

Prevention of Cardiovascular Disease: Pocket guidelines with cardiovascular risk prediction charts for assessment and management of cardiovascular risk

What is the purpose of these pocket guidelines?

Cardiovascular disease is preventable. There are many evidence-based interventions that can be applied population-wide, targeting high-risk individuals that prevent the occurrence of heart attacks and strokes. The focus of these guidelines is on the high risk approach. They provide health workers with:

- a) a simplified approach to detect those people at high-risk,
- b) guidance on what should be done for prevention of heart attacks and strokes.

How do these guidelines differ from previous ones?

The new guidelines carry risk prediction charts and present an integrated and cost-effective approach for managing risk factors, and an affordable approach to the prevention of heart attacks and strokes.

In the past, most cardiovascular disease guidelines focused on single risk factors such as hypertension or dyslipidemia, and there were separate guidelines addressing prevention of coronary heart disease versus prevention of stroke. Implementation was not cost-effective for the earlier guidelines, and many countries were unable to afford their implementation.

Previous guidelines did not take into consideration some important facts: that multiple risk factors are responsible for cardiovascular disease, that risk factors and determinants of heart attacks and strokes are very similar, and, therefore, prevention approaches are similar. The new guidelines integrate the management of multiple risk factors e.g. raised blood pressure, raised cholesterol, raised blood sugar and tobacco use.

Who are these guidelines for, and how will these guidelines be used?

Among the 193 Member States of WHO, all high-income countries have developed cardiovascular risk prediction charts using cohort data from their own populations. They have been refined over the years.

The charts in these guidelines are meant to be used in low-income and middle-income countries, where refined risk prediction charts do not exist. The guidelines are for health workers in clinical settings, including primary health care.

What are cardiovascular risk prediction charts?

The risk of an individual getting a heart attack or a stroke depends on a set of cardiovascular risk factors such as age, gender, smoking status and level of blood pressure, blood cholesterol and blood sugar. The risk prediction charts are a simple way of calculating the approximate combined risk due to all these risk factors. It is expressed as a 10-year risk of developing a heart attack or stroke.

What is significant about these charts?

Among the 193 Member States of WHO, all high-income countries have developed cardiovascular risk prediction charts using cohort data from their own populations. Those risk prediction charts have been refined over the years. The WHO/ISH risk prediction charts present a system that can be used by countries which, hitherto, had no such charts.

How can these charts be used to improve the effectiveness of cardiovascular risk management?

Using these new risk prediction charts, an individual can be classified in a category of high risk (maroon and red), medium risk (orange and yellow), or low risk (green) for heart attack or stroke in the following ten years. If an individual has high cardiovascular risk, the guidelines recommend more intensive treatment, often including drugs -- this is because the individual's risk has to be lowered urgently to prevent a heart attack or stroke. On the other hand, if the risk is low, the interventions may be more conservative ones like counselling for change in behaviour e.g. smoking cessation or increased physical activity.

How will these guidelines and charts help low- and middle-income countries in particular?

The main problem in low-income and middle-income countries is the shortage of health care resources. Still, even with limited resources, effective action can be taken to prevent heart attacks and strokes if resources are targeted at population wide cost-effective interventions and at those who are in imminent danger of a heart attack or stroke (a life-threatening event).

How is risk profile different in each sub-region? Are the guidelines very different for each sub-region?

Although the risk prediction charts are different for the fourteen sub-regions, the recommendations for treatment are the same in all versions of the guidelines.

Population distribution of cardiovascular risk factors differs in different epidemiological regions. The risk prediction charts have been developed using a modelling approach. In brief, a set of individual-level CVD risk factor profiles (age, sex, systolic blood pressure, total cholesterol, and the presence or absence of type-2 diabetes) have been generated using information on the population distribution of these risk factors from the WHO Comparative Risk Assessment study. These risk factor profiles have been combined with information on the relative risk of each risk factor, along with the population-level estimate of absolute risk. The risks of heart attack and stroke have been modelled and combined to predict the individual risk of coronary heart disease and cerebrovascular disease. The accuracy and predictive value of current risk prediction charts could be improved as more epidemiological data becomes available from individual countries.

Why is it the case that treating risk factors such as raised blood pressure and blood lipids is cost-effective for low-income and middle-income countries, only if interventions are targeted at high risk individuals?

Currently, individuals are often treated based on the presence or absence of a single cardiovascular risk factor such as high blood pressure or high blood lipids. This approach works when these risk factors are markedly elevated. If not, although the approach appears simple, it can result in committing a patient with only a small cardiovascular risk to many years of drug therapy, or, conversely, neglecting to treat those with an overall higher cardiovascular risk. Further, the single risk factor approach does not take into account the continuous relationship between blood pressure, blood glucose, blood cholesterol and cardiovascular risk.

The single risk factor approach is not cost-effective and is not affordable for many low-income and middle-income countries, and patients from lower socioeconomic categories. For example, in a hypothetical country with 1 billion population (about 500 million adults), and a 20% prevalence of hypertension, there will be about 100 million people requiring treatment. If the annual cost of providing treatment is a modest 20 dollars per person per year, about 2 billion dollars will be required annually to provide medicines for hypertension alone. In reality, the prevalence of hypertension as well as the cost of drugs for treating hypertension is often even higher.

Are the alternative charts, for use when cholesterol cannot be measured, less precise?

The charts that are used without cholesterol measurement are meant to be used only in low-resource settings where assay of cholesterol is not possible. These charts are less

accurate than those with cholesterol, but still provide an option for treating a patient based on his risk of developing a heart attack or stroke.

Why do we need CVD guidance for people in low-income countries? Do they have much heart disease?

As low-income and middle-income countries begin to make gains in combating infectious diseases and malnutrition, and garner the benefits of economic development, they have become increasingly vulnerable to the impact of cardiovascular disease. Cardiovascular disease is already the leading cause of death in all low-income and middle-income countries except those in Sub-Saharan Africa. The cardiovascular disease burden is expected to rapidly increase, obstructing further economic growth. The economic impact is significant because working-age adults account for a high proportion of the CVD burden in these countries.

Effective approaches to reduce the disease burden in low-income and middle-income countries will involve a mixture of population-wide and individual interventions, including treatment and health education. Cost-effective interventions are already available and include inexpensive, effective medications for prevention and treatment of heart attacks and strokes. Treatment needs to be combined with training of health care workers to implement clinical guidelines and training of patients so that they are knowledgeable about the importance of adhering to medical regimens. These interventions can reap future savings in terms of reduced medical costs, improved quality of life and productivity.

What are the plans for training and dissemination of these guidelines?

In order to ensure that the pocket guide gets into the hands of the health care workers who should use it, WHO will be collaborating with national Ministries of Health and health-focused nongovernmental organizations to organize 'training of trainers' workshops and dissemination of the pocket guide.

What is the added value of these charts?

Almost 80% of the global epidemic of cardiovascular disease is already in low-income and middle-income countries. Individual and societal costs of premature deaths and disability, and escalating costs of medical care, call for urgent measures to prevent and control this epidemic in low-income and middle-income countries.

Specialist physicians may not need risk prediction charts to broadly categorize the level of risk of a person. In many low-income and middle-income countries settings, non-physician health workers are the first contact for medical care. A simple tool of this

nature will help them to assess the cardiovascular risk of people rapidly, and take appropriate action.

Pragmatic and feasible approaches are needed to prevent people from getting heart attacks and strokes. Treating risk factors such as blood pressure and blood lipids is one such approach. However, this approach is cost-effective and affordable for most countries, only when targeted at high-risk individuals.

Further, currently, individuals are often given drug treatment based on the presence or absence of a single cardiovascular risk factor such as high blood pressure or high blood lipids. Although this approach appears simple, it can result in committing a patient with only a small cardiovascular risk to many years of drug therapy or, conversely, neglecting to treat those with an overall higher cardiovascular risk.

Why not make the charts more accurate by using more variables?

The charts can have an impact on prevention of heart attacks and strokes, particularly if they can be used by health workers in primary health care. Health systems in low-income and middle-income countries do not have the basic infrastructure facilities to support resource-intensive risk prediction tools, particularly in primary health care. Charts use simple variables that can be applied even in low resource-settings.

Using the chart, a health worker in primary health care can select people at high-risk and, if necessary, refer them for appropriate treatment to the next level of care. Thus, the WHO/ISH risk prediction charts and the accompanying guidelines will improve the effectiveness of cardiovascular risk management, even in settings which do not have sophisticated technology.

How have the WHO/ISH cardiovascular risk prediction charts been developed?

The charts have been developed using a modelling approach. In brief, a set of individual-level cardiovascular disease risk factor profiles (age, sex, systolic blood pressure, total cholesterol, and the presence or absence of type -2 diabetes) have been generated using information on the population distribution of these risk factors from the WHO Comparative Risk Assessment study. These risk factor profiles have then been combined with information on the relative risk of each risk factor, along with the population-level estimate of absolute risk. The risks of non-fatal and fatal myocardial infarction and non-fatal and fatal stroke have been modelled and combined to predict the individual risk of coronary heart disease and cerebrovascular disease.

What are the limitations of the new risk prediction charts?

Due to the paucity of data, charts have been compiled not for individual countries but for 14 WHO epidemiological sub-regions. There are 28 different charts for 14 epidemiological sub-regions of WHO. One set with cholesterol and one set without cholesterol. It is likely that results will be most applicable to the largest country within the region. The accuracy and predictive value of current risk prediction charts will be improved as more epidemiological data become available from individual countries.

If the charts are not perfect, is it safe to use them?

Charts are not perfect because of paucity and quality of available data. but they are safe for use for the intended purpose of broad risk stratification for guiding management.

Only five categories of risk are depicted with five colours, four blood pressure categories and five cholesterol categories are shown (as they should not be too complicated for use in the field). Therefore, the charts will not depict minor gradations in risk.

The best available data have been used for developing these cardiovascular risk prediction charts (although this data is not as good as the data available for high-income countries). This is the best that can be done for low-income and middle-income populations for the moment. The charts will be refined in the future, once cohort data are available for individual populations.

At present, these charts are safe and useful tools for guiding, management and treatment decisions for individuals.

When can treatment decisions be made without the charts?

The new WHO guidelines explain that the charts can underestimate the risk in certain categories of people



e.g. Persistent raised blood pressure $\geq 160/100$ mm Hg or
Blood cholesterol ≥ 8 mmol/l or
Established ischemic heart disease, or
Diabetes with renal disease.

All of the patients in these categories need intensive lifestyle interventions and appropriate drug therapy. They do not need risk stratification using charts for treatment decisions.

When are the charts useful for stratifying risk?

Charts are useful for stratifying risk for people with blood pressure <160/100 mm Hg or blood cholesterol < 8 mmol/l or uncomplicated diabetes.

For example, by using the charts, person X and person Y, who have similar blood pressures and blood cholesterol levels, can be correctly assessed for their risk of developing a heart attack or a stroke as follows:

	Risk factor profile	10 year risk of heart attack or stroke
Male X 50 years	SBP 140 mm Hg, TC 7 mmol/l, nonsmoker, no diabetes	10% to <20% 
Male Y 50 years	SBP 140 mm Hg, TC 7 mmol/l smoker, diabetes	≥ 40% 

Person Y needs intensive lifestyle interventions and drug treatment to prevent a heart attack or stroke.

Person X needs lifestyle interventions and may need drug treatment if risk persists at follow up.

Rates of cardiovascular disease are increasing globally. Why is this and what can be done - at the country level?

The major determinants that drive the cardiovascular epidemic are ageing of populations and change in behaviours due to urbanization and globalization. The determinants and risk factors of coronary heart disease (heart attacks) and cerebrovascular disease (stroke) are similar. For successful prevention and control of cardiovascular disease (heart attacks and strokes), governments can implement strategies to control the disease-determinants and risk factors such as tobacco use, physical inactivity, unhealthy diet and socioeconomic inequalities. These can be addressed through strategies that impact on the whole population such as tobacco control, promoting physical activity through conducive environments and promoting healthy diets through proper agricultural and food policies. In addition, individuals at high risk of developing heart attacks and strokes need to be detected and cared for through health system strategies. There are many cost-effective strategies that are affordable, even to low-income countries, for prevention and control of cardiovascular disease.

What are WHO's recommendations for individuals who want to decrease their risk of getting cardiovascular disease?

Stop tobacco use, maintain a healthy body weight through daily physical activity and a healthy diet, have a regular intake of fruits and vegetables.

Maintain a healthy level of blood pressure, blood sugar and blood cholesterol according to medical advice.

If medicines have been recommended, take them as prescribed by a health care worker.