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THE PREVENTION OF CARDIOVASCULAR DISEASE IN THE ELDERLY

J.H. Abramson

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ABSTRACT

Diseases of the heart and blood vessels are responsible for a heavy burden of disability and suffering in the elderly, and are major causes of death in old age. The prevention of these diseases should start early in life, but preventive measures may have some effect even when applied at a late age. There is convincing trial-based evidence that treating hypertension, even mild hypertension, in the elderly reduces subsequent morbidity and mortality. The findings of epidemiological studies in elderly people and the results of trials in middle-aged adults support the advisability of preventive intervention with respect to weight control, exercise, cigarette smoking and blood cholesterol modification. There is also evidence of the value of these and other measures in secondary prevention. The "medical" model of intervention, which concentrates on people at high risk, and the "public health" model, which aims to reduce risk in the population as a whole, both have their advantages. These two approaches may be combined, as exemplified by the CHAD programme in Jerusalem, which demonstrates the integration of cardiovascular prevention into primary care. Preventive care for the elderly should be integrated into community-wide programmes.

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Chapter 1: INTRODUCTION

Diseases of the heart and blood vessels, such as coronary heart disease, congestive cardiac failure. strokes, and vascular diseases of the limbs, eyes, kidneys and other organs, are responsible for a heavy burden of disability and suffering in the elderly, and are major causes of death in old age. If they were eliminated, life expectancy at 65 years of age might be increased by ten years (National Center of Health Statistics, 1973). The decline in mortality from coronary heart disease and strokes observed in some countries in recent years, in the elderly as much as in younger age groups, is evidence that these diseases and their consequences are not inevitable (Kannel and Gordon, 1978).

This review, which is an update of one written in 1976 (Abramson and Hopp, 1976), examines the evidence concerning the effectiveness of measures applied in later adult life in preventing or delaying cardiovascular diseases and their consequences. Decisions about the value of preventive measures in the elderly should be based on trials in this age group or, failing this, on observational studies of the elderly. Data about the elderly are, unfortunately, very limited. Although there have been extensive studies of preventive measures in younger and especially middle-aged adults, their findings cannot be automatically extrapolated. The paucity of data on the elderly may be symptomatic partly of lack of interest in the elderly, partly of a feeling that the life style of older people cannot easily, or should not, be changed, and partly of a feeling that these diseases are inevitable concomitants of aging.

The prevention of cardiovascular diseases should, of course,

start early in life, when habits are formed and pathogenetic processes commence. Various findings in studies of the elderly substantiate this truism. In a study of the incidence of strokes during a four-year period in people aged 65 and older in a community in England, for example, no relationship was found with the body mass index (weight divided by the square of height) measured at the beginning of this period; but there was a significant association between stroke incidence in these people and a high body mass index at age 25, calculated on the basis of remembered weights (Evans, 1983). In the Framingham study, the incidence of coronary heart disease in people aged 59-82 who were followed up for six years was more strongly related to low density lipoprotein (LDL) cholesterol levels measured 18 years earlier than it was to the measurements at the beginning of the follow-up period (Gordon et al., 1981).

The relative risks associated with most of the established primary cardiovascular risk factors have been shown to decrease with advancing age (Kannel and Gordon, 1978), and new risk factors, such as the presence of myocardial damage (Coronary Drup Project Research Group, 1978), become important. There is an increased prevalence of subclinical and clinical pathological changes, which may be difficult or impossible to reverse. Moreover, by the time old age is reached there has been ample time for selective factors to operate. Elderly people who are either free of disease, or who live despite suffering from a clinical disease, may attribute their longevity to low susceptibility to the risk factors to which they have been exposed.

The advisability of early prevention does not, however, necessarily mean that preventive measures at an advanced age will have

no effect. On the contrary, because of the high rates of disease incidence and mortality among the elderly, the absolute impact of a preventive measure in the population may in fact be greater (in the short term) than for a younger age group, even if the relative effect on the individual's risk is smaller. A ten percent reduction of mortality in a population of older people may save more lives in a year than a fifty percent reduction of mortality in an equal-sized population of younger people.

This review deals both with primary prevention, which aims to prevent disease, and with secondary prevention, which aims to forestall recurrences and complications of disease. These concepts are not always clearcut - the treatment of hypertension, for example, may be viewed as primary prevention of strokes and heart failure, or as secondary prevention with respect to hypertension. The treatment of acute disease episodes and rehabilitative care are outside the scope of this review.

Chapter 2: SPECIFIC PREVENTIVE MEASURES

Treatment of Hypertension

Hypertension is a powerful independent risk factor for cardiovascular diseases, including stroke, coronary heart disease (in populations where that condition is common), congestive heart failure, intermittent claudication and retinal degeneration, and renal disease.

Many prospective studies have demonstrated that a raised pressure is a definite risk marker even at an advanced age. Systolic and diastolic pressures have been shown to make separate contributions, at all ages and for both sexes, to the risk of these diseases and of death (Agner, 1983; Gordon and Kannel, 1972; Holme and Waaler, 1976; Kannel et al., 1971, 1970; Oliver, 1984; O'Malley and O'Brian, 1983; Peacock, 1972; Schroll et al., 1983; Shekelle et al., 1974; Society of Actuaries, 1959). Although the relative risk associated with hypertension may decrease with age, the attributable risk (the absolute difference in risk) increases (Neutra, 1974; Rose, 1981). Risk tends to rise progressively as pressure rises, and epidemiological studies of risk do not demonstrate well-defined cutting points between "normotensive" and "hypertensive" values. Among the elderly, as among younger people, the increased risk associated with higher blood pressure is manifest even within pressure ranges that are considerably lower than those usually regarded as "high" (Gordon and Kannel, 1972; Kannel et al., 1970; Peacock et al., 1972; Shekelle et al., 1974; Society of Actuaries, 1959).

Both systolic and diastolic pressures are significant predictors of disease and death in the elderly. For people with low diastolic pressures, raised systolic pressures are associated with an increased

risk of stroke and other cardiovascular diseases (Dyer et al., 1977; Rowe, 1983; Short, 1974). In the Framingham study, where hypertension-related risk was measured in subjects who were, for the most part, untreated, systolic and diastolic pressures did not lose their value, with increasing age, as independent predictors of risk of death. The increased risk was apparent in both sexes (Kannel and Gordon, 1978).

Contrary findings have also been reported. In his general practice in England, Fry found that when he excluded the few patients who received drug treatment for severe hypertensive disease, the deaths observed in a 5-10 year follow-up of people who had diastolic pressures of 100 mm Hg or more at the age of 70 or older were fewer by 13% than the expected number of deaths in this group. Among people who were aged 60-69 when the hypertension was detected, the observed deaths exceeded the expected number by only 15%. Fry concluded that "there is no strong case for hypertensives first diagnosed over the age of sixty to be treated with specific hypotensives" (Fry, 1974). This study has been criticized, however, on methodological grounds - for example, for its use of an inappropriate standard for the calculation of expected deaths (Hart, 1974; Neutra, 1974; and Pedoe, 1974).

In a study of 70-year-old men and women in Dalby, Sweden, who were followed up for ten years, a life-table analysis revealed no significant difference in mortality between people with hypertension and those without. This finding may, however, be due to the fact that the hypertensives in this cohort received medical treatment (Lindholm, 1983).

In Tampere, Finland, a two-year follow-up of mortality in 559

people aged 85 or older revealed a significant inverse gradient of mortality in relation to blood pressure, the highest death rates occurring among men and women with systolic pressures below 110 and those with diastolic pressures below 70 mm Hg (Rajala et al., 1983). One explanation suggested is that the deaths in this very old group may have been due to illnesses that cause a fall in blood pressure, such as congestive heart failure and other cardiac disorders, subnutrition, and cachexia (Coope, 1983a; MacLennan, 1983). This explanation is supported by preliminary results of a study in England, in which 260 untreated hypertensive people aged 60-79 were compared with 520 age- and sex-matched normotensive controls; excluded from both groups were patients with cardiac failure, atrial fibrillation, atrioventricular block, or other conditions representing a hazard to survival. After an average follow-up period of four years the cardiovascular death rate was 10.8% in the hypertensive group and 5.2% in the control group (Coope, 1983a).

Unless the hypertension is very marked or is accompanied by other manifestations that point to an especially high risk, the need to treat it in the elderly is sometimes questioned on the ground "that what is common must be normal and therefore safe" (Lancet, 1977). This thesis cannot be defended. A rise in blood pressure with age does not occur in all individuals, or even in all populations (Henry and Cassel, 1969) and cannot be regarded as a normal phenomenon. There is no doubt, however, that many hypertensive people reach old age without therapy. In a long-term study of hypertensive outpatients in Copenhagen (mean age, 54) who were diagnosed in the 1930s and 1940s and were, for the most part, untreated, Bechgaard showed an excess

mortality during 35 years of follow-up for men and 40 years for women (Bechgaard, 1983). He notes, nevertheless, that 29% of the men and 45% of the women reached the age of 75 years, and 6% of the men and 11% of the women attained the age of 85 years. This indicates, according to Bechgaard, "that there must be a rather big group of hypertensive persons whose state of health and life expectancy is not seriously affected by moderate blood pressure elevation". At the present time we do not have the prognostic tools that would enable us to identify these lucky individuals.

Controlled trials of hypertensive medication

A risk marker, however strong its predictive value, is not necessarily a causal factor, and even if it is, its removal will not necessarily lessen the risk, as its effects may be irreversible. Only well-designed trials can provide assurance that treatment of hypertension will improve the prognosis. Such trials have shown that medicinal treatment of hypertension produces a striking reduction in cardiovascular diseases and in mortality. Although there is a marked lessening of cerebrovascular accidents and congestive heart failure, as well as of renal and retinal complications, there is little effect on the incidence of coronary complications. Most of these trials, however, were done on middle-aged subjects.

There is no doubt about the value of treating hypertension in elderly people who have very high blood pressures. In the first of the well-known randomized controlled trials conducted by the Veterans Administration in the U.S. on men with sustained diastolic pressures of 115-129 mm Hg, treatment was as effective in men over 60 years old as in younger men (Freis, 1983). There were eight severe

complications and deaths among placebo-treated men aged 65-69 in this trial, as opposed to only one among treated men of this age (Veterans Administration, 1967).

The second Veterans Administration trial, which dealt with men with lower diastolic pressures (90-114 mm Hg), included 81 subjects who were aged 60 or older (Veterans Administration, 1970). Morbid events, fatal or nonfatal, occurred in 27 of the 43 untreated men in this older group, but in only 11 of the 38 who were treated. The main differences were in the numbers of cases of cerebrovascular accident (ten and three respectively) and congestive heart failure (nine and none). Among the older men (aged 50-75) treatment reduced the incidence of morbid events by 50% when initial diastolic pressure was 90-104 mm Hg, and by 64% when it was 105-114 mm Hg (Veterans Administration, 1972). The relevance of this study to the treatment of symptomless mild hypertension is uncertain, since the subjects were not as mildly affected as they appeared. Their average diastolic pressures (fifth phase) were measured under basal or near-basal conditions (Short, 1974), and they had a high prevalence of cardiovascular disease before entering the trial.

More convincing proof of the value of treating mild hypertension was provided by the Australian randomized controlled trial, which dealt with volunteers aged 30-69 who attended screening centres and were found to have diastolic pressures of 95-109 and systolic pressures under 200 mm Hg, without evidence of cardiovascular disease. The rate of end-point events (deaths and nonfatal cardiovascular complications) during an average follow-up period of four years was 20% lower in the treatment group than in the placebo group. This relative difference was similar for people with initial diastolic

values of 95-99 mm Hg (who had a 30% reduction in complications), 100-104 mm Hg (29% reduction) and 105-109 mm Hg (32% reduction) (Management Committee, 1980). The trial included 582 men and women aged 60-69 years, whose average follow-up period was 2.9 years. In this age group too there was a significant reduction in end-point events, the incidence of which was 39% lower in treated subjects than in placebo-treated ones. In these older subjects the treated group had a lower incidence of stroke, as well as of myocardial infarction and other manifestations of coronary heart disease. The authors mention that the benefit seen in these elderly subjects was mainly due to the outcome in men; they do not, however, provide data to substantiate this conclusion (Management Committee, 1981).

Similar findings were provided by the Hypertension Detection and Follow-up Program (HDFP) in the United States, a large-scale randomized controlled trial in which men and women aged 30-69, recruited by community screening and found to have diastolic pressures of 90 mm Hg or more, were either allocated to systematic antihypertensive therapy (Stepped Care) or referred to their usual doctors for treatment (Referred Care) (Hypertension Detection and Follow-up Program Cooperative Group, 1979a). A substantial proportion of the subjects in the latter group also received treatment, especially if the baseline pressure was over 104 mm Hg. The study included 2,376 subjects who were aged 60-69 on entry. Among these older subjects, the five-year reduction in total mortality in the Stepped Care group (in comparison with the Referred Care group) was 16%, and the reduction in the incidence of strokes was 45% (Hypertension Detection and Follow-up Program Cooperative Group,

1979b, 1982b). After five years, 75% of the older subjects in the Stepped Care group had achieved normotensive values, as compared with 55% of those in the Referred Care group, 62% of whose members were receiving antihypertensive treatment (Hypertension Detection and Follow-up Program Cooperative Group, 1979b). In the study as a whole the effect of stepped care on mortality was most marked if the hypertension was mild; the difference was 22-23% in people with diastolic pressures of 90-94 and 95-99 mm Hg. Among subjects with mild hypertension (diastolic 90-104), those who had cardiac, cerebrovascular, or other end-organ damage on entry into the trial suffered three to four times as many deaths and strokes as those who were free of these complications. This finding was adduced to support the thesis that treatment of people with mild hypertension should be started early, and certainly before end-organ damage occurs (Hypertension Detection and Follow-up Program Cooperative Group, 1982a).

The most recent evidence for the value of treating mild hypertension comes from the European Working Party on High Blood Pressure in the Elderly trial, which showed significant reductions in cardiac deaths, strokes, and severe congestive heart failure (Amery et al., 1985). This trial commenced in 1972, and it was terminated in 1984 because predetermined criteria of benefit were met. It was a double-blind multicentre trial in which 840 subjects aged 60 years or more, with sitting blood pressures of 90-119 mm Hg (diastolic) and 160-239 mm Hg (systolic), who were free of severe complications and concurrent diseases, were randomized to active treatment (using a thiazide/potassium-retaining diuretic combination to which methyldopa was added if necessary) or placebo treatment. The mean blood pressure

at randomization was 183/101 mm Hg, and the subjects' mean age was 72. During the double-blind period (mean duration about three years) in which all the subjects were on their allocated treatment regimes, overall mortality was lower by 26% in the treated group, total cardiovascular mortality by 38%, cardiac mortality by 47%, and cerebrovascular mortality by 43%. The differences in cardiac and total cardiovascular mortality were statistically significant. There was also a significant reduction (60%) in severe nonfatal cardiovascular complications. The total incidence of congestive heart failure was not reduced, but the incidence of severe congestive heart failure (not controlled by digitalis alone) was decreased significantly (63%). There was no decrease in the total incidence of myocardial infarction, but there was a significant decrease (60%) in fatal myocardial infarction. Nonfatal strokes were reduced significantly (52%).

If a significant event or complication occurred, the subject's double-blind period was terminated and the allocated treatment was often modified. As a more stringent form of analysis, therefore, events in the total follow-up period (over 4 1/2 years on average) were examined without regard to these subsequent changes in treatment. This "intention-to-treat" analysis showed that total mortality in the subjects originally allocated to active treatment was reduced by 9%, total cardiovascular mortality by 27%, cardiac mortality by 38%, and cerebrovascular mortality by 32%. The differences in cardiac and total cardiovascular mortality were significant.

The reduction in cardiovascular terminal events in the European trial was 37% for subjects with mild hypertension (diastolic 90-99 mm

Hg) and 50% for those with moderate hypertension (diastolic 100-119 mm Hg).

Other studies give limited confirmation of the value of treating mild hypertension in the elderly. Among residents of homes for the aged in Toronto who had blood pressures of at least 180 (systolic) or 100 (diastolic) mm Hg, the four-year mortality of 100 people aged 60-96 years who were treated with thiazides was half that of controls, similar in age, who were not treated. The difference remained apparent when the subjects were stratified according to their blood pressure levels (Priddle et al., 1968). In a five-year study of apparently healthy people aged 60-90 at a home for the aged in Japan, 63 subjects with systolic pressures of 160 or more and/or diastolic pressures of 90 or more, who were treated with diuretics, were compared with 49 placebo-treated controls who were similar in age, sex, initial blood pressure, and ECG findings. The incidence of cardiovascular morbidity and mortality was lower in the treated group (13%) than in the control group (32%); the five-year survival rates, however, did not differ (Ikeda, 1976). In another small-scale study in Japan, a randomized controlled trial on residents of homes for the aged who had mild hypertension (systolic 160-200, diastolic 90-110 mm Hg), 44 subjects who received stepped care were compared with 47 similar subjects who received placebos (mean age, 76 years). Although there was no difference in four-year mortality, the number of nonfatal cardiovascular events (strokes and congestive heart failure) was smaller in the treated group (one case, as compared with six in the control group). When the development of severe hypertension (over 200/100 mm Hg) was included as a complication, the total numbers of cardiovascular events (four in the treated group and 17 in the control

group) differed significantly (Kuramoto et al., 1981).

No evidence of effectivity was provided by a randomized trial in Nottinghamshire, England, among residents of welfare homes (mean age, 80) who were found on one-time screening to have diastolic pressures of 100 or more (range, 100-145 mm Hg). During a follow-up period of up to 90 months there were no differences in mortality or in nonfatal cardiovascular events between the subjects treated with methyl-dopa and those who received no treatment (Sprackling et al., 1981). This study too was a small-scale one, with only 60 subjects in each group at the outset, about half of whom remained in the study after 24 months. The subjects were selected on the basis of blood pressure readings on a single occasion, not (as in other studies) on the basis of consistent findings of repeated measurements.

To summarize, the available results suggest that medicinal treatment of mild hypertension in the elderly is beneficial. Until recently the main evidence was provided by the Australian and HDFP trials , both of which included subjects up to age 69 on entry, but definite conclusions could not be reached, especially with respect to older people (Amery et al., 1983b). The findings of the European trial, where the mean age of the subjects was 72 years, have now greatly strengthened the case for treatment. As pointed out in an editorial in The Lancet (1985), however, these findings "will undoubtedly be used as ammunition by both sides in the controversy about treatment". The absence of a significant effect on total mortality, for example, will be cited as an argument against treatment, although this was due only to the fact that noncardiovascular nonrenal deaths were about equally common in the

treatment and placebo groups, and thus diluted the effect of treatment on cardiovascular deaths. Reservations may also be based on possible selective factors - how representative were the subjects? - and on the unusual form of stepped care used in the trial. The editorial moncludes that although the trial does not present "final" information, "it seems likely that, by treating hypertension in the elderly according to the criteria now applied to younger age groups, we shall help at least some of our patients".

Hazards of antihypertensive medication

A judgment on the value of any form of treatment must be based on the balance between the good and the harm it may do. Antihypertensive medication is not without its hazards, both to the quality of life and maybe to life itself. In the HDFP trial, the incidence of adverse drug reactions was 30% in subjects who were aged 60-69 when they entered the study (Curb et al., 1982). Drugs in common use often have unwanted side-effects in elderly patients, and errors in the taking of medicines - especially likely in the case of the elderly - may increase the risk of therapeutic misadventures. The side-effects - many of which have mild or uncertain influence - include decreased glucose tolerance, hyperuricaemia, a fall in serum potassium and an increase in serum creatinine and lipids (Anderson, 1983; O'Malley and O'Brien, 1983). They also include a variety of symptoms, including postural hypotension (which may lead to dizziness and falls) and impotence. In the European Working Party on High Blood Pressure in the Elderly trial, minor adverse effects included a decrease in glucose tolerance and an increase in serum uric acid and creatinine (Amery et al., 1985).

Injudicious medication that leads to an excessive sudden reduction of blood pressure may give rise to serious complications. Jackson et al., (1976), for example, report six elderly patients with no symptoms who started antihypertensive therapy and within one week were admitted to hospital for episodes of unconsciousness (Joossens and Geboers, 1983). If administered with caution and under careful supervision, however, antihypertensive therapy in the elderly may cause relatively few side-effects (Amery et al., 1983; Radin and Black, 1981; Storm-Mathisen et al., 1983). To avoid cerebral ischaemia, the pressure should not be reduced too suddenly (Caris, 1982; Gwinip, 1975); in the opinion of some physicians, the diastolic pressure should not be brought below 90-100 mm Hg (Strandgaard, 1983).

The risk of cerebral ischaemia or other cerebrovascular complications as a result of treatment may be most acute in patients who receive antihypertensive medication for isolated systolic hypertension (a raised systolic but a low diastolic level). The treatment of this condition is, therefore, controversial. Some physicians hesitate to treat it, while others claim that treatment is safe if drugs are selected and administered judiciously (Gifford, 1982). A large, randomized controlled trial of the treatment of isolated systolic hypertension in the elderly is being launched in the U.S. by the National Institutes of Health (Rowe, 1983).

Reports of possible untoward effects on the heart have been published by Morgan et al. (1979), who found an excessive number of myocardial infarctions among elderly men who had been treated for mild hypertension with thiazide diuretics, and by Stewart (1979), whose series of 29 cases of myocardial infarction among patients treated for hypertension suggested that reduction of the diastolic pressure below

90 mm Hg may precipitate an infarction. In the Multiple Risk Factor Intervention Trial (MRFIT) in the U.S., hypertensive subjects in the Special Intervention (treatment) group who had abnormalities in their resting ECG had a 40% higher rate of total mortality and a 65% higher rate of mortality from coronary disease, than similar subjects in the Usual Care (control) group. An explanation suggested for these findings was that antihypertensive treatment might possibly be deleterious in people with E.C.G. abnormalities (Multiple Risk Factor Intervention Trial Research Group, 1982). Data from a trial in Oslo supports the possibility that if such abnormalities are present, drug treatment of hypertension may increase the risk of coronary events; but the number of cases in this trial was small and the effect was not statistically significant (Holme et al., 1984).

Attention has been drawn to the possibility that mild elevation of blood pressure may have a beneficial effect on mental function (Libow and Butler, 1981). This speculative possibility arises from electroencephalographic studies (Obrist et al., 1961) and from the Duke University Study of Human Aging, where it was found that whereas subjects aged 65-70 with diastolic pressures below 95 mm Hg showed no change in their intellectual ability during the subsequent ten years and those with pressures above 105 mm Hg had a definite decrease in performance; subjects with diastolic pressures of 96-105 mm Hg showed a significant improvement (Wilkie and Eisdorfer, 1971). A possible interpretation is that at this age, slight blood pressure elevation may maintain adequate cerebral circulation and thus protect, and even enhance, mental function. It should be noted, however, that the latter observations were based on only ten subjects with pressures of

96-105 mm Hg and that the findings were not replicated among subjects aged 70-79.

With severe hypertension there is little doubt that the benefits of drug treatment outweigh the hazards. But with mild hypertension, when the risk of morbidity or mortality attributable to elevated blood pressure is smaller, the issue is not so clear, even if this risk can be appreciably reduced by treatment. As put by Tudor Hart (1983), "every doctor, and perhaps every patient, should decide whether six fewer deaths outweighs 65 more impotent men treated with propranolol, or 262 more impotent men treated with thiazides, in 14,000 patient-years of treatment". Stamler and Stamler (1983) point out that "even though the absolute rates [of side-effects] may not be high, ... if these rates are applied to the entire hypertensive population, the numbers are staggering. If, for example, 10,000,000 women in the United States were receiving propranolol, there could be as many as 56,000 cases annually of Raynaud's phenomenon due to this cause. Other 'small effects', when applied to millions of people on drugs, may also mean tens of thousands experiencing impotence, impaired glucose tolerance, gout, fatigue, and so on".

Nonpharmacological treatment of hypertension

The potential hazards of drug treatment have led to an increased interest in nonpharmacological methods of reducing blood pressure. The methods most commonly recommended are weight control and salt restriction.

A recent comparison of the results of trials indicates that although drug treatment is the most effective way of lowering blood pressure, other forms of treatment also have some influence. Weight

restriction had a larger effect in these trials than other nonpharmacological interventions. Yoga and muscle relaxation had more marked effects than meditation, exercise, biofeedback, placebo treatment, or salt restriction (Andrews et al., 1982).

The value of weight reduction has been noted in several studies (Fletcher, 1954; Stamler and Stamler, 1984). In the Chicago Coronary Prevention Evaluation Program, for example, in which changes in eating and exercise habits led to moderate sustained weight loss, middle-aged men with mild hypertension (diastolic 90-119 mm Hg) who were initially overweight and received no antihypertensive medication showed notable falls in blood pressure throughout the five years of the program, with a somewhat greater decline in the moderately than in the very overweight. The changes in blood pressure and weight were correlated (Stamler et al., 1980).

In Israel, a controlled study showed that almost all overweight hypertensive patients who were put on a weight-reduction programme showed meaningful reductions in blood pressure, whether or not they were taking antihypertensive drugs as well. Many returned to normal levels. The reduction was considerably larger than in patients treated with drugs only. Salt intake was not restricted in this trial (Reisin et al., 1978). A two-year follow-up showed that the reduction in blood pressure persisted as long as the body weight remained low. Regression analysis of the changes in patients whose blood pressures initially exceeded 150/90 mm Hg (mean systolic pressure 180, mean diastolic 110) and who complied with the low-calorie diet indicated that two-thirds of such patients achieve normal blood pressure with a loss of half their weight excess, even if they remain overweight (Eliahou et al., 1981). In another study, regression equations

predicted a fall of 2.5 mm Hg (systolic) and 1.5 mm Hg (diastolic) for every kilogram of weight loss (Ramsay et al., 1978).

A number of studies have shown that salt restriction can reduce blood pressure in some cases of hypertension (Morgan et al., 1978; Parijs et al., 1973); but the findings are not unequivocal, and there is still debate on the value of this measure, especially if salt is restricted only moderately (Morgan et al., 1979b; Simpson, 1979).

A high consumption of alcohol has also been identified as a major risk factor in hypertension (Dyer et al., 1980). Reduction in consumption lowers the blood pressure (Saunders et al., 1981).

Weight control and salt restriction are often used in combination with antihypertensive drugs. Since the effect of dietary measures is uncertain and not immediate, drug treatment should probably not be withheld while these measures are being tried, unless the hypertension is mild (Tobian, 1978). The effect of withdrawing drugs can be examined later. In this context, it may be noted that several studies, including one of elderly patients, have shown that a proportion of patients treated with drugs remain normotensive for long periods when their medication is withdrawn; the reasons are not clear (Hansen et al., 1983).

A randomized controlled trial of combined nutritional measures - weight reduction with a fat-modified diet and sodium and alcohol restriction - has had promising early results in middle-aged men and women with uncomplicated hypertension that had been successfully controlled by drug treatment in the HDFP trial. About 60% of the subjects had initially had mild hypertension (diastolic 90-104 mm Hg). In the group whose medication was stopped and who were allocated to

the nutritional treatment programme, the percentage who maintained normal pressures (average diastolic below 90 mm Hg) during an average follow-up period of almost three years was 46% - significantly more than the corresponding percentage (14%) in the group whose medication was stopped but who received no dietary counselling. Pressures were not as low, however, as in a third group who continued their drug treatment Stamler and Stamler (1984).

In a small but carefully designed experiment in Finland, the systolic pressures of hypertensive subjects aged 30-50 decreased by 12.7 mm Hg on average, and their diastolic pressures by 10.8 mm Hg, after six weeks of eating a diet low in total fat, with a high P:S ratio and high in vegetables. The values rose on return to the usual (high fat, low P:S ratio) diet. No significant changes occurred in a group whose salt intake was restricted (Priddle et al., 1968).

Although results of this sort are promising, research on elderly subjects is needed to determine the feasibility and effectiveness of dietary and other nonpharmacological measures as substitutes for drug treatment at a more advanced age.

It is of interest that the subjects in control groups in trials of antihypertensive treatment often manifest a drop in blood pressure. This phenomenon was examined in detail in the Australian trial, where the average decrease over three years among control subjects aged 30-69 with mild hypertension (systolic under 200 and diastolic 95-109 mm Hg) was 14 mm Hg for systolic pressure and 11 mm Hg for diastolic pressure. The pressures of half the subjects fell to levels below the range of mild hypertension. The decrease occurred in both sexes and was not influenced by age. It was greater in subjects who lost weight, but was also observed in those who did not. The fall

continued after the two initial screening measurements, and hence could not be attributed solely to the phenomenon of regression to the mean (Management Committee of the Australian Therapeutic Trial in Mild Hypertension, 1982. Possible explanations for the fall include adaptation to the procedures of blood pressure measurement, and a nonspecific effect connected with the taking of placebo tablets or familiarization with physicians or other medical workers. While the use of placebos as a substitute for active treatment is not recommended, such findings suggest that the role of reassurance, suggestion, and a supportive doctor-patient or nurse-patient relationship should not be underestimated (Shanoff et al., 1970).

Blood pressure reduction after a stroke

Opinions differ about the value and safety of blood pressure reduction in hypertensive patients who have survived strokes. Observational studies suggest that such treatment may be beneficial, although the findings are not consistent. Some studies have shown relationships between blood pressure level and subsequent stroke recurrences or survival; others have not (Adams, 1965; Carter, 1970; Hypertension-Stroke Cooperative Study Group, 1974). In a group of hypertensive stroke survivors who were given placebo treatment in the framework of a controlled trial, the rate of cardiovascular complications (other than strokes) that warranted removal from the trial rose markedly in accordance with the initial systolic pressure level; the rate of recurrence of strokes, however, was not related to the baseline blood pressure (Hypertension-Stroke Cooperative Study Group, 1974). Among stroke survivors who were given antihypertensive medication, Beevers et al. (1973) observed that recurrences were less

frequent than expected, and that patients whose hypertension was poorly controlled had significantly higher rates of recurrences and of cardiac failure than those whose hypertension was better controlled.

Randomized controlled trials support the value of antihypertensive medication, but are not conclusive with respect to older subjects. In a study in England of hypertensive survivors of ischaemic-type strokes below the age of 80, Carter (1970) found a significant reduction of total mortality (26% in the treated group and 46% in the untreated group) during a two to five year follow-up period, mainly due to a reduction in fatal strokes. There was also a reduction in the recurrence rate of nonfatal strokes (14% and 23% respectively). The benefit was larger for diastolic than for systolic hypertension, and was apparent only among patients whose hypertension was well controlled. Among patients over age 65, however, no benefit was observed; the mortality rate was 33% in the treated group and 36% in the untreated group. There were, however, only 21 and 25 patients, respectively, in these groups; as the author says, "the figures are probably too small to mean anything".

In the Hypertension-Stroke Cooperative Study in the U.S. (1974) - a randomized controlled trial performed on patients with strokes or transient ischaemic attacks in the previous year and with blood pressures of 140-220 (systolic) and 90-115 (diastolic) mm Hg - no significant effect on stroke recurrence was detected during a mean follow-up period of three years. There were, however, significant reductions in the occurrence of congestive heart failure and severe hypertension (above 220/115 mm Hg). The authors conclude that antihypertensive therapy is safe and useful in these patients even if

they have only moderate elevation of blood pressure, "not because of an improved prognosis for stroke recurrence, but because of its overall beneficial effects on morbidity and mortality from other manifestations of hypertensive disease". The benefit of treatment was larger for patients aged 70 or older than for other age groups. Among the older subjects, the rates of stroke recurrence were 11% (treated group) and 36% (placebo group), and the rates of other cardiovascular end-points were 5% and 12% respectively. But the number of elderly subjects was small - 19 in the treated group and 25 in the placebo group - and these differences were not statistically significant.

Primary Prevention of Hypertension

It would obviously be better to prevent hypertension than to treat it. It would also be preferable to reduce all blood pressures (except the lowest) rather than only very high ones. Although the risk of morbid events is highest when the pressure is very high, most events attributable to elevated pressures occur in the large group of people whose blood pressures are not regarded as high enough to require therapy. Using 13-year follow-up data for 50-year-old men in Goteborg, Sweden, Wilhemsen (1979) has demonstrated that, on the assumption that reducing blood pressure will prevent morbid events, a general lowering of all systolic pressures by 10 mm Hg would yield as much benefit as bringing all high pressures down to 135 mm Hg.

A WHO Scientific Group (1983) that recently reviewed current knowledge about the role of body weight, diet, alcohol intake, physical activity, and psychological, social and other factors in the etiology of hypertension concluded that firm recommendations cannot yet be made concerning primary prevention. The only measures whose

immediate application can be advocated are the reduction of overweight and the restriction of salt intake. Even in these instances, there is a need for considerable further research.

Epidemiological findings suggest that reduction of body weights will reduce blood pressures and the prevalence of hypertension in a population. Not only is weight usually a strong correlate of blood pressure in cross-sectional epidemiological surveys, but cohort studies have shown a strong correlation between changes in weight and change in blood pressure. People who gain weight show a greater rise in pressure than those whose weight does not change, and blood pressure tends to fall if there is a decrease in weight. This correlation has been demonstrated in population samples of men and women in Framingham and Evans County in the U.S. (Ashley and Kannel, 1974; Tyroler et al., 1975), in Goteborg, Sweden (Noppa, 1980), in Jerusalem (Goffin et al., 1983a), in Wales (Miall et al., 1968) and elsewhere. In the Chicago Coronary Prevention Evaluation Program, in which middle-aged overweight men were given nutritional counselling, those with diastolic pressures of 80-89 mm Hg (i.e., in the normal range) experienced sizable sustained reductions in weight during the five years of the study and also manifested a decrease in blood pressure. Their mean weight decreased by 10 lb, their mean systolic pressure by 7 mm Hg, and their mean diastolic pressure by 4 mm Hg (Stamler et al., 1980).

It has been estimated that shifting the weight distribution in the population in the direction of lower values could (perhaps on the basis of overly optimistic assumptions), reduce the prevalence of hypertension by as much as 25% (Epstein, 1979). In Evans County,

similar calculations suggested that prevention of weight gain among normotensives during the seven-year period of the study could have resulted in a decrease of 22% in the incidence of hypertension (diastolic pressure 95 mm Hg or more) in the study cohort (aged 35-59). If the weights of overweight hypertensives had also been reduced, the total decrease in incidence could have been 41% (Tyroler et al., 1975).

Although counseling and education on weight control should be directed mainly to children and younger adults, weight control programs for older people might have beneficial effects on blood pressure. In the Goteborg study, the associations of weight change with changes in systolic and diastolic pressures were far stronger among women followed up from 60 to 66 years of age, than among younger women (Noppa, 1980). On the other hand, in two Welsh communities the associations between these changes in an eight-year period were found in all age groups below 50 years, but were not consistently seen in older age groups. In the small groups of subjects who were aged 60-64, 65-69 and 70 or older at the beginning of the period some of the correlations were negative, suggesting either that increase in pressure was accompanied by loss of weight, or that people whose weight and pressure increased were less likely to survive (Miall, 1968). Further research is required on the effect of weight control on blood pressure in the elderly.

The case for salt restriction as a preventive measure is not conclusive. In general, comparisons of population groups support the thesis that a high salt intake leads to a raised blood pressure; but most individual-based studies within populations have failed to show an association between sodium intake and blood pressure (Joossens and

Geboers, 1983; Simpson, 1979). There is considerable debate on this issue, and there is not yet enough evidence from carefully designed intervention studies to warrant firm conclusions (Morgan et al., 1979b; Simpson, 1979; Stamler and Stamler, 1984). The WHO Scientific Group (1983) concluded, however, that "pending further information and firmer evidence, it now appears prudent to reduce the sodium content both of infant foods and of the usual diet towards 5 grams of sodium chloride per day, especially in populations known to have a high salt intake or a high prevalence of elevated blood pressures". A reduction of the average daily sodium ingestion to 3-6 grams (equivalent to 7.5 to 15 grams of salt) has been set by the U.S. Public Health Service as a high-priority national target to be met by 1990 (Public Health Service, 1983).

There is also some evidence that calcium and other dietary components may influence blood pressure (Stamler and Stamler, 1984). Small-scale experiments suggest that a reduction in the fat content of the diet and an increase in the P:S ratio (of polyunsaturated to saturated fatty acids) may reduce the blood pressure within a short time, in both normotensive and hypertensive people (Iacono and Dougherty, 1983; Priddle et al. 1983). In the National Diet-Heart Study (1968) in the U.S., however, there was no evidence that the changes that were achieved in the P:S ratio led to changes in blood pressure.

A randomized controlled trial of nutritional and hygienic measures for the primary prevention of hypertension, now in progress, has shown promising early results (Stamler and Stamler, 1984; Stamler et al., 1983). The subjects are overweight but otherwise healthy

people with diastolic pressures of 80-89 mm Hg, and the recommended measures include a calorie-controlled fat-modified diet, decreased sodium intake, cessation of heavy drinking and smoking, and regular exercise. In the first two years the proportion of subjects whose diastolic pressures rose to hypertensive levels was lower in the treated group; in the treated group there was a decrease in mean diastolic pressure, most marked in subjects who were more successful in losing weight and reducing their sodium intake. Since this trial is restricted to people aged 30-44, however, it can provide no direct evidence on the value of these preventive measures for the elderly.

Modification of Blood Cholesterol

Numerous studies have shown that raised blood cholesterol levels due to elevated levels of low-density lipoprotein (LDL) are strongly associated with an increased risk of atherosclerotic diseases (Stamler et al., 1972) and that elevated levels of high-density lipoprotein (HDL) cholesterol are associated with a decreased risk of these diseases. In the elderly, however, these relationships are weaker or, in some studies, absent (Friedman, 1974; Kannel and Gordon, 1978; Ostfeld et al., 1974; Peacock et al., 1972). In the Framingham study, in a six-year follow-up, blood lipids were measured at the ages of 59-82 and showed that high LDL cholesterol values were predictive of high coronary heart disease incidence and mortality (significantly so in men) and (although not significantly) of intermittent claudication. There was, however, an inverse association with stroke in women. High HDL cholesterol measurements were predictive of low overall mortality, and of low coronary heart disease incidence and mortality in men and in women younger than age 70. There were also inverse but

nonsignificant associations between HDL cholesterol and intermittent claudication and stroke (Gordon et al., 1981).

Until recently the case for preventive intervention was based mainly on the results of trials of lipid-reducing diets (Dayton et al., 1969; Reisin et al., 1978; Stamler, 1971; Turpeinen, 1979). Although these trials were not conclusive, together they provided a fairly persuasive picture of favourable effects on the incidence of coronary morbidity or mortality and, in one instance (Dayton et al., 1969), cerebral infarction. All trials in which the blood cholesterol level was reduced by diet or drugs have shown a decrease in the subsequent rate of coronary heart disease, proportional to that in cholesterol (Castelli, 1984). A large primary prevention trial of a lipid-lowering drug, clofibrate, showed a decline of 25% in the incidence of nonfatal myocardial infarction but no decline in coronary mortality; there was an increase in mortality from other causes - possibly as a result of toxic effects - which continued for some years after the trial (Committee of Principal Investigators, 1978, 1980).

Convincing proof of the effect of modifying blood cholesterol has now come from the Lipid Research Clinics (LRC) Coronary Primary Prevention Trial in the U.S. (1984a, 1984b). This was a large-scale randomized double-blind study in which men aged 35-59 who had high plasma cholesterol levels (total cholesterol 265 mg/dl or more, and LDL cholesterol 190 mg/dl or more) and were free of coronary heart disease were treated for an average of 7.4 years with cholestyramine resin, which reduces these cholesterol levels. The treatment also produced a slight increase in HDL cholesterol. The incidence of coronary mortality was lower by 24% in the men allocated to the

treatment group than in those who received a placebo, and the incidence of nonfatal myocardial infarction was reduced by 19%. There were similar reductions in the incidence of coronary bypass surgery, angina pectoris, and an ischaemic ECG response to exercise. The risk of coronary heart disease was halved when there was full compliance with the medication regimen. The observed benefit tallied almost exactly with what might be expected from the reduction achieved in total and LDL cholesterol, calculating the expected benefit from the relationships with cholesterol levels observed in the control group. This suggests that cholesterol-related risk may be completely reversible in middle age, and that the prevention of new complications may be achieved by merely preventing the further progress of lesions (Lancet, 1984). Whether or not this possibility applies to the elderly as well is uncertain.

The findings of this trial may be taken as an indication that cholesterol lowering by dietary modification would also be beneficial; cholestyramine is expensive and unpleasant to take. The authors suggest that the trial may have implications not only for people with very high cholesterol levels, but also to those with more modest levels. It is in the latter group that most of the morbidity and mortality attributable to raised blood cholesterol occurs (Rose, 1981).

Whether or not these findings can validly be applied to the elderly is not certain. The report on the LRC trial (Lipid Research Clinics Program, 1984a) stated that "the trial's implications could and should be extended to other age groups"; but an editorial in the American Journal of Cardiology (Roberts, 1984) suggests only that the trial's findings "are readily applicable to ... younger persons".

There is, in fact, virtually no direct evidence that modification of blood cholesterol is of prophylactic value in the elderly. The trials listed above - dietary and drug - were conducted on middle-aged subjects, except for one (combined primary and secondary prevention) performed on men aged 54-88 in Los Angeles. In this trial "most of the prophylactic effect occurred in the younger half of the study population, less than 65.5 years old at the start of the study"; the older men, however, had a larger drop in serum cholesterol levels (Curb et al., 1982).

There is certainly no compelling case for cholesterol modification as a preventive measure in the elderly. The possibility exists, however, that it may be of benefit to some people, most likely those who do not already show advanced atherosclerotic changes. In the light of the findings of the LRC study it would seem prudent to adopt this measure for people who have high blood cholesterol levels and to advise elderly people in general to partake of diets that do not produce elevated cholesterol levels.

A decision on the advisability of large-scale modification of cholesterol levels should be based on available knowledge about blood lipids and their associations with cardiovascular diseases in the population under consideration. The need for emphasizing cholesterol modification in Israel, for example, may be questioned on a number of grounds - the relatively low total and saturated fat content and the high P:S ratio of the average diet of adults, compared with populations of other Western countries (Kaufmann et al., 1982), the relatively low mean blood cholesterol values of adults of all ages in Israel (Gofin et al., 1981; Halfon et al., 1982; Kark and Kark, 1983),

and the weakness of the associations observed in this country between cholesterol levels and subsequent mortality (Goldbourt and Kark, 1982).

There has recently been some concern about possible harmful effects of cholesterol reduction. This arises from the demonstration in some populations of associations, so far unexplained, of low cholesterol values with noncardiovascular mortality and malignant neoplasms, especially cancer of the colon (Kark et al., 1980). In the Framingham study (Gordon et al., 1981), for example, LDL cholesterol values were inversely associated with deaths from noncardiovascular causes in people aged 59-82. This was due to a relationship with cancer mortality in men and with mortality from other causes in women. Two prospective studies in Israel have provided slight evidence of associations between low cholesterol levels and total mortality (Goldbourt and Kark, 1982). Associations of this sort tend to exist, however, only at the lower end of the cholesterol range (Bottiger and Carlson, 1982). In studies where they occur, they are demonstrable at levels below 180 mg/dl (Lewis, 1983). Even if the lowering of blood cholesterol is in fact hazardous - which is by no means certain - it is considered unlikely that modest dietary measures aimed at effecting only a moderate reduction of elevated values will have harmful effects.

Cholesterol reduction after myocardial infarction

Among those with clinical coronary heart disease, indicators of the status of the myocardium are more powerful indicators of the long-term prognosis than hypercholesterolaemia or other primary risk factors (Coronary Drug Project Research Group, 1974). But follow-up

studies have shown that blood cholesterol levels some months after the infarction also have prognostic significance. In a large group of men aged 30-64 in the U.S. (the control group in the Coronary Drug Project, a trial of lipid-lowering drugs) the risk of dying within five years rose, on average, by one percentage point (about 5% of the total mortality in this cohort) for every increase of 19 mg/dl in the baseline serum cholesterol level. Electrocardiographic, radiographic and other variables were held constant in this analysis (Coronary Durg Project Research Group, 1974). There was also an inverse association between mortality and the baseline HDL cholesterol level (Berge et al., 1982). In Oslo, a relationship with 11-year mortality was found in men aged 30-59, but not in those aged 60-67 years (Leren, 1966). In New York, relationships with survival were found in women aged 25-54 and 55-64, but not in men (Weinblatt et al., 1973). A Canadian study found no association with survival in men aged 31-83 (Shanoff et al., 1970). There are no data showing an association between blood lipids and the prognosis of elderly infarction survivors.

Secondary prevention trials of lipid-lowering diets, most of which influce middle-aged men as subjects, yielded inconsistent findings; but on balance they indicated small benefits (Dayton et al., 1969). In Oslo, a lipid-lowering diet produced a significant reduction of coronary relapses over a five-year period among men aged 30-59, but a smaller and nonsignificant reduction in men aged 60-67 (Leren, 1966). Secondary prevention trials of lipid-lowering drugs (clofibrate and nicotinic acid) have also yielded inconclusive findings (Kornitzer, 1982; Stamler, 1983). Elderly subjects were not included in these trials.

In 1980 a panel of experts convened by the International Society

and Federation of Cardiology concluded that while evidence from trials was very limited, lipid reduction in secondary prevention could be supported by the theoretical possibility that this measure might decrease the progression of the disease, support regression of existing arterial pathology and diminish liability to thrombosis; it may also have educational value as an object lesson for patients' relatives (Kornitzer, 1982). Since then, a randomized controlled trial using cholestyramine, in which the subjects were men and women aged 21-55 with angiographic evidence of coronary artery disease and with very high levels of LDL cholesterol, has provided evidence suggesting that the treatment retarded the rate of progression of the arterial lesions during a five-year follow-up period (Brensike et al., 1984). There was a significant inverse relationship between the progression of the lesions and the combination of a decrease in LDL and an increase in HDL cholesterol. This association was apparent both for subjects who were treated with cholestyramine and a low-cholesterol low-fat diet and for controls treated with a placebo and the same diet (Levy et al., 1984).

For secondary prevention of cardiovascular diseases in the elderly, as for primary prevention, the reduction of raised blood cholesterol levels may be considered a prudent measure, despite the lack of evidence from trials in this age group.

Cessation of Cigarette Smoking

Observational studies provide strong evidence that cessation of cigarette smoking decreases the risk of heart attacks and cardiovascular mortality (Kuller et al., 1982). A number of

epidemiological studies have indicated that cessation is associated with a prompt 20% to 50% reduction in coronary heart disease rates (Kannel and Thorn, 1984). The case for cessation of smoking by elderly people, however, rests mainly on effects on noncardiovascular morbidity and mortality rather than on cardiovascular disease.

Large-scale prospective studies have shown that male and female smokers aged 65-74 and 75-84 have higher overall mortality rates than nonsmokers, the rates rising with the number of cigarettes smoked (Hammond, 1966; Kahn, 1966). The relative risk attached to smoking decreases with age, but the absolute difference in death rates between smokers and nonsmokers is larger at higher ages (Kahn, 1966). In older age groups, comparisons between people who cease to smoke cigarettes and those who continue also yield evidence of an effect on total mortality. In the Framingham study, in which data on smoking habits were obtained in two-year intervals, the overall death rate at 65-74 years was considerably lower in those who gave up smoking (Kannel and Gordon, 1978). An analysis of the findings of large prospective studies extending to the age of 80-84 suggests that longevity can probably be increased by giving up smoking in the sixties and, especially for heavy smokers, in the early seventies (Abramson, 1977).

Evidence of an association between smoking and cardiovascular diseases in the elderly is less clear. The only large randomized controlled trial of anti-smoking advice, which demonstrated an 18% reduction in mortality from coronary heart disease (but no reduction in overall mortality) during a ten-year period, was conducted on men aged 40-59 on entry (Rose et al., 1982). Comparisons of smokers and nonsmokers in three large prospective studies showed higher coronary

or cardiovascular death rates in smokers up to the age of 74 or 84 (Doll and Hill, 1964; Hammond, 1966; Kahn, 1966); but in the Framingham study no independent association between smoking and coronary incidence was found above the age of 64 (Gordon and Kannel, 1972). When elderly people who ceased smoking were compared with those who continued, the findings were inconsistent. No difference in coronary disease rates between those who quit and those who continued smoking could be demonstrated above the age of 65 in the Framingham study (Kannel and Gordon, 1978). The findings of two other studies, however, point to the possibility that persistent smoking in later life may enhance the risk of death from coronary heart disease (Hammond, 1966; Kahn, 1966). This inference is based on calculations that show an excess mortality among continuing smokers of 23% at 65-74 years in one study and of 19% at 65-84 years in the other (Abramson, 1977). Seltzer (1978) has contested the validity of this analysis, claiming that there is no excess coronary mortality among elderly continuing smokers.

From a practical viewpoint, however, this question does not appear to be of critical importance. There is a strong case - at least until the early seventies - for stopping smoking in order to enhance longevity, whether or not there is a proven specific effect on cardiovascular risk. It is sometimes argues that unless the elderly suffer from a troublesome cough or other special indication, they need not be advised to cease smoking, since the likely benefits of cessation are otherwise small; in addition, many elderly smokers may find it traumatic to give up one of their few remaining pleasures (British Medical Journal, 1975). But the smoker himself should have

the prerogative of making this decision, armed with whatever facts he can be given. A difference of as little as 10% in the annual risk of dying may not seem small to a man nearing the end of his days. To stop smoking may be easier for older than for younger people. In a community programme implemented by family doctors and nurses in Jerusalem, the reported prevalence of smoking decreased from 46% to 30% in men aged 55-64 and from 45% to 29% in those aged 65-74, whereas the changes among younger age groups were much smaller (Abramson et al., 1981).

Smoking cessation after myocardial infarction

The influence of stopping cigarette smoking after a myocardial infarction has been examined in a number of follow-up studies, the results of which were recently reviewed by Mulcahy (1983).

In studies with follow-up periods of several years, the mortality of infarction survivors who gave up smoking was usually found to be about half that of those who continued to smoke. This benefit applied both to coronary mortality and to total mortality. It existed irrespective of stratification of patients into different age and risk groups, and occurred whether the infarction was a first one or a recurrence. In one study, which began with subjects two years after an infarction and continued for another 13 years, the adverse effect of continued smoking became more pronounced during the course of the follow-up period (Daley et al., 1983). The results of another study suggested that mortality was lowered as much by a reduction in the amount of smoking by more than half as it was by complete cessation (Mulcahy et al., 1977). Cessation is also associated with a reduced risk of nonfatal recurrences (Meinart et al., 19797; Wilhelmsson et

al., 1975).

Since almost all these studies included only middle-aged patients, there is very little direct evidence concerning the effect of smoking cessation on the elderly. The report on a large study in Goteborg provides separate results for 714 men aged 50-67 on entry (three months after the infarction); 43% of these patients were aged 55-59 and 16% were 60-67. Results showed that the five-year cumulative mortality rate was lower by 28% in patients who stopped smoking, and the five-year cumulative reinfarction rate was lower by 32%. These differences - which could not be accounted for by differences in prognostic indicators - became more marked during the subsequent three years of follow-up (Aberg et al., 1983). The Framingham study provided data on 195 cigarette smokers aged 35-75 who survived a first infarction. The six-year cumulative mortality rate was 18.8% in people who quit smoking (mean age, 55 years) and 30.4% in those who continued to smoke (mean age, 57). The six-year rates of second infarctions were 15.5% and 21.5% respectively (Sparrow et al., 1978).

Mulcahy (1983) concludes that "stopping cigarette smoking may be the most effective single means of intervention currently available to us in the management of patients with established coronary heart disease". It would seem prudent to apply this conclusion to elderly patients as well, despite the dearth of direct evidence for this age group. Experience shows that antismoking advice from doctors and other medical personnel is very effective following a life-threatening event such as a myocardial infarction (Pederson, 1982). Cessation rates as high as 70% have been reported in such patients (Mulcahy, 1983). For patients who have had symptoms of coronary heart disease,

this form of prevention is "cheap, harmless, and much easier to achieve than in symptom-free subjects" (Kornitzer, 1982).

Reduction of Weight

Numerous studies, although not all (Dyer et al., 1975), have shown that people who are overweight have an elevated risk of mortality and of cardiovascular diseases. In the Framingham study, for example, increased risks were demonstrated for congestive heart failure, hypertension, sudden death, angina pectoris, coronary heart disease other than angina, and stroke (Ashley et al., 1974; Gordon and Kannel, 1972; Hubert et al., 1983; Kannel et al., 1967a, 1967b). For men aged 50-62, every pound of additional weight portended a 2% increase in the risk of death in the next 26 years (Garrison et al., 1983).

But evidence for such relationships in the elderly is limited. A large-scale prospective study in the U.S. showed associations between overweight and excessive coronary mortality in men and women aged 60-69 and 70-79. These associations were weaker, however, than at younger ages - at 80-89 years there was no clear evidence of a relationship (Lew and Garfinkel, 1979). Little effect of overweight on cardiovascular morbidity and mortality was found among elderly people in the Framingham study (Kannel and Gordon, 1978); overweight men and women aged 50-62 had a raised incidence of cardiovascular disease during the next 26 years, but this association was weaker than for younger age groups (Hubert et al., 1983). Evidence for a relationship between overweight and stroke in the elderly is inconsistent (Evans, 1983; Hammond and Garfinkel, 1969; Ostfield et

al., 1974; and Peacock et al., 1972).

There have been no randomized controlled trials of weight control in the prevention of cardiovascular diseases; this measure has, however, been included as a component in some succesful trials of lipid-lowering diets and of multifactorial intervention. Among insured men in the United States, those who were rated for overweight and then became eligible for standard insurance because they reduced their weight had a considerably lower subsequent mortality than men who stayed overweight. This applied to men who were aged 40-69 when issued with insurance as well as to younger men (Society of Actuaries, 1959). In Goteborg, weight change between the ages of 60 and 66 was mirrored by changes in systolic and diastolic blood pressures, and women who reduced their weight had a relatively low incidence of angina pectoris (Noppa, 1980).

Some experts have minimized the importance of overweight as a cardiovascular risk factor on the grounds that the strength of its relationships with cardiovascular diseases is greatly reduced if other risk factors that commonly accompany obesity are taken into account. This does not, however, necessarily negate the value of weight control, since the effect of overweight on morbidity may in part be mediated through its effects on other risk factors. The effect of weight change on blood pressure has already been discussed. This effect alone may be sufficient justification for weight control in the elderly, as a possible means of preventing or treating hypertension. The Framingham study and other studies have shown that changes in weight tend to be mirrored by changes not only in systolic and diastolic blood pressure, but in serum cholesterol and blood glucose (Ashley and Kannel, 1974 ; Heyden et al., 1983; Noppa, 1980). The

Framingham investigators concluded that for this reason, weight reduction appears to have a sound rationale in the elderly (Kannel and Gordon, 1978). More recent analyses of the Framingham data have shown that when long-term risk is considered, obesity has an independent contribution not explained by other risk factors (Hubert et al., 1983). Needless to say, the control of obesity also carries benefits unrelated to cardiovascular disease.

Weight control is likely to be especially beneficial if caloric restriction is accompanied by appropriate qualitative changes in the diet (Epstein, 1979). It has been pointed out (in relation to coronary heart disease) that "it almost certainly matters more by which dietary pathway you become fat, than whether you become fat" (Rowe, 1983).

Weight reduction may also be expected to lessen the cardiac work load and to improve exercise tolerance in people who already have heart disease.

The mainstays of weight control are, of course, diet and exercise. Relationships between diet, energy expenditure and body weight are complex, and population studies do not show simple positive relationships between food intake and body weight (Keen et al., 1979; Lincoln, 1972; Thomson et al., 1961). Even exercise that is not particularly vigorous, such as walking, can make an important contribution to weight reduction (Gwinup, 1975).

Weight reduction is not easy to achieve either for individuals, where the frequency of relapses has suggested that weight control by dieting may be "the rhythm method of girth control" (Mayer, 1968), or for a population group. Most community trials of multifactorial

primary prevention have failed to reduce weights (Farquhar, 1980; Puska et al., 1979; WHO, 1982). In the CHAD programme in Jerusalem, which is integrated into primary medical care, the prevalence of overweight (body mass index 2.8 or more g/cm2) in the population was reduced by 13% (Abramson, 1981).

Physical Activity

There is now strong evidence, epidemiological and other, that physical activity - especially if it is strenuous - protects against coronary heart disease in its various manifestations (angina pectoris, myocardial infarction, sudden unexpected death, and total coronary heart disease mortality); some studies have also reported an inverse association with the incidence of stroke. This evidence has been reviewed by Leon and Blackburn (1981), Paffenbarger and Hyde (1984), and Kannel (1984). The relationship with activity is dose-dependent over a considerable range; i.e., the greater the energy expenditure, the lower the coronary heart disease incidence and case-fatality rates.

The protective effect of physical activity may be due to its influence on cardiopulmonary fitness, the blood lipid pattern (increase in HDL cholesterol), fibrinolytic activity, platelet stickiness, insulin sensitivity, and body weight; physical activity may stimulate the development of a collateral arterial circulation to the heart. Most epidemiological studies have dealt with exercise at levels well below that required to produce "trained" level of fitness. There is limited evidence that exercise may contribute to the lowering of blood pressure, particularly in hypertensives (WHO, 1983).

The apparent protective effect of physical activity has been noted at all ages. In a comparison of sedentary and nonsedentary workers in kibbutzim in Israel, for example, differences in the incidence of coronary heart disease were apparent in all five-year age groups between 40 and 64 years (Brunner et al., 1974). In a large prospective study in the U.S., relationships between physical activity and mortality from coronary heart disease and stroke were considerably stronger in men and women aged 60-69 and 70-79 than at lower ages (Hammond and Garfinkel, 1969). A large-scale study of university graduates in the U.S. showed that at all ages the incidence of fatal or nonfatal coronary heart disease was inversely associated with habitual energy expenditure in stair-climbing, walking, and sports play. Between 65 and 74 years of age the incidence of coronary heart disease in less active alumni was 1.7 times the rate of those who were more active (Paffenbarger and Hyde, 1984). In the Framingham study a comparison of coronary heart disease rates revealed some apparent benefit from even modest amounts of exercise in men aged 50-69 (Kannel and Gordon, 1978). In Israel, a study of men aged 50-74 who participated in sporting activities revealed higher blood HDL cholesterol levels, which may be protective against coronary heart disease, than in other men of the same age (Brunner and Weisbort, 1980).

Apart from its other beneficial effects, physical activity thus offers a hope of reducing the risk of cardiovascular disease. There is good reason to encourage elderly people to be more active when this can be safely recommended, even if not all can undergo the high-intensity training required to improve the ability of the heart and

lungs to deliver oxygen to the tissues. Specific recommendations for exercise for the elderly have been prepared by the U.S. National Council on Fitness and Aging (Fuller, 1982).

No large-scale primary prevention trial of exercise alone has been reported, or is likely to be done. A number of small-scale experiments on volunteers have shown the feasibility of physical fitness programmes for the elderly and have demonstrated favourable physical and mental effects (Vallbona and Baker, 1984). The Framingham investigators conclude, perhaps overcautiously, that "it is difficult and perhaps unwise to motivate the elderly either to undertake vigorous regular exercise or to enjoy it, but such moderate exercise as walking and climbing stairs may be beneficial" (Kannel and Gordon, 1978).

Physical exercise after myocardial infarction

Numerous studies point to the value of physical activity for people who already have coronary heart disease. These studies include comparisons of people with differing occupational or leisure-time activities and studies (controlled and uncontrolled) of patients exposed to the long-term exercise regimens that have now become an accepted part of rehabilitation programmes after myocardial infarction. In general, the results suggest that exercise is beneficial and safe (Fletcher, G. 1984) and of possible importance in secondary prevention; however, its role is less well-defined than it is in primary prevention (Paffenbarger and Hyde, 1984). There is, however, no definitive proof - even for middle-aged people, let alone elderly ones - that exercise protects against further infarctions. Most of the studies are beset by selection bias, confounding, small

sample size, or other serious methodological problems. As Naughton (1983) has stated in a review of these studies, "of all forms of clinical trials, an exercise intervention study is among the most complicated and difficult to conduct".

Three recent randomized controlled trials did not yield conclusive results. In the National Exercise and Heart Disease Project in the U.S., 23% of the men (aged 30-64) who were assigned to the exercise group dropped out of the organized exercise programme by the end of two years, while 31% of the control subjects took up regular exercise on their own. The three-year reinfarction rates were 5.3% for the exercise group and 7.0% for the controls, and the respective total mortality rates were 4.6% and 7.3%. These differences were not statistically significant (Shaw, 1981).

In the Ontario Exercise-Heart Collaboration Study, in which men aged 26-56 were randomly allocated to high-intensity or low-intensity exercise groups, about half the subjects dropped out of both groups. The rate of fatal reinfarctions was 4.0% in the high-intensity exercise group and 3.7% in the other group. The corrresponding rates of nonfatal reinfarctions were 10.3% and 9.3%. These differences were not statistically significant (Rechnitzer et al., 1983).

In the WHO Collaborative Study, performed in a number of centres in Europe and in Israel, men under age 65 were randomly allocated either to a rehabilitation group (for physical exercise, anti-smoking and dietary advice, blood pressure and weight control and psychological and vocational assistance) or to a control group. Different systems of allocation were applied in the different centres, and the men placed in the rehabilitation group turned out to be younger and to have less severe disease and lower risk factor levels.

In only two of the 17 centres were significant differences found in three-year mortality, and these were in opposite directions. In only one centre was there a significant difference in nonfatal reinfarction rates, and this was in the "wrong" direction (Lamm et al., 1982).

Kellerman (1982) has pointed out that one of the research problems is the use of "hard end-points" (disease or death), which necessitate large samples and long follow-up periods. He suggests that more attention should be paid to "soft end-points", such as the quality of survival, rather than survival itself.

Moderate Consumption of Alcohol

Several large-scale studies, reviewed by Devenyi et al. (1980) have shown that a moderate consumption of alcohol (up to two or three drinks a day) is associated with a low incidence of coronary heart disease. Alcohol may have a protective role. This may occur because it increases HDL levels in the blood, produces coronary vasodilatation, or affects some other mechanism. The increase that moderate drinking produces in HDL levels is apparent in the dense fraction of HDL, which is not clearly related to coronary heart disease; it is not apparent in the less dense fraction, which is associated with a low incidence of coronary heart disease (Lieber, 1984).

The dilemma these findings pose is discussed in a recent editorial in the New England Journal of Medicine entitled "To Drink (moderately) or Not to Drink?" (Lieber, 1984). The question as to whether people should be advised to engage in moderate drinking to protect their coronary arteries may be relatively easy to answer at an

individual level, by considering the person's past capacity to keep consumption within acceptable limits. According to the author, "the introduction of moderate drinking in the life of an abstainer involves the unpredictable risk of loss of control, with the potential for social and medical disintegration. By contrast, in a moderate drinker who has demonstrated his capacity to maintain intake at an acceptable level, there is no compelling reason to change a life style and eliminate a pleasurable and possibly beneficial habit". At a community level, however, the danger that alcohol may be abused, and the hazards associated with its abuse, may make it difficult to recommend its consumption as a preventive measure. As previously noted, a high consumption of alcohol is a major risk factor for hypertension.

Secondary Prevention by the Use of Drugs

Much current research is studying the value of long-term administration of drugs as a means of enhancing the survival of people with cardiovascular diseases, preventing recurrences of myocardial infarction and stroke, preventing first occurrences of myocardial infarction or stroke in patients who have angina pectoris or transient cerebral ischaemia, and preventing deterioration in patients with diabetic retinopathy (Passamani, 1980). These studies centre mainly on the use of beta-adrenoceptor antagonists (beta blockers), aspirin, and other platelet-modifying agents.

Treatment with beta blockers starting within a few weeks after recovery from a myocardial infarction has had encouraging results. Several studies have demonstrated significant reductions in mortality and reinfarction rates, particularly within the first year or two

after the infarction (Gorlin and Fuster, 1984). A British study showed a very favourable effect on six-year mortality if the treatment was started within four months of the episode; but if treatment was started between five and twelve months after the episode it did not affect mortality, and if it was started a year or more later it apparently increased mortality. Most of the deaths in the last group occurred in patients who had stopped taking the drug a year or more previously (Strate et al., 1983). Apparent worsening of the prognosis by beta blockers in the elderly has been refuted (Anderson, 1979); favourable effects have been reported in old as well as in younger patients (Berge et al., 1982). In a randomized controlled trial in Norway, in which patients allocated to treatment with timolol (starting 7-28 days after the infarction) were compared with controls assigned to placebo treatment, marked reductions in total deaths, total cardiac deaths, sudden deaths, and nonfatal reinfarctions were seen both among patients aged 65-75 and among younger subjects. The incidence of side-effects was similar in older and younger patients (Gundersen et al., 1982; Norwegian Multicentre Study Group, 1981).

The potential value of aspirin and other platelet-active agents is not yet certain. In the U.S., a double-blind randomized trial of aspirin for patients with transient ischaemic attacks (over a third of whom were aged 65 or older) showed a significant reduction in the combined incidence of continued transient ischaemic attacks, cerebral infarction, retinal infarction, and death; there was no significant effect on any of these outcomes when considered separately (Fields et al., 1977). In Canada, a similar trial of aspirin for patients with transient ischaemic attacks or mild or moderate neurological deficits

following strokes showed a statistically significant reduction of 31% in the risk of stroke and/or death. The beneficial effect was apparent for men only (Canadian Cooperative Study Group, 1978). In Italy, a trial involving patients with transient ischaemic attacks showed a similar sex difference in the effect of aspirin (Candelise et al., 1982). Favourable effects on the occurrence of fatal and nonfatal cerebral infarction, and of myocardial infarction, were observed in a trial in France, in which most of the subjects had already had strokes and about half were aged 65 or older. There was no significant sex difference (Bousser et al., 1983). Other trials have shown little or no effect. A trial in patients with transient cerebral ischaemia in Denmark showed no effect on the risk of stroke, recurrent transient ischaemic attacks, or death, either at 60-75 years or in younger patients, in either sex. Myocardial infarction occurred more frequently in the placebo group, but the difference was not statistically significant (Sorenson et al., 1983).

Randomized controlled trials so far reported on the use of aspirin and other platelet-active drugs after myocardial infarction have yielded promising but statistically nonsignificant results (Stamler, 1983; VanAken, 1982). A large-scale trial in France demonstrated no difference between aspirin and oral anticoagulant treatment in their effects on survival (E.P.S.I.M. Research Group, 1982).

The value of anticoagulants, except for selected patients, is still controversial, despite a number of randomized controlled trials and studies based on data from medical records (Mitchell, 1981). A recent double-blind randomized trial of long-term anticoagulant treatment for patients over age 60 showed a significant reduction of

reinfarctions and mortality, with no increased risk of stroke, despite the frequency of episodes of bleeding caused by the treatment (Sixty Plus Reinfarction Research Group, 1980).

Coronary Bypass Surgery

Coronary bypass surgery is generally accepted as improving survival in patients with angina pectoris and marked narrowing of the left main coronary artery (Silverman et al., 1984). Its impact on other patients is less certain. In the Coronary Artery Surgery Study (CASS) in the U.S., which excluded subjects with severe angina and with left main coronary disease, five-year survival was not significantly different in the patients randomly allocated to surgical or medical treatment; it was very high in both groups. The five-year incidence of myocardial infarction was not significantly different in the two groups (CASS Principal Investigators, 1983, 1984). Another large, randomized controlled trial in the U.S., the Veterans Administration Cooperative Study, also failed to demonstrate a significant difference in survival, except in patients with left main vessel lesions (Takaro et al., 1982). In the European Coronary Surgery Study, which admitted patients with more severe angina than did the CASS study, five-year mortality from cardiac disease was significantly lower in subjects allocated to surgical treatment than in those allocated to medical treatment; there was, however, no significant reduction in nonfatal infarctions. It was concluded that surgery did not prevent myocardial infarctions, but reduced the risk of dying from them (Varnauskas, 1983). Operative mortality is generally higher in older patients. According to CASS data, the

perioperative mortality rate was 5% at ages 65-69, 7% at ages 70-74, and 10% at ages 75 and older (Gersh et al., 1983).

A recent report from the CASS study compares the results of bypass surgery and medical therapy in a large consecutive series of patients aged 65 or older with angina, but without severe narrowing of the left main coronary artery. Six-year survival and functional capacity after five years were considerably better in the surgically treated patients. The authors point out that the conclusion must be tempered by consideration of the limitations of nonrandomized studies. Multivariate analysis showed that the difference in survival could not be explained by the confounding effects of differences in age, the number of diseased vessels and several other known prognostic variables; controlling for these variables, the six-year survival rates were 79% and 64% (for surgical and medical treatment respectively). The analysis could not, however, take account of unmeasured differences between the two groups of patients, e.g., in "physiological age". Little or no difference in survival occurred among patients who, according to the measured prognostic indicators, were at low risk. The difference in survival was apparent only among patients with double-vessel or triple-vessel disease (Gersh et al., 1985).

Other Preventive Measures

Other primary preventive measures, the value of which is not certain, include the avoidance of stressful situations, the reduction of emotional stress, a reduced consumption of sugar and coffee, an increased intake of fruit and vegetables as protection against stroke (Acheson and Williams, 1983), the prophylactic use of aspirin, and the

treatment of hyperuricaemia and hypothyroidism. Although diabetes and impaired glucose tolerance are risk factors for cardiovascular disease, there is little evidence that treatment reduces the risk.

In a small pilot study, medication with beta-blockers was found to reduce Type A ("coronary-prone") behavioural characteristics (Schmieder et al., 1983). There is as yet no hard evidence, however, that reinfarctions and deaths can be reduced by modifying behaviour patterns; a trial of behavioural counselling is in progress (Friedman et al., 1982).

Chapter 3: PRACTICAL IMPLEMENTATION

Is There a Case for Intervention?

The case for preventive measures against cardiovascular diseases in the elderly depends not only on the magnitude of the problem - of which there can be no doubt - but on the prospects that these measures will have an effect. Conclusive evidence of the efficacy for the elderly of most of the measures discussed in the previous section is lacking. Those whose value is most convincing are the pharmacological treatment of hypertension and the use of beta blockers for secondary prevention. For other interventions, such as weight control, dietary changes, exercise, and cessation of smoking, there is no trial-based proof of their efficacy - or of their lack of efficacy - in the elderly. But for each of these measures there is some evidence from observational studies of the elderly to support the possibility that intervention may be of benefit.

Prudence demands that these measures be given the benefit of the doubt, in the hope that they will reduce risk for the elderly in the same way, although maybe not to the same degree, as for the middle-aged. As Strasser (1983) has said,
"incompleteness of knowledge is no reason - and no excuse - to desist from action based on reasonable probabilities". If intervention that

is reasonably likely to protect against cardiovascular diseases or their consequences is safe, and especially if it carries other probable benefits (as is the case with weight control and smoking cessation), there is no reason not to intervene and every reason to intervene. Inaction based on lack of sufficient information is itself a decision not to act, a decision that may be difficult to justify.

Maximal safety is, of course, an essential condition. If drugs are used they should be administered cautiously and under close supervision. Where possible, they should be replaced by nonpharmacologic strategies. "Physicians, often subject to impatience, must closely monitor their own performance, perhaps collaborating with nurses, psychologists, dietitians and other professionals to achieve the safest outcome for the patient before succumbing to the impulse to reach for the prescription pad" (Hazzard, 1983). Vigorous physical activity should be prescribed for elderly people only after exercise tests and medical examinations have indicated its safety, and it should be gradated and, if necessary, supervised. Extreme dietary measures that may reduce blood cholesterol to very low levels, such as the ingestion of large amounts of unsaturated fats, should be avoided.

There is obviously an urgent need for more research, so that cardiovascular intervention in the elderly - as in all age groups - will have a more substantial basis. Research priorities include both further understanding of the effects and mechanisms of action of known risk factors in the elderly, as well as the identification of new risk factors. Research is also needed into methods of preventing the occurrence of risk factors, of modifying them (preferably by

nonpharmacologic means) when they occur, and also, it may be hoped, of reversing pathologic processes. The effectiveness of intervention procedures and programmes for the elderly should be carefully assessed. Specific areas requiring further research include the treatment of mild hypertension, isolated systolic hypertension, and secondary preventive measures.

The Multiple Risk Factor Approach

The common cardiovascular diseases comprise a "community syndrome" of related disorders that have common or related causes (Kark, 1974). Except in trials designed to measure the effects of modifying a single risk factor, intervention directed at multiple risk factors has obvious advantages over unifactorial intervention. Different risk factors tend to occur together in the same populations and in the same individuals, and it is their combined presence that determines the individual's level of risk. The assessment of risk thus requires attention to more than one factor, and the reduction of risk may require intervention directed at more than one factor. Moreover, modification of one risk factor may affect others. An increase in physical activity may favourably affect body weight, blood pressure and the blood lipid pattern; beta blockers and diuretics may have an unfavourable effect on blood lipids; and cessation of smoking may lead to a rise in weight. Other arguments in favour of multifactorial intervention are that people may be more likely to modify a constellation of related activities than to make single changes in their behaviour, and that the costs of intervention programmes may not be greatly affected by a distinction between single and multiple risk factors (Winkelstein and Marmot, 1981).

The effectiveness of multifactorial programmes in modifying risk factor levels is now well established (Stamler and Stamler, 1984; Winkelstein and Marmot, 1981). Favourable effects on coronary heart disease morbidity and on mortality (in middle age) have now been reported by trials in Belgium (Kornitzer et al., 1983), Finland (Salonen et al., 1983), and Norway (Hjermann, et al., 1983); but effects on disease incidence and mortality have not been conclusively proved. The great disappointment of recent years, of course, is the failure of the Multiple Risk Factor Intervention Trial (MRFIT) in the U.S. (1982) to demonstrate a significant effect on mortality from coronary heart disease or from all causes. In this randomized trial, over 12,000 high-risk men aged 35-57 were either assigned to a special intervention (SI) programme consisting of stepped-care treatment for hypertension, counseling on smoking, and dietary advice for lowering blood cholesterol, or referred for usual care (UC) to their own sources of medical care. Although the special intervention produced considerable changes in blood pressure, serum cholesterol and cigarette smoking, seven-year mortality did not differ in the two groups. One possible explanation that is suggested by the investigators is a deleterious effect of antihypertensive drugs on people with certain ECG abnormalities, which may have cancelled out a beneficial effect on other subjects. The investigators also point out that sizable reductions in risk factors also occurred in the UC group, and that the number of deaths in the UC group was only two-thirds of the expected number. In a criticism of the report, Stallones (1983) states: "My conclusion is that the best explanation for the failure to detect a beneficial effect in MRFIT is that no benefits occurred". It

may be justifiable to regard the trial as providing limited evidence for a lowering of mortality by risk-factor modification in both the SI and UC groups.

A comprehensive approach, directed at the multiple factors connected with related disorders, is not always fully consistent with conventional medical thinking, which tends to prefer "categorical" programmes directed at single targets. Recent years have seen the development in a number of countries of numerous hypertension programmes, including case-finding, treatment and surveillance activities in various frameworks - occupational health services, primary medical care, and specialist clinics. Although very laudable, these programmes, regrettably, do not generally take advantage of the opportunities they offer for identifying and counselling or treating people who are not hypertensive but are obese, smoke cigarettes, or have other cardiovascular risk factors.

Changes in Life Style

The changes in lifestyle that may be advocated, though easy to state, may not be as easy to effect. They include altered eating habits - moderate calorie intake, low consumption of fats (especially fats with predominantly saturated fatty acids, such as those from animal sources), and low consumption of salt; avoidance of heavy drinking (and, perhaps, encouragement of moderate drinking); cessation or reduction of cigarette smoking; and exercise.

Changes of this sort are feasible, as witnessed by the achievements of local intervention programmes in the U.S. (Stamler and Stamler, 1984), Israel (Abramson et al., 1981), and elsewhere, and by the changes in diet, smoking and exercise habits in the U.S. in the

last 25 years. The latter were apparently due in part to the lead given by the health professions and voluntary and official agencies, and the behavioural changes probably contributed to the decline in cardiovascular mortality during that period (Kannel and Thom, 1984; Stamler, 1981; Stamler and Stamler, 1984).

This does not mean that changes in lifestyle are easy to achieve. At an individual level, the main problem is lack of motivation for change; and the main task of health workers interested in prevention is to provide this motivation, through individual counselling or through group or community health education. Compliance is greater when people are ill than when they are well, as shown by studies of compliance with physicians' advice to quit smoking (Pederson, 1982). The problem is confounded by the understandable reluctance of some physicians to upset patients who feel well by telling them they are at risk; being labelled a hypertensive may produce depression and subjective ill-health (Bloom and Monterossa, 1981). An important factor here is the physician's own motivation - the extent of his conviction of the importance of preventive care and the degree of his concern with the future welfare not only of individual patients, but of the community at large.

One difficulty in individual health education is the "preventive paradox" pointed out by Rose (1981): "a measure that brings large benefits to the community offers little to each participating individual". If a change in eating habits, say, saves one man in 50 from a heart attack, this may lead to a large decrease in the overall incidence. But 49 men out of 50 will have gained nothing from having modified their diet.

Environmental influences may present important obstacles to change. It is hard to compete against publicity campaigns for the sale of cigarettes or fatty foods; and compliance with dietary advice may be difficult if foodstuffs such as skim milk, palatable soft margarine, low-fat cheese, lean meat and fish are expensive or not readily available, or if processed foods are not labelled with their sodium content. These problems may require action by governmental or other agencies.

Environmental influences may also facilitate change. Social supports and social pressures are of obvious importance; many people find it easier to reduce their weight or stop smoking if they do it in a group. If "healthy behaviour" is socially acceptable and desirable, those who conform will reap immediate social benefits (Rose, 1981). If it is not, only exceptional people will comply - going with the current is easy; swimming against it is hard. It is difficult to conceive of a successful effort to change the habits of elderly people living at home - as individuals or as a group - except in the context of a programme encompassing all adults or the whole community. This may be seen as a strong argument against the development of educational programmes that are limited to the elderly.

Health workers have an important role to play in shaping public opinion, both by their professional and public activities and by personal example. Their potential contributions will be considered next.

The Clinician's Role

Cardiovascular prevention cannot depend only on community health education and other activities performed at a group or community

level. Attention must also be directed at individuals, both in risk assessment and in subsequent counseling and care.

The identification of at least two important risk factors - raised blood cholesterol and blood pressure - requires examinations of individuals. Even if these examinations are organized on a mass basis, recommendations for treatment must be personalized, on the basis of appraisals by physicians or other responsible clinical personnel.

Clinicians, especially those in primary care, have valuable opportunities to identify people who smoke, are overweight or hypertensive, and have other cardiovascular risk factors (Reeves et al., 1981). By making small additions to investigative routines they can, in time, attain a full coverage of their patients in the course of their ordinary work. This could lead to extensive coverage of the total population, especially the elderly, who tend to make more use of doctors.

Whatever winds of change may be blowing in the community at large, individual counseling can make an important extra contribution. A man is more likely to make satisfactory changes in his diet, for example, if he can be given informed advice based on a detailed assessment of his and his family's dietary practices and preferences. The clinician-patient relationship gives the clinician especial advantages as an agent of change. A controlled trial in London, for example, showed that one-time advice by general practitioners to stop smoking (one or two minutes' simple but firm advice after asking about smoking habits, supplemented by an information leaflet) was sufficient to lead 5% of cigarette smokers to

stop soon afterwards, and to abstain for at least a year (Russell et al., 1979).

Regrettably, doctors do not always use their opportunities to identify people at risk and to modify risk. This is evident even concerning hypertension, the risk factor that is probably controlled best. At least half the hypertensives in Britain are not identified, half of those identified are not treated, and half of those treated are not controlled (Hart, 1983). In the early 1970s this was also the situation in Israel, where the introduction of a hypertension control programme in hundreds of primary care clinics has since led to a rise in the proportion of hypertensive people who are under control, from under 10% to an estimated 42% (Doron, 1983; Silverberg et al., 1983). In the U.S., increased interested in hypertension control led to a similar rise from 10-15% to well over 50% (Stamler and Stamler, 1984). But there must be very few practitioners who can claim, like Hart (1983) in Wales. that "all hypertensives in our population are identified, all are offered treatment and/or follow-up. Ninety-one percent of them had been seen within the last 3 months at our last audit". Hart can also show that the prevalence of smoking has decreased by 51% in his hypertensive patients and by 33% in a sample of his other patients, and he is now systematically tackling the problems of obesity with the help of a dietitian.

The majority of physicians certainly do not have systematic programmes for the reduction of smoking, obesity, and other risk factors. Part of the reason for this probably lies in the physician's perception of his role: most doctors see their main function as the treatment of ill patients who seek care, and this accords with what most patients expect. It is also consistent with the heavy weighting

of national health expenditures in the direction of curative rather than preventive care.

Some preventive activities have a high congruency with this conventional perception of the doctor's role. The treatment of hypertension, for example - which is generally regarded as a disease in its own right, not a risk factor - fits in easily. But even here, some physicians query the need to treat mild hypertension that is not accompanied by cardiac, cerebrovascular or other disease, despite clear evidence that the risk of further complications and death becomes far higher if hypertensive patients are not treated early and subsequently reach the stage of end-organ damage (Hypertension Detection and Follow-up Program, 1979b). In Denmark for example, a study of elderly patients who were treated for hypertension showed that ten-year mortality was much higher when complications were present at the outset (Strate et al., 1983).

The prescription of drugs is an accepted function of the doctor, and pharmacotherapy to prevent recurrences of myocardial infarction or stroke can also easily be accommodated as part of the doctor's role. Yet, most survivors of these diseases do not receive long-term prophylactic care. Both in this instance and in the treatment of hypertension, many doctors condition their treatment on the patient's continued demand and do not initiate the outreach activities that may be needed to ensure ongoing compliance.

In general, secondary prevention - since it is applied to people who may be defined as ill - fits into the conventional pattern of medical practice better than primary prevention. Primary prevention tends to be concentrated on people who strike the practitioner as

being at exceptionally high risk.

There is no doubt that progress in prevention demands a continuing effort to interest and inform the medical profession with respect to prevention in general and preventive gerontology in particular. But there may be constraints other than the doctor's knowledge and attitudes. In some contexts the development of effective long-term prevention may be inhibited by the lack of continuing doctor-patient relationships, or by such fiscal obstacles as a fee-for-service system or a method of reimbursement that caters for acute episodic curative care but not for preventive services. In other contexts, such as in Israel and Britain, where there are prepaid medical insurance schemes that allow for the patient's registration with a given general practice or clinic, these difficulties may not arise. But there is another problem that arises in all contexts, and for which satisfactory answers must be found. As phrased by Hart (1983), "the iceberg of submerged precursor disease greatly outweighs the peak of episodic urgent demand. This fact is recognized by health strategists not personally involved in primary care, but they forget that prudent navigators do not find icebergs attractive! Few primary medical teams are in a hurry to add to their burdens by attacking precursor states as well as endstage disease". Effective prevention requires extra work, and extra work requires extra hands.

The "Medical" and "Public Health" Models

Two contrasting strategies have been advocated for the prevention of cardiovascular diseases. The "medical" model concentrates on the identification of people at high risk and on the control of their risk factors, whereas the "public health" model is based on mass

intervention, aimed at reducing risk in the population as a whole.

Advocates of the former model emphasize the importance of individualized risk appraisals and the individualized treatment of people at high risk, and they query the effectiveness of mass intervention (Oliver, 1984). People at high risk may be identified from single characteristics such as blood pressure or blood lipid levels, or from combinations of risk markers. A multifactorial risk profile that was developed in the Framingham study, for example, based on LDL and HDL cholesterol levels, blood pressure, and the presence of diabetes and left ventricular hypertrophy, provided an estimate of risk that was valid for all age groups between 50 and 80 years. Its use identified the 10% of the elderly who accounted for 30% of subsequent coronary heart disease and for an even larger proportion of strokes and congestive heart failure (Gordon et al., 1977; Kannel and Gordon, 1978).

Proponents of the mass strategy point out that although the high risk strategy may benefit people at special risk, it can have only a limited effect on the community. Most of the diseases and deaths that are attributable to an increased blood pressure or blood cholesterol concentration arise at levels that are only slightly elevated. They arise from the many people who are exposed to a small risk, rather than from the few who are exposed to a large risk. To influence the "silent majority" (Strasser, 1983) of borderline and mild elevations, intervention should aim to lower the distributions of blood pressures and other risk factors in the population as a whole. Rose ((1981) has estimated that a downward shift of all blood pressures by 2-3 mm Hg - which could possibly be achieved by a dietary measure such as salt

restriction or by weight reduction - would save as many lives as all present-day antihypertensive treatment. Changes in the community's lifestyle may not only achieve a general reduction of risk; they also offer the potential of primary prevention of the risk factors themselves. Blackburn (1983) concludes that "the medical model of an individual patient-doctor approach to risk assessment and prophylactic therapy is insufficient when the disease [atherosclerosis] is so ubiquitous and insidious, when the causes are predominantly sociocultural, and when the therapy is nontraditional".

Winkelstein and Marmot (1981) have reviewed the results of community programmes that used the "medical" and "public health" models, and conclude that both approaches can be effective in reaching a large segment of their target populations and in changing risk factors; but it is too soon, they say, to reach more than tentative conclusions about their effects on incidence in the population as a whole. Community interventions using the "medical" model include single-factor programmes like the Hypertension Detection and Follow-up Program, and multifactorial ones like the Multiple Risk Factor Intervention Trial. Many of these have shown favourable effects on incidence and mortality in their target populations. Programmes using the "public health" model include the North Karelia Project in Finland (Puska et al., 1981), which took the form of mass community action implemented by health and social services, the Stanford Heart Disease Prevention Project (Farquhar et al., 1977), which was based on mass-media education supplemented by face-to-face counseling, and the WHO European Collaborative Trial in the Multifactorial Prevention of Coronary Heart Disease (1982), which was based on health education for factory workers supplemented by face-to-face counseling. Two of these

programmes, the North Karelia Project and the Belgian component of the WHO trial, have demonstrated favourable effects on coronary heart disease and mortality rates. In North Karelia, an inquiry revealed no negative effects of the community-wide programme with respect to the prevalence of absenteeism, anxiety or other emotional problems (Puska et al., 1983).

Both models can be effective, and each has its advantages. It would appear obvious that, except for uncommon risk factors that are best handled on an individual basis (such as hereditary disorders of lipid metabolism), the ideal solution is a combination of both approaches. Hazzard (1983) has recommended that a physician interested in preventive gerontology should not only provide individualized care for his patients, but should also "play a critical role in supporting mass prevention programmes - as a source of expertise, as a figurehead in his or her capacity as a community leader", and as a "role model in personal life-style, avoiding 'Do as I say, not as I do'".

Integration into Primary Care

Different organizational frameworks are feasible for the provision of preventive care.

One solution is the development of special clinics for this. They may be called "Risk Factor Intervention Clinics", concerned with multiple factors (Reeves et al., 1981), or with hypertension, obesity, lipid disorders, or other single factors. Such clinics can, of course, play a useful role, but they are probably best seen as complements rather than alternatives to the ordinary health services

in the community. The natural home for most cardiovascular preventive activities is within the ordinary primary health care system, as part of the function of doctors and other professionals who are continually in direct contact with the public. Primary prevention with respect to common risk factors, and many long-term activities connected with secondary prevention, can certainly be conducted in this framework. Not only is primary health care a suitable setting for the organization of screening and surveillance activities and for the provision of long-term treatment, but it provides opportunities for action at the family and local community levels as well as at the individual level.

In the Mayo Three-Community Hypertension Control Program in rural regions in Minnesota, the outcomes of intervention in a community in which a special hypertension clinic was established were compared with those in two communities in which treatment was left to regular-care physicians. After intensive mass-media health education and an educational programme for community physicians, all inhabitants were screened, and those with diastolic pressures of 95 mm Hg or more were referred for treatment. Screening and referral were repeated 1-2 years later. At the outset, one-quarter of the hypertensives in each community were receiving medication for hypertension. After five years, the investigators found what they called impressive outcomes in all three communities. Over half the hypertensive people detected in each community were receiving medication, the proportion being slightly higher (68%) in the community with the special clinic (which provided free visits and "pursued recalcitrant hypertensive patients actively") than in the other two (61% and 55% respectively). The proportions whose diastolic pressures had dropped to 90 mm Hg or less

parallelled these figures (68%, 56% and 54% respectively) (Krishan et al., 1981). A detailed comparison of costs suggested that the special clinic, despite its use of relatively low-cost nurse-practitioners, was not cost-effective compared with the services in the other communities (Christianson et al., 1981). The special clinic apparently carried no striking special advantages.

There is also a danger that the institution of a new special clinic for long-term care, in parallel with the patient's usual primary-care physician, may interfere with the continuity and comprehensiveness that are characteristic of good primary care. A special clinic is probably called for only if the requisite treatment cannot be provided reasonably well by the existing services, with the help of special instruction, consultative services, or other facilities when necessary.

The CHAD programme in Jerusalem may serve as an illustration of the integration of cardiovascular prevention into primary care ("CHAD" = "Community syndrome of Hypertension, Atherosclerosis and Diabetes"). This programme, which is operated by the Department of Social Medicine of the Hadassah Medical Organization and the Hebrew University-Hadassah School of Public Health and Community Medicine, was set up in 1971 in a family practice that provides primary care for some 2,500 people (Hopp, 1983; Kark, 1974, 1981; Kark et al., 1976). It is implemented by family doctors and family nurses in the Hadassah Teaching and Research Health Centre in the course of their day-to-day clinical work, with help in planning, programme development and evaluation from specialists in epidemiology, nutrition and other fields. The programme is concerned with all the common cardiovascular

risk factors and includes both primary and secondary prevention. It is directed at all adults aged 25 and older; elderly people are not singled out for special care. Individualized care plans are prepared for all participants, based on detailed programme guidelines, and continuous efforts are made to monitor and encourage compliance and to ensure regular surveillance. The main intervention procedures are individual and family counselling by doctor and nurse; medicinal treatment is provided when needed. Physicians and nurses have also conducted small discussion groups and participated in community educational activities. The programme combines the "medical" and "public health" models of intervention. People at risk are identified and given the necessary counselling or treatment, and people not found to be at special risk are counselled about health maintenance.

The experience of the CHAD programme shows that the integration of cardiovascular risk factor control into primary care is both feasible and effective. A controlled evaluation in 1975-76, based on a comparison with an adjacent neighbourhood that received "usual care", showed net reductions in prevalence of 20% for hypertension, 15% for hypercholesterolaemia, 23% for cigarette smoking by men, and 13% for overweight (Abramson et al., 1981). A subsequent survey pointed to a continued decrease in the prevalence of hypertension; by 1981, 78% of diagnosed hypertensives were under control (Gofin et al., 1982b; Gofin and Hopp, in press). The prevalence of cigarette smoking also continued to decrease between 1976 and 1981, at a time when national surveys showed no decrease in smoking by adults (Gofin et al., 1983b). A less tangible, but possibly no less important, effect of the programme is that in the opinion of the practitioners it led to a modification in the public's expectations of medical care, as

reflected by an increased awareness and acceptance of the preventive component of clinical medicine (Hopp, personal communication).

There is no doubt that this kind of extension of the functions of primary care services requires an appropriate addition of manpower - or rather of womanpower, since most of the additional functions can be performed very efficiently by nurses. In addition, changes in the attitudes and skills of primary-care health professionals are essential. The introduction into primary care of the public health model of intervention demands not only an interest in prevention, but an interest in the health of the community at large.

The CHAD programme is one of a number of programmes developed by the Hadassah Health Centre as demonstrations and tests of the concept of community-oriented primary care (COPC), a form of integrated practice that combines two elements: the health care of individuals in the community, and the health care of the community as a whole (Kark, 1981; Kark and Abramson, 1983; Kark and Kark, 1983). There is now increasing awareness of the potential of COPC for improving the health of total populations and populagtion groups in both developing and developed countries (Connor and Mullan, 1983). Essential features of this form of primary care include the development of defined programmes to deal with the community's health problems and the use of epidemiological methods as a basis for planning, monitoring and evaluation. The furtherance of this form of practice - of which the development of cardiovascular prevention programmes is only one example - requires special efforts to train doctors, nurses and other personnel, as well as the development of additional primary care practices in which COPC can be practised, tested and taught (Abramson, 1983; Kark and Abramson, 1983).

Chapter 4: CONCLUSION AND SUMMARY

The prevention of cardiovascular diseases should start early in life. But preventive measures may have some effect even when applied at a late age. While there is an urgent need for more research on prevention in the elderly, a case can now be made for a number of primary and secondary preventive measures that are simple and feasible, but as yet inadequately applied. There is reason to hope that these will have some effect on the very heavy burden of cardiovascular diseases and their attendant suffering, disability and deaths in the elderly, and in this way contribute to healthy aging. Inaction based on the lack of sufficient information is not justified. New findings may, of course, lead to new decisions.

Trials have convincingly shown that treatment of hypertension in the elderly reduces subsequent morbidity and mortality. The advisability of pharmacological treatment when the hypertension is very mild may be questioned; but there is a possibility that other measures, especially weight control and dietary changes, including salt restriction, may reduce blood pressure. Research is needed on the effectiveness of lifestyle changes in the prevention as well as the treatment of hypertension in the elderly.

The case for recommendations concerning exercise, weight control, and cessation of smoking rests mainly on evidence from observational studies of the elderly and from trials in younger people. Each of these measures carries other benefits, unrelated to cardiovascular diseases. Caution must be taken in advising vigorous exercise. The case for modification of blood cholesterol in the elderly rests

largely on the very promising findings of the recent LRC trial in middle-aged men.

Evidence concerning the effectiveness of these measures in secondary prevention in the elderly, i.e., after the onset of clinical cardiovascular disease, is very limited. But there is a possibility that they may be helpful even then, and prudence demands their adoption. Special care is needed in the prescription of exercise and antihypertensive medication. Beta blockers have been shown to be useful in the prevention of recurrences of myocardial infarction in elderly patients; the value of aspirin and other platelet-active drugs in secondary prevention is not yet certain.

The recommended changes in life style may be promoted by individual counselling and by community health education, as well as by certain actions by governmental and other agencies. Social pressures and supports are of considerable importance. It may be difficult to change the habits of elderly people except in the context of a programme encompassing all adults or the whole population.

Both the "medical" model of intervention, which concentrates on the identification and management of people who are at high risk, and the "public health" model, which aims at reducing risk in the population as a whole, can be effective, and both have their advantages. The high risk strategy can have only a limited impact on the totality of disease in the community. The ideal solution is a combination of both approaches.

Clinicians have important functions in prevention but do not generally make full use of their opportunities for preventive activities. This is probably due in part to their perception of the doctor's role as curative rather than preventive, and partly to

objective constraints. The preventive procedures that fit best into the conventional pattern of medical practice are pharmacotherapy for the treatment of hypertension and for the secondary prevention of myocardial infarctions, and the identification and management of people who are at very high risk.

Although special clinics for the treatment of hypertension or other conditions can play a useful role in some circumstances, the natural home for most cardiovascular preventive activities is within the ordinary primary health care system, as part of the function of doctors and other professionals who are in a continuing first-line relationship with the public. The integration of cardiovascular prevention into primary care is feasible and can be effective, as shown by the experience of the CHAD programme in Jerusalem, which combines the "medical" and "public health" approaches.

The furtherance of cardiovascular prevention for the elderly, as for other age groups, requires action at both the community and the individual level. The expansion of individualized preventive care necessitates continuing efforts to interest and inform doctors and other health professionals with respect to prevention in general, and preventive gerontology in particular. The integration of preventive functions into medical care also requires practical arrangements that will make this work feasible. These include the provision of guidance by experts; the development of consultation facilities and of teamwork by doctors, nurses and other health workers; the expansion of facilities for outreach activities; the development of appropriate record and information systems; and the creation of suitable fiscal arrangements to cover the cost of the extra work involved. Existing

trends in these directions should be encouraged and extended, and demonstration projects should be developed and subjected to careful evaluation. The expansion of community-oriented primary care, in which the health care of individuals is combined with programmes directed at meeting the health needs of the community as a whole, should be promoted by providing special training for doctors and other personnel and by the development of suitable teaching and demonstration projects.

At younger ages, preventive measures can often be advocated on economic grounds. After a few years of operation of the North Karelia project, which concentrated on cardiovascular risk factor control in middle-aged men, the money that was saved merely as a result of the reduction in payments for permanent disability due to cardiovascular diseases was more than five times the cost of the intervention programme (Epidemiological Department, 1982; Kotte et al., 1987). At older ages it is difficult to advocate prevention on economic grounds. The economic benefits are, at best, uncertain, and there are obvious costs, although these can possibly be minimized by incorporating preventive measures for the elderly into broad programmes directed at all adults or the whole community - programs which, it may be hoped, will in time pay for themselves.

The only valid argument for prevention in the elderly - and none other should be needed - is the hope of avoiding premature disability and death and of improving the quality of the remaining years of life.

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מניעת מחלות לב וכלי דם אצל קשישים

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פורום בינלאומי

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תאריך	תאריך	תאריך

המכון

הוא מכון ארצ [illegible] הוא
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מניעת מחלות לב וכלי דם אצל קשישים

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המחלקה לרפואה חברתית

הסתדרות מדיצינית הדסה ובית הספר לבריאות הציבור ורפואה קהילתית

של האוניברסיטה העברית והדסה

מאמר זה הוזמן על-ידי מכון ברוקדייל וג'וינט-ישראל

כחלק מסדרת מאמרים על טיפול מניעתי בקשישים בישראל

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תקציר

מחלות לב וכלי דם גורמות למעמסה כבדה של מוגבלות וסבל בקרב הקשישים, ומהוות גורם תמותה עיקרי בגיל הזיקנה. אילו סולקו גורמים אלה, יתכן כי ניתן היה להאריך בעשר שנים את תוחלת החיים.

במאמר זה אנו סוקרים את הנתונים הקיימים לגבי מועילות האמצעים המופעלים בגיל הזיקנה למניעת מחלות לב וכלי דם או לדחייתן. המאמר מציין כי יש להתחיל במניעה של מחלות אלה כבר בגיל מוקדם, אבל מדגיש כי לאמצעי מנע עשויה להיות השפעה מסויימת גם כאשר הם מופעלים בגיל מאוחר יותר.

מובאות הוכחות משכנעות, המבוססות על ניסויים שונים, לכך שהטיפול ביתר-לחץ-דם אצל הקשישים מביא להורדת התחלואה והתמותה. ממצאים של מחקרים אפידמיולוגיים בקרב קשישים, ותוצאות ניסויים שנערכו בקרב מבוגרים בגיל העמידה, תומכים בכדאיות ההתערבות בכל הנוגע להתעמלות, פיקוח על המשקל, עישון סיגריות והורדת הכולסטרול בדם. יש הוכחות מסוימות לכך שלאמצעים אלה ואחרים יש ערך במסגרת המניעה השניונית.

המאמר עומד על היחרונות של מודל ההתערבות "הרפואי", השם את הדגש על אנשים הנמצאים בסיכון גבוה, ועל אלה של מודל "בריאות הציבור", שמטרתו היא הורדת הסיכון בקרב האוכלוסייה הכללית. ניתן לשלב שתי גישות אלה, כפי שנעשה בתכנית CHAD שהופעלה בירושלים. תוכנית זן הדגימה שילוב של מניעה קרדיווסקולרית במסגרת הטיפול הראשוני. המחבר ממליץ כי הטיפול המניעתי לקשישים ישולב בתכניות קהילתיות.

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