

## Using nurses for preventive activities with computer assisted follow up: a randomised controlled trial

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### Abstract

**Objective**—To assess whether an organised programme of prevention including the use of a health promotion nurse noticeably improved recording and follow up of cardiovascular risk factors and cervical smears in a general practice that had access to computerised call and recall.

**Design**—Randomised controlled trial.

**Setting**—General practice in inner London.

**Patients**—All 3206 men and women aged 30-64 registered with the practice.

**Intervention**—The intervention group had their risk factors ascertained and followed up by the health promotion nurse and the general practitioner, whereas those in the control group were managed by the general practitioner alone.

**End point**—Recording and follow up of blood pressure and cervical smears after three years. Recording of smoking, family history of ischaemic heart disease, and serum cholesterol concentrations were also examined.

**Measurements and main results**—When the trial was stopped after two years the measurements of blood pressure in the preceding five years were 93% (1511/1620) *v* 73% (1160/1586) (95% confidence interval for difference 17.5 to 22.7%) for intervention and control groups respectively. For patients with hypertension the figures were 97% (104/107) *v* 69% (80/116) (18.2 to 38.2%). For women the proportion who had had a cervical smear in the preceding three years were 76% (606/799) *v* 49% (392/806) (22.5 to 31.9%). Recording of smoking, family history of ischaemic heart disease, and serum cholesterol concentrations was also higher in the intervention group compared with the control group.

**Conclusion**—An organised programme, which includes a nurse with specific responsibility for adult prevention, is likely to make an important contribution to recording of risk factors and follow up of those patients with known risks.

### Introduction

Preventing cardiovascular disease, diseases related to smoking, and cervical cancer is a priority for primary care services.<sup>1,2</sup> National strategies exist for child and maternity services supported by health visitors and midwives.<sup>3,4</sup> No professional group has specific responsibility for preventive health or anticipatory care for adults, though most agree that such activities are appropriately based in primary care. Doubts both about the efficacy and feasibility of preventive action for whole populations and about government commitment to necessary resources remain.<sup>5,6</sup> The need for adequately organised services can be set against the increasing gap between the expectation for prevention and the delivery of care.<sup>7</sup>

Though the failure to apply what is known to be effective is at its most acute in industrial areas and inner cities, delivering preventive care is a national problem.<sup>8</sup> No single professional group can bridge this gap; the magnitude of the task requires coherent team approaches backed up by clerical staff and information systems capable of collating multiple risks in entire populations.

The underused potential of nurses has been recognised ever since the Burlington trial showed that for specified tasks nurses performed at least as well as doctors.<sup>9,10</sup> When successful preventive programmes have been organised, trained nurses have played a key role either as nurses employed by practices or, as in Glasgow, as health visitors employed by the district.<sup>11-13</sup> In Tower Hamlets (east London) fewer than 10% of practices have employed nurses, and in inner London as a whole the figure is still only 25%.<sup>14</sup> Morrell *et al* have shown the deleterious effects of restricted time in consultations on preventive activities,<sup>15</sup> and additional staff time and changes in the content of consultations seem to be necessary for prevention.

Several studies have shown the benefits of organised preventive programmes,<sup>16-20</sup> though the contribution of nurses has not been specifically examined. We assessed the process of care by measuring the recording of preventive activities when the doctor worked alone compared with recording achieved when the doctor and nurse worked together. Such a programme would have effects on the group allocated to normal care as well as the intervention group. The contribution of the health promotion nurse was, however, felt to be sufficiently distinct and the numbers of patients high enough to have a 95% chance of detecting a 10% difference in recording significance at  $p < 0.05$ . The primary end points were recording of blood pressure and cervical smears after three years. Recording of smoking, family history of ischaemic heart disease, and serum cholesterol concentrations was also documented.

### Methods

In 1984 a group practice of five doctors in east London with 9000 registered patients employed a health promotion nurse, whose primary task was the preventive care of adults. After three months' training she transferred records of cardiovascular risk factors and cervical smears on all patients aged 30-64 from the manual record to a modified relational database (Dataflex) running on a multiuser 16 bit computer (Equinox). She was helped by a clerk, and the time for transfer was equivalent to one person working for nine months. Validation procedures identified errors in transcription, and the registration was checked with the family practitioner committee and by postal

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Br Med J 1989;298:433-6

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Br Med J 1989;298:433-6

inquiry or personal visit to patients' homes.<sup>21</sup> All patients aged 30-64 registered with the practice and known by postal or personal inquiry to live at their stated address were included and randomly allocated (with random number tables) to control or intervention groups identified by marking the notes. New patients aged 30 and over and existing patients reaching the age of 30 during the trial were included. Patients reaching 65 years and those patients who left the practice during the trial were excluded.

The general practitioners were taught to use the computer and encouraged to make full use of its facilities for follow up. They were asked to manage and follow up their patients in whatever way they thought best. In a series of preparatory meetings protocols for preventive activity and follow up to be used by the health promotion nurse were agreed by all participants. Regular meetings continued to review and support the programme. Each doctor and the nurse had a computer terminal in his or her consulting room on which each agreed to enter blood pressure, history of smoking, and records of cervical smears. Recording of the following was encouraged: history of ischaemic heart disease in the patient and his or her first degree relatives under the age of 65, serum cholesterol concentrations when appropriate, and dietary and anti-smoking advice. The age-sex register was maintained by reception staff with a terminal at the reception desk.<sup>22</sup>

For blood pressure the computer automatically entered a date for follow up based on a "box system" of graded risk.<sup>23</sup> Blood pressures for box allocation were based on age specific mortality taken from American actuarial data.<sup>24</sup> Box 0 contained patients who had never had their blood pressure recorded. Box 1 contained those at low risk with a five year recall. Box 2 contained those with moderate risk and yearly recall. Box 3 was a transitional box, which, if sustained over a mean of three readings, allocated the patient to box 4—patients with hypertension requiring treatment with three monthly follow up. Hypertensive patients already receiving treatment were allocated to box 4. This was a dynamic system in which a single reading (systolic or diastolic, whichever was higher) determined initial and upward allocation, and movement downwards was based on the mean of preceding readings. Allocation to box 4 was permanent. Recall dates for cervical smears were three yearly unless abnormalities dictated otherwise. Facilities existed to identify women who had had hysterectomies or those who declined to take part in the programme.

Patients had open access to the health promotion nurse, who also saw newly registering patients. Most patients, however, saw her after routine consultations with the general practitioner. In addition, the nurse ran monthly computer searches, which identified patients without any record of risk factors or those requiring recall. These patients were contacted and asked to arrange to see the nurse. Recall was based on allocation to a particular box depending on blood pressure or the date for another cervical smear. The scheme thus used routine attendances to the surgery combined with systematic recall for follow up or non-attendance.<sup>25</sup> Validation of the register was maintained by postal inquiry, checks with the family practitioner committee, and domiciliary visits to non-respondents. A survey at two years showed that list inflation in the study population was 8.8% with no significant difference between control and intervention groups. Although the trial had been designed to last three years, it was stopped after two years because participating doctors were not prepared to continue excluding half the practice from access to the health promotion nurse.

The normal approximation to the binomial distribu-

tion for proportions was used to calculate confidence intervals and to test for significance.

## Results

At the start of the study in 1986 there was no significant difference in recording preventive activities between control and intervention groups. Over the next two years the intervention group had a higher rate of increase in recording than that in the control group. Figs 1 and 2 illustrate these trends (with 95% confidence intervals). Averaged over all preventive activities data for the intervention group showed a 34% increase and the control group a 10% increase in recording after two years.

The table shows the results at the end of the study in 1988. The proportion of patients who had had their blood pressure recorded within the preceding five

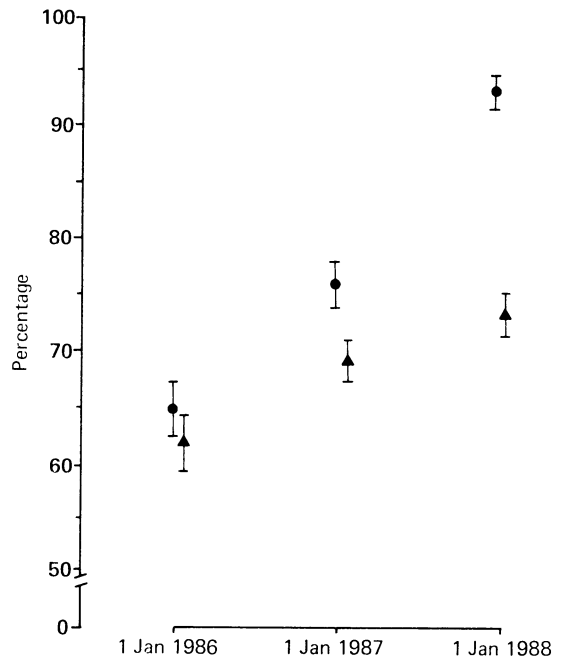


FIG 1—Proportion of patients with blood pressure recorded within preceding five years, 1986-8. ● Nurse and doctor (1986—*n*=1550; 1987—*n*=1669; 1988—*n*=1620). ▲ Doctor (1986—*n*=1567; 1987—*n*=1617; 1988—*n*=1586)

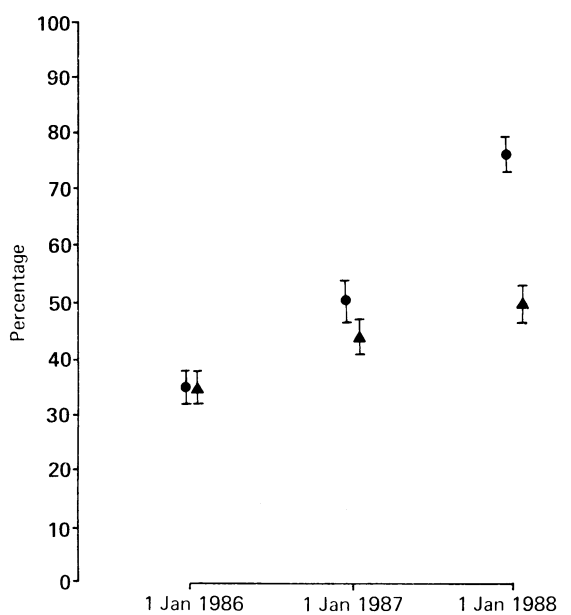


FIG 2—Proportion of women with cervical smear performed within preceding three years, 1986-8. ● Nurse and doctor (1986—*n*=771; 1987—*n*=828; 1988—*n*=799). ▲ Doctor (1986—*n*=802; 1987—*n*=826; 1988—*n*=806)

Preventive activity	Intervention group (nurse and doctor)	Control group (doctor)
Blood pressure recorded within preceding five years	1511/1620 (93)	1160/1586 (73)
Hypertensive patients (boxes 3 and 4) with blood pressure record within preceding year	104/107 (97)	80/116 (69)
Patients with record within preceding five years of whether or not they smoked	1180/1620 (73)	907/1586 (57)
Patients with record at any time of whether or not there was family history of heart attack	838/1620 (52)	388/1586 (24)
Patients with positive family history of heart attack who had serum cholesterol recorded at any time	106/264 (40)	29/104 (28)
Women with cervical smear recorded within preceding three years (excluding women with hysterectomy)	606/799 (76)	392/806 (49)

years was 93% for the intervention group compared with 73% for the control group, a difference of 20% (95% confidence interval 17.5 to 22.7%;  $p < 0.001$ ). The proportion of patients with hypertension (box 4) or who had had fewer than three readings in the hypertensive range (box 3) but had not had blood pressure recorded within the preceding year was 97% compared with 69%, a difference of 28% (18.2 to 38.2%;  $p < 0.001$ ).

The proportion of patients in whom smoking state had been recorded within the preceding five years was 73% compared with 57%, a difference of 16% (12.3 to 18.9;  $p < 0.001$ ). The proportion of patients who had a record at any time of whether there was a family history of heart attack was 52% compared with 24%, a difference of 28% (23.8 to 30.6%;  $p < 0.001$ ).

In patients with a family history that was positive for ischaemic heart disease 40% in the intervention group had had their serum cholesterol concentration recorded compared with 28% in the control group, a difference of 12% (1.3 to 23.1%;  $p < 0.05$ ). For recording cervical smears in the preceding three years in women who had not had a hysterectomy the proportions were 76% compared with 49%, a difference of 27% (22.5 to 31.9%;  $p < 0.001$ ).

## Discussion

The 10% average increase in preventive recording in the control group after two years was modest compared with the 34% improvement in recording in the intervention group. The 24% additional improvement can be attributed to the effect of the intervention programme. The aspect that showed the greatest improvement with intervention was follow up. These results suggest that with organisation and resources over 90% recording and follow up of risk factors in general practice can be achieved even in the most adverse inner city conditions and that nurses with defined responsibilities for adult anticipatory care are a key feature of such schemes.

Though organising manual records was necessary, all participants in the study agreed that the task of surveillance of multiple risks and recall for the entire adult population would be extremely difficult without a computer. The computer was a prerequisite for change, but, as the control group showed, it was not enough to achieve high levels of recording. Attention to the responsibilities and organisation of care were key features contributing to the high levels of delivery achieved in the intervention group.<sup>26</sup>

The skills of the health promotion nurse were an unquantified part of the intervention programme. Patients had open access to the nurse, who, in addition to detecting risks and counselling, dealt with a wide range of medical and psychosocial problems, which were often the starting point for further dialogue and health promotion.<sup>27</sup>

## COSTS

The computer was funded with grants, and the

health promotion nurse had some financial support from the district health authority, with whom she had her contract of employment. A multiuser computer system with printers and tape back up supporting up to eight terminals now costs about £3000 per principal, with a yearly maintenance contract of £500 a year. Loading of age-sex registers is now done with computers by family practitioner committees in many regions, and transcription of data and postal or telephone recall can be undertaken by trained clerical staff. These costs are not inconsiderable and may add up to an initial £12000 for a group practice of four principals, with yearly costs of £2000. Salaries, postage, and above all the time required for organisation are further additions to the necessary resources required for increased ascertainment.

Although the practice started off from a baseline of recorded preventive activity above average for inner London,<sup>28</sup> the project was completed against a background of high workload (4.0 total consultations/patient/year) and overcrowded premises in a poor condition. Rates of consultation with the general practitioners stayed the same during the trial.

## FURTHER DEVELOPMENTS

The need for these resources may prove to be a major obstacle in developing such schemes, especially in inner cities and other areas of high need.<sup>29</sup> Nevertheless, the scheme has been enthusiastically received in the district. Tower Hamlets has some of the worst social conditions in Britain and primary care services lag 15 years behind the rest of England and Wales.<sup>30</sup> Despite these obstacles to delivery of care the scheme has proved sufficiently robust to expand. There are currently six health promotion nurses based in six group practices covering a quarter of the district's adult population, and there are plans for further expansion. Protocols for prevention have been developed through consensus with general practitioners, health promotion nurses, and district representatives. They represent the emergence of a practical and coherent prevention strategy among adults in the borough based on primary care. Regular meetings include all participants and provide continuing support, education, and audit. Funding of computerisation has proved elusive and manual systems are maintained at present.

The computer system was funded by the Greater London Council and the King Edward's Hospital Fund for London. The scheme was greatly helped by Mr A Bennett, administrator, City and East London Family Practitioner Committee; Dr J Richards, district medical officer; Mr J Rowson, director of computing, The London Hospital, E1; Mr C Megan, City Technology Centre, who wrote the software; and Ms M Ridley. Mr S Evans, Dr J Tudor Hart, Dr D Irvine, and Professor D C Morrell commented on the paper.

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(Accepted 9 January 1989)

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