

# Promotion of health in older people: a randomised controlled trial of health risk appraisal in British general practice

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## Abstract

**Background:** there is inadequate evidence to support currently formulated NHS strategies to achieve health promotion and preventative care in older people through broad-based screening and assessment in primary care. The most extensively evaluated delivery instrument for this purpose is Health Risk Appraisal (HRA). This article describes a trial using HRA to evaluate the effect on health behaviour and preventative-care uptake in older people in NHS primary care.

**Methods:** a randomised controlled trial was undertaken in three London primary care group practices.

Functionally independent community-dwelling patients older than 65 years ( $n = 2,503$ ) received a self-administered Health Risk Appraisal for Older Persons (HRA-O) questionnaire leading to computer-generated individualised written feedback to participants and general practitioners (GPs), integrated into practice information-technology (IT) systems. All primary care staff received training in preventative health in older people. The main outcome measures were self-reported health behaviour and preventative care uptake at 1-year follow-up.

**Results:** of 2,503 individuals randomised, 2,006 respondents (80.1%) (intervention,  $n = 940$ , control  $n = 1,066$ ) were available for analysis. Intervention group respondents reported slightly higher pneumococcal vaccination uptake and equivocal improvement in physical activity levels compared with controls. No significant differences were observed for any other categories of health behaviour or preventative care measures at 1-year follow-up.

**Conclusions:** HRA-O implemented in this way resulted in minimal improvement of health behaviour or uptake of preventative care measures in older people. Supplementary reinforcement involving contact by health professionals with patients over and above routine clinical encounters may be a prerequisite to the effectiveness of IT-based delivery systems for health promotion in older people.

**Keywords:** health risk appraisal, health promotion, older, primary care, elderly

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## Introduction

Promotion of health and prevention of functional impairment in later life are major health policy priorities in the United Kingdom (and elsewhere) with recent standards elaborated in England within the National Service Framework for Older People [1]. The primary mechanism implicit in this framework for driving preventative care is

a broad-domain 'Single Assessment Process' of need and risk ascertainment [1]. This comprises the integration of standardised information gathering and exchange into the existing health and social care system, using one or more assessment tools to document health and social status. The Single Assessment Process contains a set of standardised

domains including ‘disease prevention’, consisting of blood-pressure monitoring, nutrition, vaccination history, drinking and smoking history, exercise pattern and history of cervical and breast screening [1]. Additionally, an on-line ‘life check’ personal health and lifestyle risk assessment tool, linked to the provision of specific health and social care advice, is planned in the current phase of UK health policy [2]. It is, however, by no means established in evidence that such strategies will succeed, and the effectiveness of different approaches to preventative care is a matter of ongoing debate [3]. An existing policy and resource commitment to primary care-based population screening above 75 years was implemented in the United Kingdom in 1990 [4] without a clear evidence base, so that its efficacy against no intervention will probably be never known. More recently, a large UK trial failed to show benefits of population-based multi-domain assessment of older people [5] (although methodological aspects were subsequently questioned) [3]. In general, effective prevention appears to require the combined use of strictly evidence-based, standardised assessment instruments and defined, direct follow-up reinforcement of advice provided.

For the delivery of such a strategy in practice, the most extensively evaluated instrument to date is Health Risk Appraisal (HRA). HRA is a systematic approach to collecting information from individuals that identifies risk factors by questionnaire, and provides individualised feedback. A systematic review of HRA in older people based on controlled studies showed potential benefits on behaviour (particularly exercise), physiological variables (particularly blood pressure and weight) and general health status in those studies that included personalised reinforcement [6].

This article presents the results of a randomised study of Health Risk Appraisal for Older Persons (HRA-O), a system originally developed through an evidence-based process at the University of California, Los Angeles [7]. HRA-O encompasses all the domains (amongst others) required in the Single Assessment Process. We have previously published [8, 9], as part of this ongoing three-centre European collaborative investigation (the prevention in older people—assessment in generalists practices (PRO-AGE) project) [10, 11], the feasibility and yield of HRA-O (adapted for European use) in older people in the United Kingdom, Germany and Switzerland, and demonstrated high levels of acceptance amongst participants and primary care providers.

Given the established IT-supported system in British primary health care, we chose to integrate HRA-O feedback into the electronic patient record and test the hypothesis that HRA-O so implemented would improve self-reported health behaviour and uptake of preventative care in older British primary care patients over a 12-month period.

## Methods

A detailed account of the study methodology and baseline data has been reported elsewhere [10, 11].

## Design and randomisation

Randomisations were computer generated at an independent centre. Four computerised London group practices (26 GPs) were recruited. Of these, three (18 GPs) were randomly allocated to participation in the trial (See Appendix 5 in the supplementary data on the journal’s website), the fourth practice serving as a concurrent comparator and receiving no training or trial intervention. Practices provided lists of all registered patients aged 65 years and older with the following exclusions: nursing home resident; needing help in basic activities of daily living; dementia; terminal disease; and non-English speaking. Eligible patients were sent the project information and consent form, and a short pre-randomisation questionnaire [12]. Eligible persons giving consent to participate were on average 1 year younger than not-consenting persons [12]. Gender distribution was similar between consenting and not-consenting persons. Eligible and consenting participants in the three trial practices were then randomly allocated to intervention or control. Those living in the same household were allocated to the same group. A total of 1,240 patients (1,021 household units) were allocated to the intervention group, and 1,263 (1,029 households) to the control group (see Appendix 5 in the supplementary data on the journal’s website). Eligible patients in the fourth practice were invited to participate in a concurrent comparison group and continued to receive usual care over the study period.

## Intervention

Trial participants randomised to the intervention group were mailed the HRA-O questionnaire (April 2001) [10, 11]. This comprised the health behaviour and preventative care uptake domains listed in Tables 2 and 3, respectively, plus self-reported health-related sections on chronic conditions, medication use, eyesight, hearing, depressive symptoms, memory problems, falls, physical function, continence, social support and health measurements (weight, height, blood pressure and cholesterol). Participants’ responses were keyed into a specifically designed database. This interfaced with the HRA-O decision support software, which generated individualised written feedback both to patients and their GPs.

Patient feedback included advice on modifying health risks, a personalised preventative health checklist, sources of support (such as local exercise schemes for older people and national help lines) and information on when to seek medical or other (e.g. social) advice. This 20–35 page individualised report was accompanied by a letter from the practice encouraging recipients to discuss issues raised with their GP or practice nurse, followed by a reminder card to non-responders 6 months later.

Feedback to GPs summarised (on 1-page) clinical information to be used for reinforcement of preventative health and health behaviour issues. To minimise the ‘shoehorning’ problems that have arisen with IT interventions forced into primary care and subsequently ignored [13], practices could choose to enter (using agreed computer READ codes) [14]

all or only some HRA-O feedback domains into the electronic patient record. This choice was made by the patient's usual GP, who marked the relevant sections of the report and passed it to a data-entry clerk. The patient's status as a recipient of HRA-O advice was added to his/her problem list, and individual HRA-O-identified risks were incorporated as reminders in the electronic patient record to act as electronic prompts when the record was accessed. Finally, the whole physician summary report was scanned into the electronic patient record as if it were a hospital letter.

It was left to the discretion of both providers and patients how HRA-O identified issues were addressed, be it directly, opportunistically during unrelated consultation or not at all. No attempt was made by the research team to influence this decision making, because we wanted to test the impact of the intervention when embedded within routine clinical practice.

All GPs and practice nurses participated in a 2-h training session held in the practice using an evidence-based manual on current preventative care and health behaviour recommendations related to the domains of the HRA-O. Quarterly review meetings averaging 90 min were held to update practitioners with emerging evidence, reinforce previous educational messages and address any problems with the project. Participating professionals were invited (but not required) to complete a structured self-administered feedback questionnaire on the project at conclusion.

Trial practice participants randomised to the control group and those in the concurrent comparison group were advised by post that they would be sent the HRA-O questionnaire after 12 months.

### Pre-randomisation data

Pre-randomisation data was used for baseline comparisons, including co-morbidity, healthcare use, and social support. Those reporting a need for assistance in basic activities of daily living were excluded prior to randomisation (see Appendix 5 in the supplementary data on the journal's website). In addition, Townsend Deprivation scores [15] were derived based on postal codes.

### Follow-up and outcome measures

At 1 year (April 2002), the HRA-O postal questionnaire was sent to surviving participants of all groups (intervention, control and concurrent comparison group) together with a short questionnaire on patients' perception of self-efficacy with patient-physician interaction [16], and on number of physician visits and hospital admissions.

Primary outcomes (Tables 2 and 3) were self-reported health risk behaviour and uptake of preventative care measures [10, 11]. Where patients did not self-report preventative care uptake, ( $n = 44$  intervention,  $n = 33$  control), data were obtained from practice records by abstractors blinded for group assignment. Mortality, nursing home admission (if information available) and change of residence data were obtained from the practices.

### Sample size

On the basis of published HRA-O pilot study data [9], an outcome prevalence rate among controls of 20% was selected. Sample size was calculated to detect with 80% power and two-sided 0.05 significance level, a minimum 6% absolute increase in positive health risk behaviour or preventative care uptake for the main comparison (intervention versus control group). Assuming a 20% drop-out rate at 1 year, the required sample size was 1,000 per group.

### Statistical methods

All data were double entered and analysed according to an *a priori* plan [11] based on the intention to treat principle. Sensitivity analyses were conducted to control for potential bias introduced by missing outcome data: (1) by repeating the analyses with adjustment for available baseline data and (2) by conducting analyses with imputed measures of overall health behaviour and overall preventative care. For calculating imputed measures, missing outcome information was substituted with values derived from regression analyses based on available baseline information [17]. Categorical outcomes were compared using chi-square tests, and continuous data by *t* tests if normally distributed or Mann-Whitney U test if skewed. Number of physician visits was analysed with ordered logistic regression. To allow for within-household clustering, generalised estimating equations (assuming an exchangeable correlation structure) were used to analyse all outcomes [18]. Data were analysed using SAS version 9.1 [19].

## Results

### Response rate and characteristics of non-respondents

Among randomised patients, 76% of the intervention group (940/1,240) and 84% of the control group (1,066/1,263) returned the HRA-O questionnaire at 1 year (see Appendix 1 in the supplementary data on the journal's website for baseline characteristics of all randomised participants). See Appendix 5 in the supplementary data on the journal's website which shows the reasons for non-returns. Comparison of baseline characteristics (using pre-randomisation data) between participants who completed the 1-year follow-up questionnaire and participants who did not complete the same in both groups combined showed that individuals with poor general health perception and those with higher Townsend Deprivation scores were less likely to return the follow-up questionnaire (See Appendix 2 in the supplementary data on the journal's website for complete data).

### Characteristics of respondents

Table 1 shows that baseline characteristics in respondents (intervention group  $n = 940$ , control group  $n = 1,066$ ) were comparable.

**Table 1.** Baseline characteristics in study participants completing the 1-year follow up, according to group assignment

Baseline characteristics	Intervention ( <i>n</i> = 940)	Control ( <i>n</i> = 1,066)
Age (years)	74.7 ± 6.3	74.2 ± 6.0
Gender female	526 (56.0)	564 (52.9)
Fair or poor general-health perception	207 (22.0)	271 (25.4)
≥1 hospital admission over last 12 months	130 (13.8)	157 (14.7)
>6 doctor visits over last 12 months	191 (20.3)	254 (23.8)
Diabetes	70 (7.5)	73 (6.9)
Ischaemic heart disease	170 (18.1)	175 (16.4)
No caregiver available if needed	155 (16.5)	157 (14.7)
Townsend score <sup>a</sup>	1.00 ± 2.93	0.86 ± 2.88

Values are numbers (percentages) or means ± standard deviations.

<sup>a</sup> Townsend score: higher scores denote higher social deprivation. Denominators for Townsend score are *n* = 901 for intervention group and *n* = 1,050 for control group.

### Effect of intervention on outcomes

There were no significant differences in self-reported health risk behaviour, except for a small but statistically significant difference in adherence with recommended levels of physical activity (≥5 times per week moderate to strenuous) (10.8% versus 7.8%; intervention group versus controls, respectively; *P* = 0.03) (Table 2). There was no significant difference for the lower (but perhaps more realistic) target of ≥3 times per week. Among preventative care measures, only uptake of pneumococcal vaccination was significantly higher in the intervention group at 1-year follow-up (Table 3).

A significant reduction in physician visits at 1 year amongst the intervention group [OR 0.79 (0.66, 0.96)] became non-significant when subjected to sensitivity analysis (see Methods). Patient–physician interaction scores were also similar between intervention and control groups (20.0 ± 5.3 versus 20.3 ± 5.3, *P* = 0.3) (higher scores denote greater self-efficacy). No differences were found in hospital admission rates (See Appendix 3 in the supplementary data on the journal's website for full data).

The concurrent comparison group differed significantly from the intervention group at 1 year with respect to three preventative care variables: cholesterol measurement within 5 years (46.6% versus 60.2%; *P* = 0.01), fasting glucose measurement within 3 years (13.6% versus 25.9%; *P* = 0.0001) and influenza vaccination within 1 year (64.5% versus 83.9%; *P* < 0.0001) (see Appendix 4 in the supplementary data on the journal's website). There were no significant differences in health behaviour or other preventative care measures.

### Discussion

This study showed that the integration of an evidence-based delivery instrument (HRA-O) for the promotion of health in older people into the current IT driven system of three British

primary care group practices did not improve self-reported health risk variables over 12 months (other than increased pneumococcal vaccination take-up). There was a slight but equivocal effect on physical activity. We suggest that these findings have significant implications for contemporary health policy in the United Kingdom and elsewhere.

### Strengths and weaknesses of the study

As an examination of multi-domain promotion of health in later life, this study was methodologically strong in using the most extensively evaluated instrument currently available. Its feasibility, acceptability and yield in a United Kingdom (and European) primary care context have been established [9]. It meets known criteria favouring effective guideline implementation in primary care—strong evidence base, clarity, lack of controversy—whilst requiring minimal modification of existing practice routines [20]. Furthermore, its ease of integration into existing practice IT systems characterises it to practitioners as a resource rather than yet another constraint.

Certain study limitations are, however, identified. Generalisability of the present study findings might be limited due to selection of practices located in urban London areas, and partial non-response of eligible older persons. All GPs and practice nurses received preventative health education from geriatricians; so control-group patients received care from 'educated' providers. It is therefore plausible (though not directly testable in this study) that contamination (and therefore dilution of intervention effect) may have occurred at this level. Although for three preventative care variables the intervention group compared favourably with the concurrent comparison group (an indicator of possible contamination), the majority of health risk categories showed no difference.

We did not rigorously measure provider or patient response to receiving HRA-O information as we felt this may influence actions. Non-adherence by patients to recommended advice, or lack of reinforcement or follow-through by primary care teams, or both, may have reduced the intervention effect, but similarly this may represent clinical reality.

Finally the study was conducted within existing resource constraints; for example, colon cancer screening was a recommended preventative care measure but was not readily available.

### Implications and conclusions of the study

Those primary care studies that have so far shown positive outcomes from health promotion interventions (including other HRA-based intervention studies [6]) have included face-to-face encounters with participants, often in their homes [21–24]. Indeed, other HRA-O studies demonstrating sustained benefit on health risk behaviour used dedicated providers to deliver reinforcement to individuals following HRA-O feedback [25].

Our largely negative findings—despite high prevalence rates of suboptimal health behaviour and underuse of preventive care—contrast with these results. It is difficult to interpret the apparent differences in outcome,

**Table 2.** Comparison of self-reported health-risk behaviour in intervention and control group at 1-year follow-up

Health-risk behaviour	Intervention ( <i>n</i> = 940)	Control ( <i>n</i> = 1,066)	Odds ratio (95% CI)	<i>P</i> value
≥3 times per week moderate or strenuous physical activity	143/874 (16.4)	137/993 (13.8)	1.2 (0.9, 1.6)	0.15
≥5 times per week moderate or strenuous physical activity	94/872 (10.8)	77/989 (7.8)	1.4 (1.0, 2.0)	0.03
Consumption of ≤2 high fat food items per day	219/870 (25.2)	218/999 (21.8)	1.2 (0.95, 1.5)	0.13
Consumption of ≥5 fruit/fibre items per day	326/877 (37.2)	372/1,015 (36.7)	1.0 (0.8, 1.3)	0.86
No current tobacco use	779/857 (90.9)	897/1,001 (89.6)	1.2 (0.9, 1.6)	0.36
No or moderate alcohol use	727/906 (80.2)	822/1,032 (79.7)	1.1 (0.8, 1.3)	0.63
Driving with use of seat belt	755/898 (84.1)	883/1,040 (84.9)	1.0 (0.7, 1.2)	0.66

Values are numbers (percentages).

CI, confidence interval.

Denominators vary according to number of valid responses.

Odds ratios >1 denote positive intervention effect.

*P* values based on multivariable logistic regression models (GEE model with cluster household).

**Table 3.** Comparison of self-reported uptake of preventative care in intervention and control group at 1-year follow-up

Type of preventative care	Intervention ( <i>n</i> = 940)	Control ( <i>n</i> = 1,066)	Odds ratio (95% CI)	<i>P</i> value
Blood-pressure check in previous year <sup>a</sup>	785/940 (83.5)	903/1,066 (84.8)	0.9 (0.7, 1.2)	0.40
Cholesterol measurement in previous 5 years (younger than 75 years) <sup>a</sup>	312/518 (60.2)	389/643 (60.4)	1.0 (0.8, 1.3)	0.95
Blood glucose measurement in previous 3 years <sup>a</sup>	243/940 (25.9)	302/1,066 (27.2)	0.9 (0.7, 1.1)	0.19
Faecal occult blood test in previous year (younger than 80 years)	45/732 (6.1)	49/862 (5.7)	1.1 (0.7, 1.6)	0.73
Influenza vaccination in previous year <sup>a</sup>	788/939 (83.9)	916/1,066 (85.8)	0.8 (0.6, 1.1)	0.12
Pneumococcal vaccination (ever) <sup>a</sup>	308/939 (32.8)	291/1,066 (27.5)	1.2 (1.01, 1.5)	0.04
Dental check in previous year	678/905 (74.9)	757/1,051 (72.0)	1.1 (0.9, 1.4)	0.23
Vision check-up in previous year	626/916 (68.3)	732/1,052 (69.6)	0.9 (0.8, 1.1)	0.53
Hearing check-up in previous year	155/912 (17.0)	191/1,047 (18.2)	0.9 (0.7, 1.2)	0.47
Mammography in previous 2 years (younger than 70 years)	47/131 (35.9)	50/155 (32.3)	1.2 (0.7, 1.9)	0.52

Values are numbers (percentages).

CI, confidence interval.

Denominators vary according to number of valid responses.

Odds ratios >1 denote positive intervention effect.

*P* values based on multivariable logistic regression models (GEE model with cluster household).

<sup>a</sup> Self-reported data were completed from practice records (see Methods section).

given the diverse health care systems involved. Various reasons such as non-adherence of older persons with recommendations, lack of primary care team reinforcement or system factors such as the presence of resource constraints might explain the largely negative results. However, most importantly, it is possible that change in risk behaviour requires a higher level of personalised reinforcement than that achieved in the present study.

How practitioners capture HRA-O feedback data and use it to reinforce preventative health is currently being assessed as part of a further Department of Health-funded study [26]. This ongoing research also explores other uses of HRA-O methodology such as identifying unmet health and social need (with additional social domains) for targeted comprehensive geriatric assessment.

There are two important factors common to this study, the recent MRC UK trial [5] and the National Service Framework Single Assessment Process-based strategy for

health promotion [1]: (1) single episode data collection across a broad range of domains and (2) incorporation of the data into the existing health care system without supplementary investment in dedicated professional time to deliver reinforcement. We suggest that such investment, together with sustained follow-up, may be necessary prerequisites for successful preventative care.

It remains questionable, therefore, whether substantial gains in health promotion and preventative care in older people are achievable through currently conceived strategies for broad-based screening and assessment within NHS primary care. Furthermore, without clear evidence of such gains, it will remain crucial to target scarce UK health care resources on established specific health risks and acute and chronic disease management in older people, using these as triggers for specialist comprehensive geriatric assessment. In parallel, a more coherent approach to broad-based preventative care, not only using an evidence-based method for initial

assessment but also incorporating dedicated professional time for reinforcement and follow-up, appears to be required.

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## Key points

- There have been conflicting and variable findings on the effectiveness of broad-domain preventative care interventions on health outcomes in older populations, and the best method of achieving this remains a matter of debate.
  - This study indicates that provision of written advice to older patients together with integration of patient self-report data into primary care electronic patient records alone is insufficient to improve short-term health behaviour and uptake of preventative care.
  - Supplementary reinforcement involving direct professional/patient follow-up contact may be necessary to achieve benefit.
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## Ethical approval

Ethical approval was obtained from the Brent Medical Ethics Committee and the King's College Hospital Research Ethics Committee.

## Supplementary data

Supplementary data for this article are available at *Age and Ageing* online.

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