 International Journal of Epidemiology 2001;**30**:1485–1491

Pragmatic randomized trial of home visits by a nurse to elderly people with hypertension in Mexico

Carmen Garcia-Peña,[a] Margaret Thorogood,[b] Ben Armstrong,[c] Sandra Reyes-Frausto[d] and Onofre Muñoz[e]

Background In Mexico, hypertension is a major cause of disability and death in the elderly, but the most effective way to promote behaviour change in old people is unknown. Low resource interventions that are effective in normal healthcare settings are urgently needed. We report the results of a randomized trial of nurse-provided health and lifestyle advice during home visits to elderly people with hypertension in Mexico City.

Methods Subjects were 718 people with hypertension aged ⩾60 years, who were residents of Mexico City and were registered with the Family Medicine Clinics of the Mexican Institute of Social Security (IMSS). A randomized controlled trial was carried out in which the intervention group was offered nurse visits over 6 months with blood pressure checks and negotiated lifestyle changes. The control group continued to receive usual care.

Results After 6 months, 36.5% of the intervention versus 6.8% of the control group had a blood pressure of <160/90 mmHg. The difference in the mean change in systolic blood pressure was 3.31 mmHg ($P = 0.03$, 95% CI : 6.32, 0.29) and the same difference in diastolic blood pressure was 3.67 mmHg ($P = 0.00$, 95% CI : 5.22, 2.12). Weight and sodium excretion fell more in the intervention group, but the difference was not significant.

Conclusions Nurse home visits are effective in reducing blood pressure in hypertensive patients aged ⩾60 years.

Keywords Hypertension, elderly, Mexico

Accepted 23 April 2001

Latin America has an ageing population and consequently a rapid increase in non-communicable diseases. In Mexico, hypertension is now a major cause of disability and death in the elderly.[1,2] Lifestyle intervention trials indicate effective ways to reduce blood pressure in elderly people, and guidelines for the management of hypertension recommend lifestyle changes as well as pharmacological treatment.[3–5] However, the most effective way to promote behaviour change in old people in Mexico is unknown. Lifestyle interventions that use considerable resources, such as nutritionists, physical therapists or provision of food[6–9] have been evaluated in efficacy trials, but whether lower resource interventions are effective in normal healthcare settings remains to be tested.

The Mexican Institute of Social Security (IMSS) has been part of the Health and Social Security System of Mexico since 1942, and currently covers 53% of the population. The proportion of elderly people covered by IMSS is higher compared with the rest of the country, and hypertension represents a serious health burden. For this reason innovative strategies for the care of elderly people with hypertension are an urgent necessity.

We report here the results of a randomized trial of an intervention to provide health and lifestyle advice during home visits to elderly people with hypertension in Mexico City. The aims of the study were to assess the effectiveness of the intervention in reducing blood pressure and to analyse the consequences in

[a] Epidemiological and Health Services Research Department, Research Coordination, Mexican Institute of Social Security, Mexico.

[b] Health Promotion Research Unit, London School of Hygiene and Tropical Medicine, London, UK.

[c] Environmental Epidemiology Unit, London School of Hygiene and Tropical Medicine, London, UK.

[d] Medical Research Unit on Ageing, Research Coordination, Mexican Institute of Social Security, Mexico. Currently at University of Leicester.

[e] Research Coordination, Mexican Institute of Social Security, Mexico.

Correspondence: Dr Margaret Thorogood, Health Promotion Research Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1 7HT, UK. E-mail: M.Thorogood@lshtm.ac.uk

terms of weight and salt reduction and increase in physical activity.

Participants and Methods

Participants were men and women insured by the IMSS, and registered with one of 12 Family Medicine Centres run by the Institute in Mexico City. Participants were selected by multistage random sampling, first by Family Medicine Centre, and then by age-stratified sampling within the population served by each Family Medicine Centre, representing the population in IMSS in Mexico City. They were aged ⩾60 years and were found to have either a mean systolic blood pressure (SBP) of ⩾160 mmHg or a diastolic blood pressure (DBP) of ⩾90 mmHg, or both, at screening. Screening took place over 6 months, with home-based blood pressure measurements made by trained nurses not involved in the intervention stage of the trial. A detailed description of this screening process has been reported.[10] After informed consent was obtained, participants were randomly allocated to an intervention or a usual care group. Randomization was carried out by computer and was concealed until screening and recruitment were complete.

Measurement of baseline and outcome variables

Reduction in blood pressure was the primary goal of the intervention. Secondary outcomes were reductions in weight and salt excretion and increase in reported physical activity.

Blood pressure at screening and at follow-up was measured with a mercury sphygmomanometer. Three blood pressure measurements were carried out, twice seated and once after standing for at least 2 minutes, using the techniques recommended by the British Hypertension Society.[11] Weight was measured with a Seca scale. Height was measured with a plastic stadiometer, recording to the nearest millimetre. Sodium in urine was measured in single morning samples using the autoprocessor Beckman Syncron CX5, with the technique of selective ion in samples of 69UL.[12] The technician was blinded to the allocation group of the participants. Level of physical activity was measured using an adapted questionnaire (Hillsdon M, personal communication) that was divided into three sections: housework, activities outside the home, and recreational activities. Participants reported number and duration of occasions of activity per week in the last 4 weeks. Data on pharmacological treatment, socio-demographic variables, co-morbidity, and risk factors were collected at baseline. Outcome measurements were made by the same group of nurses, who were not otherwise involved in the trial, and were not told the trial group allocation of participants. Data collection began in January 1998 and finished in June 1999.

The intervention

Participants in the intervention group received regular visits from a nurse over 6 months. The nurses were first given training about ageing, clinical aspects of hypertension, personal interviews, health behaviour change models, process of negotiation and ethical aspects of home visits. During visits, the nurse measured blood pressure and the nurse and patient reviewed information from the baseline health check, and discussed possible lifestyle changes. The nurses tried to guide their patients to a healthier lifestyle and suggested different alternative ways to achieve the changes and negotiated specific targets. The nurse also reviewed the pharmacological treatment and adherence was encouraged. The patient led the process of negotiation, while the nurse provided information about risks and benefits from lifestyle change. The visits took place between once a month and fortnightly, with the exact timing decided by the patient and nurse through discussion. Quality control was provided through tape and video recorded interviews. The control group received a mailed pamphlet about hypertension. All patients continued to receive usual care from family physicians in the Institute's clinics.

Statistical analysis

Statistical significance of differences in mean changes of numerical variables in intervention and control groups was assessed using t-tests, following verification that distributions were reasonably represented by the Gaussian model. The statistical significance of differences in changes in proportions reporting physical activity and pharmacological treatment was assessed by logistic regression of final reported exercise and treatment on intervention, allowing for initial exercise by inclusion in the model.

The associations of intermediate and baseline variables with change in blood pressure, and the modification of the treatment effect by other variables was investigated in multiple linear regression analyses.

Most analyses excluded subjects who dropped out before the final assessment, but intention-to-treat analyses including all subjects are also reported for key comparisons.

Ethics

The study was approved by the Research Committee of the IMSS and the Ethics Committee of the London School of Hygiene and Tropical Medicine.

Results

There were 911 subjects eligible for the trial at screening. Twenty-eight subjects (3.1%) died, 101 people (11.1%) moved away and 64 people (7%) refused to participate (Figure 1). Thus, 718 subjects were recruited and randomized; 364 (50.7%) were allocated to intervention and 354 (49.3%) to control. Nineteen intervention and 16 control participants did not complete the final evaluation (Figure 1). Table 1 shows the baseline characteristics in the two arms. Differences between groups were small, except in the proportion of people living alone.

At the final evaluation the difference in the mean change in SBP was 3.31 mmHg (95% CI : 6.32, 0.29, $P = 0.03$) and in DBP was 3.67 (95% CI : 5.22, 2.12, $P < 0.001$), comparing intervention with control. An intention-to-treat analysis including 35 participants who did not complete the study with their baseline blood pressure measurements, had similar results (mean differences: SBP = 3.11 mmHg, $P = 0.03$, DBP = 3.56 mmHg, $P = <0.001$). At follow-up 125/345 (36.5%) of the intervention group, compared with 22/338 (6.8%) of the control group had SBP of <160 mmHg and a DBP <90 mmHg ($P = 0.004$). Among the intervention group the number of home visits was not correlated with the final SBP measurement (r = 0.04) or with the final DBP (r = –0.06).

Although the mean reduction in weight in the intervention group was small and not statistically significant (–1.06, 95%

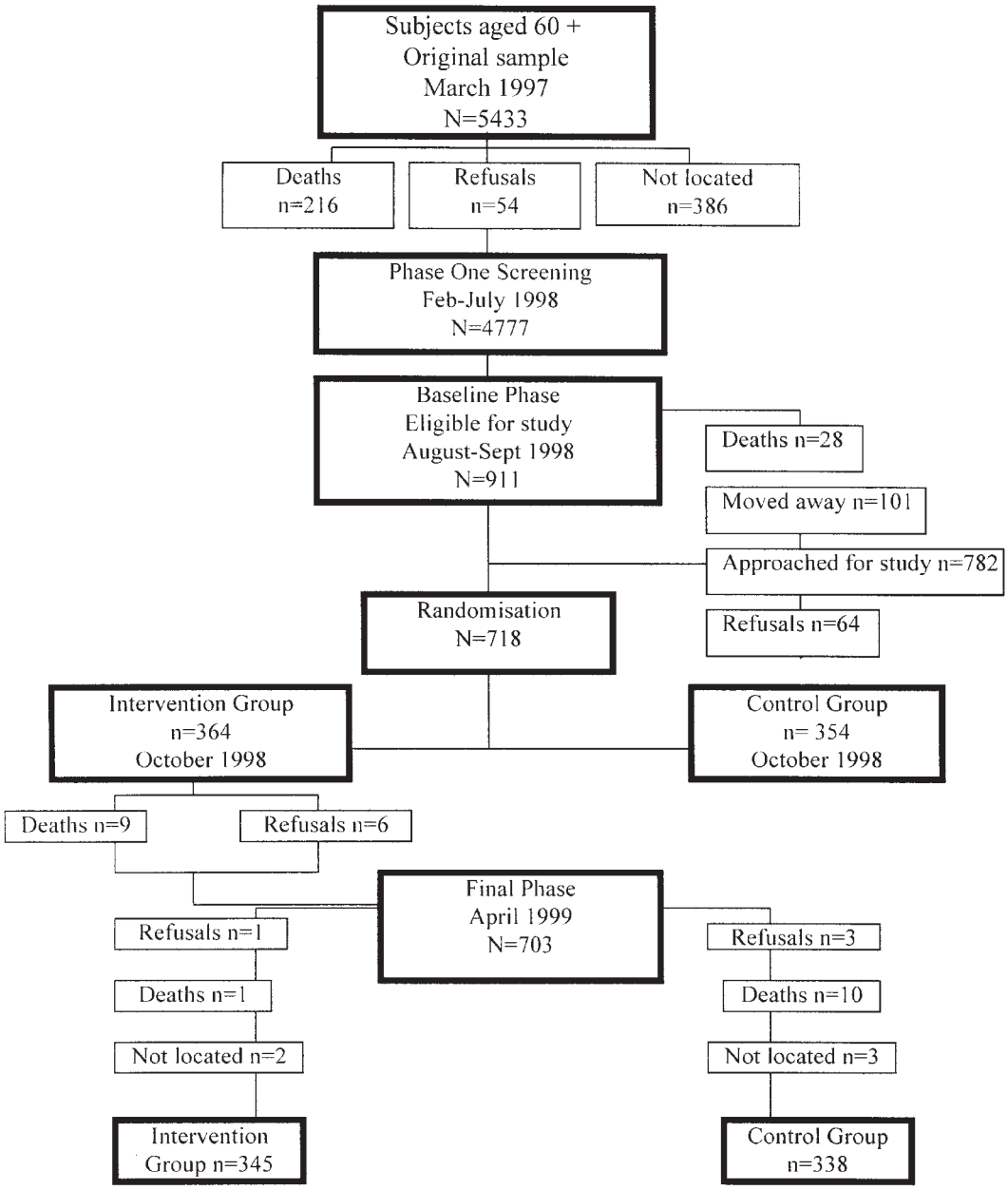

Figure 1 Flow of subjects through the study

CI : –2.18, –0.04), the difference between this and the small weight gain in the controls was on the borderline of statistical significance ($P = 0.05$). Sodium excretion showed a similar pattern, but the difference did not approach statistical significance (–5.85, 95% CI : –14.1, 2.37, $P = 0.16$). Differences within and between groups are presented in Table 2.

The number of intervention participants undertaking slow walking increased from 222 (61.4%) to 241 (70.1%), an increase of 9.1% compared with a small net decrease (0.7%) in the controls ($P = 0.004$). This difference was due both to there being fewer people who stopped slow walking in the intervention group, and more people who started slow walking. The proportion of both intervention and control subjects engaging in brisk walking decreased over the study, but much less so ($P < 0.001$) in the intervention group (Table 3). There was a significant difference ($P < 0.001$) in the proportion taking up brisk walking in the intervention group (12.4%) compared with the control group (2.4%).

The proportion of intervention participants not on drug treatment decreased from 102/345 (28.0%) to 55/338 (15.9%), compared to a decrease from 113/345 (31.9%) to 91/338 (26.9%) in the control group ($P = 0.02$). A few people stopped treatment, one in the intervention arm whose blood pressure was <160/90 mmHg and 12 in the control arm all with blood pressures >160/90 mmHg at follow-up. The most commonly used drug was Captopril (an ACE inhibitor). Few people were

Table 1 Baseline characteristics of intervention and control groups

	Control (n = 354)	Intervention (n = 364)
Mean age in years (SD)	70.34 (6.92)	70.8 (7.11)
Female, %	65.0	62.9
Education level, %		
Primary	57.6	55.0
Secondary	13.6	12.1
⩾High School	3.4	5.5
Single, widowed or divorced, %	36.1	40.6
Lives alone, %	15.5	8.2
Income US$/month, %		
10–109	55.6	56.6
110–209	21.5	26.1
⩾210	4.0	3.8
–	18.9	13.5
Lifestyle risk factors, %		
Current smoking	14.2	12.5
Clinical risk factors, %		
Diabetes mellitus	26.0	27.1
Angina pectoris	1.7	2.2
Acute myocardial infarction	4.2	5.8
Renal failure	2.0	0.6
Hypercholesterolaemia	16.1	12.2
Previously known hypertension	81.4	83.2
Mean weight in kg (SD)	67.1 (11.96)	68.4 (13.4)
Body mass index in kg/m^2 (SD)	28.6 (4.83)	28.7 (5.21)
Sodium excretion in mmol/l (SD)	95.2 (47.1)	94.9 (48.81)
Not brisk walking, %	78.3	72.9
Mean blood pressure in mmHg (SD)		
SBP[a]	161.9 (18.4)	162.1 (18.4)
DBP[b]	90.8 (9.4)	90.9 (10.4)
Blood pressure measurements, %		
DBP ⩾90 mmHg	39.0	39.3
SBP ⩾160 mmHg	31.9	31.6
DBP ⩾90 and SBP ⩾160 mmHg	29.1	29.1

[a] Systolic blood pressure.

[b] Diastolic blood pressure.

using a diuretic alone. The greater uptake of drugs in the intervention group was due to increased use of ACE inhibitors, and to a lesser extent calcium antagonists. Use of diuretics increased slightly more in the control group (Table 4). Fifteen clinical events (stroke, angina or myocardial infarction) were reported at follow-up, nine in the control and six in the intervention group.

We used regression analysis to explore the relative contribution of various factors to the difference in change in blood pressure. These showed that taking up walking was associated with reduced blood pressure, but after adjusting for this effect, and that of other potential intermediate variables, the intervention was still associated with a 2.32 mmHg greater reduction in SBP and 2.98 mmHg greater reduction in DBP (Table 5). There was little evidence of modification of the intervention effect by age or gender, education, living alone, time since hypertension was diagnosed, or total income (data not shown).

Discussion

This pragmatic trial tested the effectiveness of an intervention (home visits by nurses) that could be introduced widely in the health services in Mexico. The intervention significantly reduced SBP and DBP levels, with a mean reduction of 3.3 mmHg and of 3.7 mmHg, respectively. Significantly more participants in the intervention group reported that they had taken up walking and the proportion of participants who began anti-hypertensive drug treatment, having not been on treatment, was also significantly greater.

It is unlikely that the differences in SBP and DBP between the intervention and control group were due to an accommodation effect since the baseline and final measurements were carried out by a separate group of nurses, who had not been involved in the intervention, and would have been unknown to the participants. All the baseline and final measurements were carried out in the same conditions. The initial intention to use random zero sphygmomanometers was abandoned because they proved to be easily decalibrated when carried around and also because of the effect of underestimation of the blood pressure.[13] Mercury sphygmomanometers, the best equipment available in Mexico at the time of the trial, were used.

A meta-analysis of pharmacological trials in hypertension found a 15.8 mmHg reduction in SBP and 5.6 mmHg reduction in DBP.[14] Trials of pharmacological treatment for isolated systolic hypertension have found falls in blood pressure of between 10 and 12 mmHg in SBP and 4 and 5 mmHg in DBP.[15,16] The differences found in this trial were smaller compared with the pharmacological trials, but higher compared with trials using lifestyle change strategies.[17,18]

Our results are in accord with previous findings that blood pressure lowering can be achieved with moderate intensity exercise.[6,14,19,20] However, the intervention effect was only partially explained in the regression analysis by measured intermediate variables and it may have had an impact through other mechanisms which were not measured. One such measure is the improvement in participants' drugs adherence. The trial also found some differences in drug prescriptions, so the information provided by the nurses to the family physician may have an effect on these patterns.

Changes in body weight and sodium excretion were not significant, but this may be because the duration of the intervention was too brief to see a substantial impact. There is some suggestion in the data that weight and sodium intake were falling in the intervention group (Table 2). A significant change in sodium excretion might have been detected through a more accurate measurement of 24-h urine collection, but that was not possible in this trial of elderly people. Future trials of behaviour change should be planned with a longer duration to improve the likelihood of detecting change and assessing long-term sustainability of blood pressure reductions.

The absolute levels of risk associated with hypertension are higher in older people, so the potential benefits of blood pressure reduction are greater. A meta-analysis[21] found that an average reduction of 12–13 mmHg in SBP (mean age = 64 years) was associated with a 21% reduction in coronary heart disease and a 37% reduction in stroke. If the reductions in blood pressure observed in this trial are sustainable long term, then they may result in a reduction in the risk of stroke of

Table 2 Baseline versus final measurements. Within and between group differences

Variable	Group	Basal mean (SD)	Final mean (SD)	Change (95% CI)
Systolic blood pressure	Control (n = 338)	161.7 (18.2)	158.2 (16.6)	–3.5 (–1.4, –5.7)
	Intervention (n = 345)	161.9 (18.4)	155.1 (17.3)	–6.8 (–4.7, –8.9)
	Difference			–3.3 (–6.3, –0.3)
Diastolic blood pressure	Control (n = 338)	90.8 (9.2)	90.8 (10.4)	0.00 (–1.7, 0.7)
	Intervention (n = 345)	91.1 (10.2)	87.4 (8.6)	–3.7 (–2.7, –4.7)
	Difference			–3.7 (–5.2, –2.1)
Weight	Control (n = 338)	67.4 (12.0)	67.8 (12.1)	0.5 (1.5, –0.2)
	Intervention (n = 345)	68.7 (13.3)	68.1 (13.1)	–0.6 (0.3, –1.5)
	Difference			–1.1 (–2.2, –0.04)
Sodium excretion (mmol/l)	Control (n = 318)	99.2 (45.0)	100.1 (47.0)	0.9 (–6.5, 4.7)
	Intervention (n = 325)	100.1 (48.9)	95.2 (44.4)	–4.9 (1.8, –10.9)
	Difference			–5.8 (–14.1, 2.4)

Table 3 Changes in physical activity by group

	Control (n = 338)			**Intervention (n = 345)**				
	Baseline (%)	Final (%)	Change	Baseline (%)	Final (%)	Change	**Net change**	***P*-value**
Slow walking	60.2	59.5	–0.7	61.0	70.1	9.1	9.8	0.004
Stoppers		22.9			16.0		–6.9	0.02
Starters		22.0			24.6		2.6	0.39
Brisk walking	27.1	8.6	–18.5	21.7	17.5	–4.2	14.3	<0.001
Stoppers		21.0			17.0		–4.0	0.19
Starters		2.4			12.9		10.5	<0.001

Table 4 Change in prescription of drugs by group

	Control (n = 338)			**Intervention (n = 345)**				
	Baseline (%)	Final (%)	Change	Baseline (%)	Final (%)	Change	**Net change**	***P*-value**
Any use of diuretics	9.5	16.9	7.4	12.2	18.3	6.1	–1.3	0.91
Any use of ACE inhibitors	42.9	46.4	3.5	46.4	55.7	9.3	5.8	0.02
Any use of beta blockers	18.9	20.1	1.2	20.3	22.6	2.3	1.1	0.50
Any use of calcium antagonists	21.0	21.6	0.6	22.9	27.0	4.1	3.5	0.09
Any drug treatment	67.8	73.1	5.3	71.6	84.1	12.5	7.2	0.02

nearly 10%, and a reduction of the risk in coronary heart disease of 5%.

The IMSS is the biggest social security institution in Mexico. It covers workers in almost all the private sector, along with their families. Other social security systems and the Ministry of Health cover the remaining 37%. About 10% of the Mexican population do not have access to the health system. The IMSS covers a disproportionately high number of elderly people, and effective strategies for their care are urgently needed. The intervention evaluated in this study has been costed at 101 902 pesos (US$11 137), or 35 pesos (US$4) per patient, giving a cost effectiveness ratio of 10 pesos (95% CI : 129–6) (US$1) per millimetre reduction in SBP (Wonderling D, personal communication). Whether this represents good value compared with other health interventions remains to be determined. Certainly if this intervention is reproduced and extended to an integral care plan for the elderly, the opportunity cost has to be considered and reallocation of financial resources will be necessary as well as reallocation of human resources.

Recognition that health can be promoted for the elderly, has increased in the last few years[22] but the idea that health promotion strategies for the elderly will save money is simplistic. Such strategies will incur extra cost but if they are effective they will improve the quality of life for the elderly and decrease the prevalence of disability.[23]

Acknowledgements

Special thanks to all the participants and to the supervisor nurses, computer offices and administrative staff of the Medical Research Unit on Ageing, Mexican Institute of Social Security. This trial was funded (26125-M) by the National Council of Science and Technology, Mexico (CONACYT) and the Mexican Institute of Social Security (IMSS).

Table 5 Regression analysis of blood pressure on possible intermediate variables

	Simple		Multiple[a]	
Potential intermediate variables	Regression coefficient[b] (β)	95% CI	Regression coefficient[b] (β)	95% CI
Systolic blood pressure				
Intervention	–3.31	–6.31, –0.29	–2.32	–5.56, 0.91
Change in BMI[c] (kg/m^2)	0.19	–0.31, 0.69	0.25	–0.27, 0.77
Change in sodium excretion (mm/l)	0.001	–0.017, 0.044	–0.009	–0.020, 0.039
Taking up slow walking	–3.08	–6.76, 0.59	–4.34	–8.18, –0.54
Taking up brisk walking	–12.3	–18.86, –5.82	–12.66	–19.53, –5.79
Beginning drug therapy	1.96	–2.89, 6.82	3.53	–1.58, 8.65
Diastolic blood pressure				
Intervention	–3.67	–5.21, –2.12	–2.98	–4.69, –1.28
Change in BMI (kg/m^2)	0.32	0.06, 0.58	0.33	0.06, 0.60
Change in sodium excretion (mm/l)	–0.007	–0.027, 0.008	–0.009	–0.025, 0.006
Taking up slow walking	–1.32	–3.23, 0.59	–1.17	–3.18, 0.83
Taking up brisk walking	–4.15	–7.56, 0.73	–2.96	–6.57, 0.65
Beginning drug therapy	–1.50	–4.02, 1.02	–0.80	–3.50, 1.88

[a] Adjusted for age, gender, total income, no education and living alone, and the other variables in the Table.

[b] For intervention, taking up walking (those who started walking against the remaining), and beginning drug therapy (those who began drug therapy against the remaining), the regression coefficient can be interpreted as the adjusted mean change in blood pressure between subjects with and without the characteristic.

[c] Body mass index.

KEY MESSAGES

What is already known

- Lifestyle changes can reduce blood pressure in hypertensive elderly people.
- There is a lack of evidence of how to promote changes in behaviour in old people.

What this trial adds

- Home visits to elderly hypertensive people by a trained nurse will reduce blood pressure, and promote physical activity. Such visits may also improve adherence to drug treatment.

References

[1] Secretaria de Salud. *Boletín de Información Estadística, Recursos y Servicios*. México: SSA, 1995.

[2] Secretaria de Salud. *Encuesta Nacional de Enfermedades Crónicas*. México: Dirección General de Epidemiología, 1996.

[3] Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure. Sixth Report. NIH Publication no. 98–4080. USA: National Institutes of Health, 1997.

[4] World Health Organization. International Society of Hypertension Guidelines for the Management of Hypertension. Guidelines Subcommittee. *J Hypertens* 1999;**17:**151–83.

[5] Ramsay L, William B, Johnstom D *et al.* British Hypertension Society. Guidelines for hypertension management. *Br Med J* 1999;**319:**630–35.

[6] Hagberg J, Montain S, Martin W, Ehsani A. Effect of exercise training in 60 to 69 year old persons with essential hypertension. *Am J Cardiol* 1989;**64:**348–53.

[7] Stamler R, Stamler J, Grimm R *et al*. Nutritional therapy for high blood pressure. Final report of a four year randomized controlled trial. The Hypertension Control Program. *JAMA* 1987;**257:**1484–91.

[8] Langford H, Davis B, Blaufox D *et al.* Effect of drug and diet treatment of mild hypertension on diastolic blood pressure. *Hypertension* 1991; **17:**210–17.

[9] Whelton P, Appel L, Espeland M *et al*. Sodium reduction and weight loss in the treatment of hypertension in older persons. A randomized controlled trial of nonpharmacologic interventions in the elderly (TONE). *JAMA* 1998;**279:**839–46.

[10] Garcia-Peña C, Thorogood M, Reyes S, Duran C. The prevalence and treatment of hypertension in the elderly people in Mexico. *Salud Publica Mex* (*accepted for publication*).

[11] O'Brien E, Petrie J, Littler W *et al. Blood Pressure Measurement. Recommendations of The British Hypertension Society*. Plymouth, UK: British Medical Journal Publishing Group, 1999.

[12] Levy GB. Determination of sodium with ion selective electrodes. *Clin Chem* 1981;**27:**435–38.

[13] Brown WC, Kennedy S, Inglis G, Murray I, Lever A. Mechanisms by which the Hawksley random zero sphygmomanometer underestimates blood pressure and produces a non-random distribution of z values. *J Hum Hypertens* 1997;**11:**75–93.

[14] Ebrahim S, Davey-Smith G. *Health Promotion in Older People for the Prevention of Coronary Heart Disease and Stroke*. Health promotion effectiveness reviews. London: Health Education Authority, 1996.

[15] SHEP Co-operative Research Group. Prevention of stroke by anti-hypertensive drug treatment in older persons with isolated systolic hypertension. *JAMA* 1991;**265:**3255–64.

[16] Staessen J *et al*. Randomised double-blind comparison of placebo and active treatment for older patients with isolated systolic hypertension. *Lancet* 1997;**350:**757–64.

[17] Imperial Cancer Research Fund OXCHECK study. Effectiveness of health checks conducted by nurses in primary care: final results of the OXCHECK study. *Br Med J* 1995;**310:**1099–104.

[18] Family Heart Study Group. Randomised controlled trial evaluating cardiovascular screening and intervention in general practice: principal results of British family heart study. *Br Med J* 1994;**308:**313–20.

[19] Jenning G. Exercise and blood pressure: walk, run or swim? *J Hypertens* 1997;**15:**567–69.

[20] Fagard R. The role of exercise in blood pressure control: supportive evidence. *J Hypertens* 1995;**13:**1223–27.

[21] He J, Whelton P. Elevated systolic blood pressure as a risk factor for cardiovascular and renal disease. *J Hypertens* 1999;**17(Suppl.2):**S7–S13.

[22] Kalache A. Health promotion. In: Ebrahim S, Kalache A. *Epidemiology in Old Age*. Great Britain: Latimer Trend and Co. Ltd, 1996.

[23] Kennie D. *Preventive Care for Elderly People*. UK: Cambridge University Press, 1993.

 International Journal of Epidemiology 2001;**30**:1491–1492

Commentary: Disentangling the black box of disability prevention in older people

Andreas E Stuck

Demographic changes and expected increasing numbers of disabled older people are key challenges for medical and social care systems of this century. Thus, research on the prevention of disability is a high societal priority. Recently, this research received increased attention because of a major disagreement on the effectiveness of preventive programmes for older people.[1] In the current debate, the findings of the study by Garcia-Peña *et al*.[2] are timely. Their carefully conducted randomized controlled study showed favourable effects of a preventive home visitation programme among older hypertensive people in Mexico.

This is a randomized study of disability prevention in an older population that was conducted in subjects with a predominantly low socioeconomic status (SES). Most previous studies of preventive care in older people were conducted in more affluent areas or in subjects with a higher SES. Also, since subjects with a lower SES are more likely to refuse to participate in research studies as compared to subjects with a higher SES,[3] subjects with a low SES were often underrepresented in earlier studies of preventive care among older people. This uncertainty about effects of preventive programmes in subjects with low income or in subjects with a low level of education is of concern because income and education are key factors associated with disability among older people.[4] For example, the recent observation of a rapidly declining prevalence of disability among the black and non-black US population was explained by a coincident rise of educational level in these populations.[5] There is also empirical evidence from epidemiological studies demonstrating that the level of functional impairment associated with chronic disease is strongly influenced by the older person's SES.[6] This is likely explained by the relationship between SES and factors such as access to health care; quality of health care received; adherence with preventive or therapeutic recommendations; or individual coping with chronic disease. Garcia-Peña *et al*.[2] demonstrate that a preventive interven-tion can improve health risk among a group of subjects with low SES.

This study adds to the disentangling of the black box of disability prevention in older people. Garcia-Peña *et al*. focused on control of hypertension, one of the multiple potential risk factors for disability among older pepole. A recent meta-analysis revealed that absolute benefit of hypertension control is larger in subjects aged ⩾70 as compared to younger people.[7] Other potentially modifiable risk factors for functional status decline among older people include depressive symptoms, hazardous alcohol consumption, impaired cognition, falls, sensory impairment, smoking and multiple other factors.[3] Garcia-Peña *et al*. designed a complex intervention addressing factors associated with hypertension, including physical activity, nutrition, and medication management. Specially trained nurses conducted home visits every month or more frequently if needed and emphasized pharmacological and non-pharmacological interventions. Outcomes suggested that favourable intervention effects on blood pressure were probably related to favourable effects on the level of physical activity, on sodium intake, and on the use of antihypertensives agents. These findings add to the evidence that effective preventive programmes need to have a high level of intensity and professional quality and are not compatible with home visits conducted by inexpensive volunteers having mainly social contacts with older people.

The authors calculated that this programme would result in additional costs of US$32 per person receiving the intervention

Department of Geriatrics and Rehabilitation, Spital Bern Ziegler, Morillonstr. 75, CH-3001 Bern, Switzerland. E-mail: andreas.stuck@spitalbern.ch

and question whether these costs are acceptable for achieving improved control of hypertension. Given the lack of more comprehensive outcome and cost data, the authors could not present a more complete cost effectiveness analysis. This is relevant because preventive programmes might necessitate an initial investment, with savings occurring only after a period of time. In fact, a recent study found that preventive home visits resulted in additional costs in the first year of follow-up, but resulted in overall net savings in the third year of follow-up because intervention subjects were less dependent and were admitted less frequently to nursing homes as compared to controls at the 3-year follow-up.[8]

Do the results of this study justify a widespread dissemination of this type of programme in other regions? The findings of this study might contribute to the development of a preventive programme for older people, but many questions remain to be answered. For example, one might question whether this programme could be combined with an intervention directed towards primary care physicians, increasing physicians' prescription patterns of antihypertensive agents among older people. A key question is whether the favourable effects of this intervention would persist if it was introduced into regular health care. Therefore, more information would be needed on how the nurses should be trained, and what criteria should be used to judge the quality of the intervention. A recent study found that performance among health nurses can vary substantially and influence whether or not a preventive care programme yields favourable effects.[8] Finally, given the multiple and often interacting risk factors for disability among older people, the optimal method of prevention might be to design multidimensional preventive programmes that address the multiple risk factors for disability in older people. This approach could be based on the principle of comprehensive geriatric assessment.[9] Such multidimensional programmes include interventions to modify risk factors for disability and also attempt to improve the use of preventive care including immunization, cancer screening, and cardiovascular risk modification. As shown by Garcia-Peña *et al*., it is likely that subjects of all socioeconomic classes could benefit from such interventions if programmes were developed that contain the ingredients required for effective disability prevention.

References

[1] Van Haastregt JCM, Diederiks JPM, van Rossum *et al*. Effects of preventive home visits to elderly people living in the community: systematic review. *Br Med J* 2000;**320:**754–58.

[2] Garcia-Peña C, Thorogood M, Armstrong B, Reyes-Frausto S, Muñoz O. Pragmatic randomized trial of home visits by a nurse to elderly people with hypertension in Mexico. *Int J Epidemiol* 2001;**30:**1485–91.

[3] Norton MC, Breitner JCS, Welsh KA, Wyse BW. Characteristics of nonresponders in a community survey of the elderly. *J Am Geriatr Soc* 1994;**42:**1252–56.

[4] Stuck AE, Walthert J, Nikolaus T, Büla CJ, Hohmann C, Beck JC. Risk factors for functional status decline in community-dwelling elderly people: a systematic literature review. *Soc Sci Med* 1999;**48:** 445–69.

[5] Manton KG, XiLiang G. Changes in the prevalence of chronic disability in the United States black and nonblack population above age 65 from 1982 to 1999. *Proc Natl Acad Sci USA* 2001;**98:**6354–59.

[6] Kington RS, Smith JP. Socioeconomic status and racial and ethnic differences in functional status associated with chronic diseases. *Am J Public Health* 1997;**87:**805–10.

[7] Staessen JA, Gasowski J, Wang JG *et al*. Review of untreated and treated isolated systolic hypertension in the elderly: meta-analysis of outcome trials. *Lancet* 2000;**355:**865–72.

[8] Stuck AE, Minder CE, Peter-Wüest I *et al*. A randomized trial of in-home visits for disability prevention in community-dwelling older people at low and at high risk for nursing home admission. *Arch Intern Med* 2000;**160:**977–86.

[9] Stuck AE, Siu AL, Wieland GD, Adams J, Rubenstein LZ. Comprehensive geriatric assessment: a meta-analysis of controlled trials. *Lancet* 1993;**342:**1032–36.