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Evidence based management of hypertension Using cardiovascular risk profiles to individualise hypertensive treatment

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This is the fourth in a series of five articles

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Individual risks must be assessed in order to for the best decision to be made as to which patients to treat and how. Assessment identifies important cardiovascular risk factors that may warrant treatment and helps to establish the absolute benefits that patients can expect from particular treatments. The benefits of treating hypertensive patients also vary, depending on each patient's competing risks of dying from other than cardiovascular causes. For example, patients with multiple serious conditions, such as end stage Alzheimer's disease, obstructive lung disease, frequent falls, gout, and urinary incontinence, have high competing risks that may minimise or negate the benefits of treating their hypertension.

Factors useful in helping patients prioritise their treatments

Establishing treatment priorities for patients with multiple cardiovascular risk factors and multiple conditions is difficult. Factors such as those given in the box deserve consideration. Knowing and weighing up multiple risk factors, conditions, and treatments is difficult.

Summary points

Several treatment options reduce risk of cardiovascular disease and improve outcomes in patients with hypertension

Providers should consider the expected benefits and potential adverse effects of different treatment options and discuss them with patients

The use of decision tools may help decision making about options for reducing cardiovascular risk

Explaining them to patients is daunting and time consuming. Some patients prefer to be told what to do rather than to have to take in the diverse, complicated information necessary to make their own or joint informed decisions; others prefer a great deal of information. We recommend informed decision making, with attention to the factors given in the box, when possible.

Factors helpful in prioritising patients' treatments

- Type, immediacy, and magnitude of expected benefits and harms
- Availability and costs of treatments
- Feasibility and likelihood of compliance
- Competing risks from various conditions
- Expected interactions with other treatments
- Patient and provider preferences and values

Table 1 Approximate reductions in relative risk associated with various treatments for hypertensive people with other cardiovascular risk factors but no known cardiovascular disease

Treatment	Approximate change (%) in relative risk (range)	
	Death	Cardiovascular disease
Angiotensin converting enzyme inhibitor (ramipril)	-15 (-25 to -5)	-20 (-30 to -15)
Antiglycaemic drugs	Not shown	Not shown
Antihypertensive drugs	10 (5 to -10)	-30 (-40 to -15)
Antilipidaemic drugs	-5 (-20 to 10)	-30 (-40 to -20)
Aspirin	-5 (-15 to 5)	-15 (-30 to -5)
Physical activity	Unclear	Unclear
Smoking cessation	Unclear; ≥ -20	Unclear; ≤ -50

Patients with no known cardiovascular disease

Benefits that can be expected from treating patients with hypertension and other cardiovascular risk factors but no known cardiovascular disease include fewer deaths, longer survival times, and less fatal and non-fatal cardiovascular disease, such as myocardial infarction and stroke. Table 1 shows the approximate magnitude of such benefits in people without known cardiovascular disease. The magnitude of risk reduction for cardiovascular disease is similar for treatment with antihypertensive or lipid lowering drugs; it is slightly lower for aspirin prophylaxis. Both the type and magnitude of benefits that can be expected from lifestyle modifications, such as exercising more or quitting smoking, are less clear.

Some treatments, such as aspirin, are immediately beneficial, while others, such as lipid lowering, may take a year or more to take effect. There are no data on the effects of long term use, for over 10 years, of any of the interventions listed. Finally, some of the possibilities, such as quitting smoking, have other benefits that are not shown, including decreased risk of lung cancer and respiratory disease.

Patients with known cardiovascular disease

Patients with hypertension and known cardiovascular disease are at high risk of future cardiovascular events and warrant aggressive management of their risk factors. Several different effective treatments, which are discussed in *Evidence-Based Hypertension*¹ and the third paper in this series,² are available. Table 2 shows approximate risk reductions that can be expected with different treatments for patients with known cardiovascular disease.

Priorities and sequencing of treatments

We have found few data on synergy between different treatments. We usually give treatment of high risks such as extreme hypertension or extremely high lipid concentrations priority over treatment of mildly abnormal levels of these or other risk factors. We have no profound suggestions for fail safe methods for helping patients to decide the priorities and sequencing of their various treatments. Decisions about which treatments should be combined, and the order in which they should be initiated, depend on

- Types of benefits that are of greatest interest to patients
- Patients' individual risk profiles and accompanying conditions, and their modifiability
- The magnitude of potential benefits from possible treatments
- The types and frequencies of harms that may accompany particular treatments
- The availability, complexity, feasibility, and costs of particular treatments
- Whether patients think they are ready to adhere to particular treatments
- The degree of certainty or uncertainty of assessments.

When faced with patients with multiple risk factors and conditions, we use the above principles to guide our discussions about which treatments should be tried and when. Where possible, we use balance sheets and decision aids, such as the sample shown in the figure, to

Table 2 Approximate reductions of relative risk associated with various treatments for hypertensive people with other cardiovascular risk factors and known cardiovascular disease

Treatment	Approximate change (%) in relative risk (range)	
	Death	Cardiovascular disease
Angiotensin converting enzyme inhibitor (ramipril)	-15 (-25 to -5)	-20 (-30 to -15)
Antiglycaemia drugs	Not shown	Not shown
Antilipidaemia drugs*	-20 (-30 to -10)	-30 (-40 to -20)
Aspirin	-15 (-20 to -10)	-25 (-40 to -10)
β blockers	-25 (-30 to -15)	-25 (-40 to -10)
Cardiac rehabilitation	-25 (-40 to -10)	-25 (-40 to -10)
Fish oil	-15 (-25 to -5)	-10 (-20 to 0)
Mediterranean diet	-30 (-80 to -10)	-30 (-85 to -45)
Smoking cessation	Unclear; ≥-20	Unclear; ≤-50

*Applies primarily to statin treatment for raised concentrations of low density lipoprotein and total cholesterol. Treatment with fibrates for near normal concentrations of low density lipoprotein and total cholesterol, but low concentrations of high density lipoprotein cholesterol, has shown risk reductions of approximately 10% for death and 25% for cardiovascular disease.

Mr. Singh

Age	85	years		
Systolic blood pressure	160	mm Hg		
LDLC cholesterol	20	mg/dL		
HDL cholesterol	38	mg/dL		

Sex	<input checked="" type="checkbox"/>	Male	<input type="checkbox"/>	Female
Smoker	<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No
Diabetes	<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No
ECG-based LVH	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
Risk Time Range	5	Years		

Mr. Singh, your risk of having a cardiovascular event, such as a stroke or heart attack, in the next five years is about 25%. By comparison, an 85-year-old man with no risk factors has about a 15% chance of having such events in the next five years.

The graph shows your risk.

Five-year risk for cardiovascular events

Low
High

A number of treatments are available to you that may help prevent future cardiovascular problems.

Some are listed below:

<input type="checkbox"/> Aspirin	<div style="border: 1px solid black; background-color: #e0e0e0; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="text-align: center; margin: 0;">Select an intervention</p> </div>
<input checked="" type="checkbox"/> Blood pressure medication	
<input type="checkbox"/> Lipid medication	

Taking medication to lower your blood pressure reduces your chance of having a heart attack or stroke, and several medications are available for this purpose. On average, these medications lower the chance of having a heart attack or stroke by about 30%. The graph below shows your own chance of having a heart attack or stroke would decrease from about 25% to about 15%. They also reduce the chance of developing heart failure - a condition in which your heart does not pump the blood well, causing swelling in the legs and shortness of breath - by 50%.

Several different medications are available for treating hypertension. Your choice of medications will depend on many factors, including cost and side effects of the medications and the presence of other illnesses that may be helped or worsened by the medication used to treat high blood pressure.

Risk of heart attack or stroke after adding blood pressure medication

Low
High

Sample decision tool for a patient without cardiovascular disease

guide discussions. As the data suggest that the relative risk reductions achievable with particular therapies are generally independent of underlying cardiovascular risk levels, we base projections of absolute benefits of treatments on patients' individual risk profiles. Thus, patients at higher risk stand to gain more from treatment over the next 5-10 years than patients at lower risk, and the benefits of their treatments are less likely to be offset by other harms. We try to reach agreement with patients about what constitutes sufficient risk to warrant starting or adding additional treatment.

To help prioritise treatments for patients without known cardiovascular disease, we try to estimate the amount of risk associated with each of the patient's risk factors and accompanying conditions, using tools such as those described in *Evidence-Based Hypertension* and in the second article in this series.³ We tie our estimate of benefit from a particular therapy to our estimate of risk from a particular factor or condition. For example, we postulate that a patient with especially abnormal levels of a risk factor, such as severe hypertension, may benefit more from having his or her hypertension treated than by taking aspirin.

We also inform patients about the types of benefits and harms that they can expect from particular treatments. For example, primary prevention trials show that aspirin and lipid lowering statins reduce risk of coronary heart disease but probably not stroke. Aspirin is much less expensive than statins, but it has more potential adverse effects, such as gastrointestinal bleeding. Some patients' choices between using aspirin

or a statin may depend on cost as well as their perceived risks of adverse effects. Other patients' choices may depend more on their perceived benefits of treatments. For example, some patients may prefer to stop smoking rather than taking either aspirin or a statin, because of perceived multiple benefits of stopping smoking and fewer perceived benefits from the drug. Other patients may feel that they are not ready or able to quit smoking, but willing to take drugs.

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- 2 Mulrow CD, Pignone M. What are the elements of good treatment for hypertension? *BMJ* 2001;322:1107-9.
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Correction

Bovine spongiform encephalopathy and variant Creutzfeldt-Jakob disease

Several errors occurred in this paper by Paul Brown (7 April, pp 841-4). In the sixth paragraph, the values given in lines 2 and 6 should read 10 LD₅₀/g [not 1 LD₅₀/g], and in lines 10 and 16 the values should read 4500 LD₅₀ [not 450 LD₅₀].



The book *Evidence-Based Hypertension*, edited by Cynthia D Mulrow, can be purchased through the BMJ Bookshop (www.bmjbookshop.com).

When I use a word ...

Re: re-

I have been asked why I used the word "reduplication" in a piece about dilatation (*BMJ* 2000;320:625), when "duplication" would have done just as well. Now it is true that the first definition of reduplication in the *Oxford English Dictionary* is "the action of doubling or folding," which is just what duplication means. However, "reduplication" has a distinct grammatical meaning, not shared by "duplication": "repetition of a syllable or letter, especially in the case of verbal forms." Typically this occurs in the perfect tense of Greek and Latin verbs. For example, the paradigm of the Latin word to touch is tango, tangere, tetigi, tactum, with reduplication in the perfect tense, mimicking the repetition of a past action.

A reduplication is also "a word form produced by repetition of a syllable." Examples include helter-skelter, gaga, hurdy-gurdy, tip-top. In some languages reduplication is simply used to indicate a plural, but there are other uses. For example, it can indicate intensity, as in beri-beri, which is probably from the Sinhalese word beri (debility)—that is, much debility. Or repetition, as in the onomatopoeic borborygmi (multiple rumbling of the guts). Or continuity, as in murmur and susurrus.

Japanese is rich in reduplications, and some medical examples have been imported into English. Itai-itai is painful osteomalacia secondary to cadmium induced nephropathy; it means ouch-ouch, an example of the onomatopoeic use of reduplication, as in ding-dong and bow-wow. Moya-moya disease, a cause of stroke in young people, is occlusion of the internal carotid

arteries or of arteries in the circle of Willis, causing a collateral circulation, responsible for the typical angiographic pattern, which resembles a puff of smoke (moya-moya in Japanese); the term has also been used to describe fuzzy echoes seen during echocardiography.

Reduplicated words, such as those above, are also called reiterative words. Reiterate also seems to contain a redundant re-. To iterate means to repeat or go over again; to reiterate means to go over again and again. But the latter has displaced the former in general use.

Another word for all this reduplication, palillogy, comes from the Greek word παλιν (palin), meaning back or again. But perhaps the best is frequentative (adjective and noun). Coming as it does from frequent, you might expect it to be frequentive, but the reduplication in the middle makes the point.

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We welcome articles of up to 600 words on topics such as *A memorable patient*, *A paper that changed my practice*, *My most unfortunate mistake*, or any other piece conveying instruction, pathos, or humour. If possible the article should be supplied on a disk. Permission is needed from the patient or a relative if an identifiable patient is referred to. We also welcome contributions for "Endpieces," consisting of quotations of up to 80 words (but most are considerably shorter) from any source, ancient or modern, which have appealed to the reader.