, active staff rated the barriers as having lower effects on frequency of promoting physical activity than the pre-active staff.

Table 2 Frequency distributions for limiting effects of barriers to exercise promotion (1=not at all limiting, 5=very limiting) for general practitioners (GP) and practice nurses (PN)

	GP						PN				
Barrier	*No*	*1*	*2*	*3*	*4*	*5*	*No*	*1*	*2*	*3*	*4*	*5*
Lack of time	370	19	25	87	118	121	180	18	25	65	44	28
Lack of success	336	44	81	128	66	17	155	24	35	64	26	6
Lack of resource	336	55	94	78	73	36	150	36	38	48	21	7
Lack of protocols	336	86	103	72	62	13	147	48	52	17	17	13
Lack of incentives	336	81	106	80	49	20	148	41	48	36	15	8

Numbers differ because of missing data.

ODDS RATIO ANALYSIS

Logistic regression using barrier responses and practice demographic variables was undertaken to gain a better understanding of the stage of change for activity promotion. Odds ratio analysis quantifies the relative odds of being in one outcome category—that is, pre-active promotion group or the active group—when the predictor (the scale measuring the limiting effects of each barrier) increases by one unit (1 to 5 for barriers, or 1 to 2 for infrequent exercisers *v* regular exercisers). Three analyses were undertaken: (*a*) the whole sample, (*b*) GPs, (*c*) PNs. For the professional groups, stepwise procedures were subsequently employed.

Whole sample analysis

A direct logistic regression analysis was performed to predict dichotomised stage of change for own activity. Complete data were analysed from 470 staff. A test of the full model with all 13 predictors against a constant-only model successfully distinguished between pre-active and active staff ($\chi^2(13)$, n = 470, = 17.33; p<0.001). Prediction success was 33.6% for the pre-active and 89.7% for the active staff for an overall success rate of 72.9%. A similar statement can be made for each of the three analyses. All demographic variables—for example, numbers of GPs and PNs in practice, age, years in post, patient list—were first entered into the first predictive model for the whole group. Only the variable showing quartiles for consultation times achieved significance (p<0.05). For this reason only the results are reported in further analyses for the barrier variables, the consultation times, and own activity stage of change.

Table 3 shows regression coefficients (B), Wald statistics (z), odds ratios (ORs) and 95% confidence intervals (95% CI) for every predictor. Using the Wald criterion, lack of time (OR = 0.67, 95% CI 0.55 to 0.84), lack of incentives (OR = 0.77, 95% CI 0.77 to 0.95), stage of change for own activity (OR = 3.38, 95% CI 2.17 to 5.19), and consultation time (OR = 1.58, 95% CI 1.08 to 1.71) accurately predicted activity promotion stage of change.

GPs alone (table 4)

For GPs (n = 339) a 39% success rate was achieved in predicting pre-active status and 86% for active GPs (overall 69%). GPs were less likely to report that they regularly promoted physical activity to their patients if they indicated lack of time as a barrier (OR = 0.73, 95% CI 0.58 to 0.93), or lack of incentives (OR = 0.74, 95% CI 0.59 to 0.94), and were more likely to promote activity if they themselves were regular exercisers (OR = 3.19, 95% CI 1.96 to 5.18). In the stepwise procedure,

Table 3 All staff: logistic regression results to predict active promoting staff from pre-active staff using five barrier variables and dichotomised own activity stage of change

Variable	*B*	*Wald (z)*	*Significance*	*Odds ratio*	*95% Confidence interval*
Barriers					
Lack of time (1–5)	**−0.39**	**13.17**	**0.0003**	**0.67**	**0.55 to 0.84**
Lack of success (1–5)	0.01	0.02	0.86	1.01	1.01 to 1.24
Lack of resources (1–5)	0.02	0.06	0.79	1.02	1.02 to 1.26
Lack of protocols (1–5)	−0.00	0.00	0.99	0.99	1.00 to 1.24
Lack of incentives (1–5)	**−0.25**	**5.88**	**0.01**	**0.77**	**0.77 to 0.95**
Demographic					
Own activity stage of change (1 or 2)	**1.21**	**30.00**	**0.0001**	**3.38**	**2.17 to 5.19**
Age (years) (1–4)[A]	−0.08	0.21	0.64	0.91	1.33 to 1.57
Years in current role (1–4)[B]	−0.05	0.07	0.78	0.94	1.38 to 1.52
List size (1–4)[C]	−0.20	2.24	0.13	0.81	1.26 to 1.31
Hours of PA promotion training (1–2)[D]	0.01	0.2	0.79	1.02	1.02 to 1.26
GP:patient ratio (1–4)[E]	0.49	2.91	0.06	1.24	1.05 to 1.63
PN:patient ratio (1–4)[F]	−0.09	0.45	0.50	0.90	1.20 to 1.43
Duration of consultations (min) (1–4)[G]	**0.46**	**6.11**	**0.01**	**1.58**	**1.08 to 1.71**
Constant	1.21	2.15	0.14		

n=470.
All variables labelled 1–4 were divided into quartiles to achieve this grouping.
Quintiles 1 to 4 for each variable.
[A] Age: up to 37 years, 37.1 to 42 years, 42.1 to 48 years, over 48 years.
[B] Years in current role: up to 8, 8.1 to 15 years, 15.1 to 22 years, over 22 years.
[C] List size: up to 5500 patients, 5501 to 7500 patients, 7501 to 10 856 patients, over 10 856 patients.
[D] Hours of exercise promotion training: up to 3.75 hours, over 3.75 hours.
[E] GP to patient ratio: up to 1612.5, 1612.6 to 1850, 1851 to 2033.3, over 2033.3.
[F] PN to patient ratio: up to 2200 patients, 2201 to 3000 patients, 3001 to 3833.3 patients, over 3833.3 patients.
[G] Duration of patient consultations: up to 8.5 minutes, 8.6 to 10 minutes, 10.1 to 12.5 minutes, over 12.5 minutes.
Variables shown in bold indicate significant (p<0.05) predictors.
GP, general practitioner; PN, practice nurse.

Table 4 General practitioners (GPs) only: logistic regression results to predict active from pre-active GPs using five barrier variables and own activity stage of change

Variable	*Entry on stepwise procedure*	*Percentage accurately estimated*	*B*	*Wald (z)*	*Significance*	*Odds ratio*	*95% Confidence interval*
Own activity stage of change	**Step 1**	**65.9**	**1.16**	**22.00**	**0.0000**	**3.19**	**1.96 to 5.18**
Lack of incentives (1–5)	**Step 2**	**68.1**	**−0.29**	**6.32**	**0.01**	**0.74**	**0.59 to 0.94**
Lack of time (1–5)	**Step 3**	**69.0**	**−0.31**	**6.76**	**0.009**	**0.73**	**0.58 to 0.93**
Lack of success (1–5)			0.02	0.04	0.82	1.02	0.82 to 1.28
Lack of resources (1–5)			0.04	0.18	0.66	1.05	0.84 to 1.32
Lack of protocols (1–5)			0.04	0.13	0.71	1.04	0.82 to 1.33
Consultation time (1–4)			0.23	3.03	0.051	1.52	1.01 to 2.34
Constant			0.46	0.55	0.45		

n=339, $\chi^2(7)=151.8$, $p<0.0001$. The model correctly identified 69% of GPs (39.2% of pre-actives, and 86.6% of actives).
Variables in bold are those included in the forward (Wald) stepwise model. Thus the "Entry on stepwise procedure" column shows the order of inclusion in the model, and empty cells show that the variable was not included in the stepwise model. The "Percentage accurately estimated" column shows the predictive power of adding each variable to the model.

Table 5 Practice nurses (PNs) only: logistic regression results to predict active promoting PNs from pre-active PNs using five barrier variables, consultation time quartiles and dichotomised own activity stage of change

Variable	*Entry on stepwise procedure*	*Percentage accurately estimated*	*B*	*Wald (z)*	*Significance*	*Odds ratio*	*95% Confidence interval*
Own activity stage of change	**Step1**	**86.5**	**1.56**	**6.84**	**0.008**	**4.77**	**1.48 to 15.35**
Consultation time (1–4)	**Step2**	**87.3**	**0.47**	**5.68**	**0.01**	**1.61**	**1.02 to 1.62**
Lack of success (1–5)	**Step3**	**88.1**	**0.40**	**3.82**	**0.051**	**0.66**	**0.16 to 1.17**
Lack of time (1–5)			−0.25	0.86	0.35	0.77	0.46 to 1.42
Lack of resources (1–5)			0.02	0.00	0.93	1.02	0.55 to 1.93
Lack of protocols (1–5)			−0.17	0.45	0.49	0.83	0.50 to 1.40
Lack of incentives (1–5)			0.01	0.00	0.96	1.01	0.57 to 1.80
Constant			1.32	0.67	0.41		

n=121, $\chi^2(7)=182.5$, $p<0.0001$. The model correctly identified 88.1% of PNs (11.7% of pre-actives and 100% of the actives).
Variables in bold are those included in the forward (Wald) stepwise model. Thus the "Entry on stepwise procedure" column shows the order of inclusion in the model, and empty cells show that the variable was not included in the stepwise model. The "Percentage accurately estimated" column shows the predictive power of adding each variable to the model.

dichotomised stage of change for personal exercise behaviour accounted for the greatest proportion of accurate prediction (65.9%).

PNs alone

In the PNs (table 5), 121 respondents were analysed and success was 100% for actives but only 11% for pre-actives. From the seven variables, three were significant predictors for dichotomised stage for activity promotion: personal exercise (OR = 4.77, 95% CI 1.48 to 15.35), consultation time (OR = 1.61, 95% CI 1.02 to 1.62), and lack of success (OR = 0.66, 95% CI 0.16 to 1.17). The stepwise procedure confirmed that the strongest effect (86.5%) was attributable to the dichotomised stage of change for personal exercise behaviour.

Discussion

This study clarifies traditional barriers to physical activity promotion by GPs and PNs. Our secondary aim in fact produced the most important finding, that GPs in the highest stages of change for their own activity—that is, precontemplation, contemplation, preparation, or relapse versus action or maintenance—are three times as likely to regularly promote activity to their patients. For PNs the same difference quadruples the chances.

Other studies show the importance of institutionalised practice-wide routines in encouraging higher levels of health promotion activities.[16] This study shows the relative and overwhelming importance of personal health behaviour in increasing the chances of regularly promoting activity. It also confirms the place of activity in the private lives of many primary health care staff.

Given the lack of precontemplators and contemplators for activity promotion, the study describes differences between GPs and PNs who regularly promote physical activity and those who do so infrequently. With so few staff in these early stages of change, the level of inaccurate group prediction for pre-active staff is not surprising. The data therefore prevent comment on how to encourage these staff to begin promoting physical activity with their patients.

This notwithstanding, a high proportion of staff reported that they regularly promote activity and that they are physically active themselves. The levels of regular promotion of physical activity, compared with that in 1993,[3] (31% of GPs "always" and 36% "occasionally" reported promoting physical activity) are similar (64% were in action or maintenance in this study). The major difference since 1993 is that very few staff now report that they never promote physical activity (precontemplation or contemplation). It is likely that staff have changed their understanding of the value of physical activity, whether objectively or subjectively determined, for themselves and their patients. Further, the effects of government strategy, encapsulated in the *Health of the Nation* document, together with a paradigm shift that supports health promotion activities within general practice will all have played a part in this change.[35] Physical activity promotion, according to these results at least, is firmly on the agenda for health promotion within general practice.

There remain doubts about the utility of the stages approach to describing behaviour change[36] in its various contexts.[37] Our response profile calls into question the applicability of the stages model to practice staff promotion of physical activity. The utility of the model in developing staff training is therefore question-

able. On the other hand, using a theoretically derived approach, albeit requiring further validation, does offer an alternative to the recording methods that have been used in the comparison 1993 study[3]: "Which of the following factors does the clinic investigate?" or "Which of the following factors do you investigate?" ("Always", "By defined protocol", "Occasionally").

The descriptive results propose that programmes to increase the frequency of activity promotion should include methods to deal with the particular barriers. However, given the odds ratios, these are appreciably and quantifiably less important than personal activity behaviour. Equally, the demographic argument that proposes, for example, that younger staff are more likely to promote behaviour change[12] is found wanting. Nor was there evidence that features of the practice demography (size of patient list, ratio of staff to patients etc) were important in determining the level of physical activity promotion.

The one factor in practice demography that did make a difference was longer patient consultations. Adding between 1.5 and 2 minutes to normal 10 minute consultations increases the chances, by over 50%, of nurses regularly promoting activity. However, we cannot be sure that either the list of barriers or the demographic features included in the logistic regressions were complete. Were these outcomes replicated, this may impact on the routines of general practice and could help to explain why existing exercise interventions produce "small" or "short-lived" effects.[9 10]

Being trained to deal with barriers within the practice appears more warranted for GPs than for PNs. GPs who are not regularly active increase their chances of regularly promoting activity by about 30% for every reduction on their score for the limiting effects of lack of time and lack of incentives. A limiting factor on the responses to the barriers is the interpretation of the labels. Lack of time responses may reflect staff fulfilling the demands of the individual patient; some staff may consistently meet patients with a low interest in adopting activity. Lack of incentives may be linked to not getting any feedback for activity promotion efforts, as well as to financial incentives. This raises questions about the training provided to deliverers of lifestyle interventions in general practice. It is plausible that increased promotion might result from helping the doctors and nurses to become regularly active themselves. However, this is not a central issue even in state of the art training.[10]

The study confirms other studies[38] showing that multiple barriers exist to physician counselling for changing patient behaviour. Why the barriers had different effects between the doctors and nurses (from the odds ratios) needs further work. It is possible that the nurses have less freedom in their work practices and that longer consultation times are especially important for them to promote physical activity.

The main strengths of this study are its strong theoretical base and the high response rate, 67% of the practices in a single FHSA. This gives the study high ecological validity; the results are particularly reflective of this administrative area. Just as the strengths of the study are important, so too are the limitations and these are inherent in self reporting, social desirability, and self selection of group membership. There is a need to confirm, or assign, group (stage) membership using objective measurements, and also to assess the generalisability of the findings. Equally, there are inherent design problems; cross sectional studies do not inform how change is initiated, maintained, or relapsed.

In conclusion, this study illustrates the role of "traditional" barriers to the promotion of physical activity by GPs and PNs. It puts individual staff firmly in the central focus of health promotion efforts and shows the powerful effects of the private lives of individual health care providers on their professional behaviour.

1 Fletcher GF, Blair S, Blumenthal J, *et al*. Statement on exercise. Benefits and recommendations for physical activity programs for all Americans. A statement for health professionals by the Committee on Exercise and Cardiac Rehabilitation of the Council on Clinical Cardiology, American Heart Association. *Circulation* 1992;**86**:340–4.
2 Activity and Health Research. *Allied Dunbar National Fitness Survey: a report on activity levels and fitness levels. Main findings.* London: Sports Council and Health Education Authority, 1992.
3 Calnan M, Williams S. Coronary heart disease prevention: the role of the general practitioner. *Fam Pract* 1993;**10**:137–51.
4 Calfas KJ, Long BJ, Sallis JF, *et al*. A controlled trail of physician counseling to promote the adoption of physical activity. *Prev Med* 1996;**25**:225–33.
5 Calnan M, Cant S, Williams S, *et al*. Involvement of the primary health care team in coronary heart disease prevention. *Br J Gen Pract* 1994;**44**:224–8.
6 Little P, Margetts B. The importance of diet and physical activity in the treatment of conditions managed in general practice. *Br J Gen Pract* 1996;**46**:187–92.
7 Hirst M, Atkin K, Lunt N. Variations in practice nursing: implications for family health services authorities. *Health and Social Care* 1995;**3**:83–97.
8 Gould MM, Thorogood M, Iliffe S, *et al*. Promoting physical activity in primary care: measuring the knowledge gap. *Health Education Journal* 1995;**54**:304–11.
9 Ashenden R, Silagy C, Weller D. A systematic review of the effectiveness of promoting lifestyle change in general practice. *Family Practice* 1997;**14**:160–75.
10 Marcus BH, Goldstein MG, Jette A, *et al*. Training physicians to conduct physical activity counseling. *Prev Med* 1997;**26**:382–8.
11 Harsha DM, Saywell RM, Thygerson S, *et al*. Physician factors affecting patient willingness to comply with exercise recommendations. *Clinical Journal of Sports Medicine* 1996; **6**:112–18.
12 Frank E, Kunovich-Frieze T. Physicians' prevention counseling behaviours; current status and future directions. *Prev Med* 1995;**24**:543–5.
13 Wells KB, Ware JE, Lewis CE. Physicians' attitudes in counseling patients about smoking. *Med Care* 1984;**22**:360–5.
14 Belcher DW, Berg AO, Inui TS. Practical approaches to providing better preventive care; are physicians a problem or a solution? *Am J Prev Med* 1988;**4**:27–48.
15 Pender NJ, Sallis JF, Long BJ, *et al*. Health-care provider counselling to promote physical activity. In: Dishman RK, ed. *Advances in exercise adherence*. Champaign, IL: Human Kinetics, 1994:213–36.
16 Carney PA, Deitrich AJ, Keller A, *et al*. Tools, teamwork and tenacity: an office system for cancer prevention. *J Fam Pract* 1992;**35**:388–94.
17 Pommerenke FA, Deitrich A. Improving and maintaining preventive services. Part 1: applying the patient model. *J Fam Pract* 1992;**34**:86–91.
18 Stross JK, Hiss RG, Watts CM, *et al*. Continuing education in pulmonary disease for primary care physicians. 1983; *Am Rev Respir Dis* 1983;**127**:739–46.
19 Prochaska JO, DiClemente CC. Transtheoretical therapy: toward a more integrative model of change. *Psychotherapy: Theory, Research Practice* 1982;**19**:276–88.
20 Steptoe A, Wijetunge S, Doherty S, *et al*. Stages of change for dietary fat reduction: associations with food intake, decisional balance and motives for food choice. 1996; *Health Education Journal* 1996;**55**:108–22.
21 Adams DB, Beiner L. Motivational characteristics of smokers at the workplace: a public health challenge. *Prev Med* 1992;**21**:679–87.

22 Nettleton B, Thomson D. DRAMS: a minimal intervention to help GPs with problem drinkers. *Health Education Journal* 1993;**52**:45–8.
23 DiClemente C, Hughes SL. Stages of change profiles in outpatient alcohol treatment. *J Subst Abuse* 1990;**2**:217–35.
24 Booth ML, Macaskill P, Owen N, *et al*. Population prevalence and correlates of stages of change in physical activity. *Health Educ Q* 1993;**20**:431–40.
25 Aznar S. How effective do practice nurses think they are in reducing patients CHD risk? *Second International Conference on Heart Health, Barcelona*, 1995.
26 Marcus BH, Pinto BM, Simkin LR, *et al*. Application of theoretical models to exercise behaviour among employed women. *American Journal Health Promotion* 1994;**9**:49–55.
27 Marcus BH, Pinto BM, Clark MM, *et al*. Physician-delivered physical activity and nutrition interventions. *Medicine, Exercise, Nutrition and Health* 1995;**4**:325–34.
28 McKenna J, Glancy D. Exercise in coronary rehabilitation; stages and processes of change. *Second International Conference on Heart Health, Barcelona*, 1995.
29 Prochaska JO, Norcross J. Psychotherapists' perspectives on treating themselves and their clients for psychic distress. *Professional Psychology: Research and Practice* 1993;**14**:642–55.
30 Green LW, Cargo M, Ottoson, JM. The role of physicians in supporting lifestyle changes. *Medicine, Exercise, Nutrition and Health* 1994;**3**:119–30.
31 Rollnick S, Kinnersley P, Stott, N. Methods of helping patients with behaviour change. *BMJ* 1993;**307**:188–90.
32 Armstrong D, Reyburn H, Jones, R. A study of general practitioners' reasons for changing their prescribing behaviour. *BMJ* 1996;**312**:949–52.
33 Marcus BH, Rakowski W, Rossi J. Assessing motivational readiness and decision-making for exercise. *Health Psychol* 1992;**11**:257–61.
34 Altman DG. *Practical statistics for medical research*. London: Chapman and Hall, 1991.
35 Health Education Authority. *Physical activity promotion in primary health care in England*. London: Health Education Authority, 1994.
36 Bandura A. *Self-efficacy: the exercise of control*. New York: Freeman. 1997.
37 Ashworth P. Breakthrough or bandwagon? Are interventions tailored to stage of change more effective than non-staged interventions? *Health Education Journal* 1997;**56**:166–74.
38 Kushner RF. Barriers to nutrition counselling by physicians; a survey of primary care practitioners. *Prev Med* 1995;**24**:546–52.