Hypertension Research (2011) 34, 549–550

www.nature.com/hr

COMMENTARY

Recognizing the risk of cardiovascular diseases: quantifying the short-term and lifetime risk projections

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Hypertension Research (2011) **34,** 549–550; doi:10.1038/hr.2011.21; published online 10 March 2011

Despite decades of declining mortality from stroke,[1–3] it still remains the third most common cause of death[4] in Japan. In the year 2000, stroke accounted for 13.8% of the country's total deaths.[4] Life expectancy at birth in Japan is now the longest in the world, and it continues to increase.[5–7] With the aging of the population[8] and the current unfavorably diverging trends in cardiovascular risk factor scenarios,[9–11] cardiovascular diseases—stroke in particular—are likely to be an increasingly important health burden in Japan. Thus, stroke-prevention activities require immediate and ongoing attention.

Hypertension is a well-established risk factor of cardiovascular disease morbidity and mortality.[12–14] High blood pressure is the most significant modifiable risk factor for stroke, and much of the excess risk for stroke incidence and acute fatality can be attributed to hypertension. Cardiovascular events have been shown to have a graded relationship to higher levels of blood pressure. Therefore, the control and management of hypertension are of utmost importance, not only at the individual level of medical practice but also at the population level from a public health perspective.

An absolute-risk approach to risk assessment would be more easily understood than conventional relative-risk approaches, by both clinicians as well as patients, and would thus be useful in public health education focusing on cardiovascular disease-prevention initiatives, such as personal-level lifestyle modifications. Easily comprehensible statistics are essential for use by public health planners and policy makers in order to comprehend the population burden of chronic diseases and apply population-risk estimates to aid health economics and public policy decisions. One important statistic for such purposes is the lifetime risk, which is the cumulative absolute incidence of a disease condition and indicates the probability that a person who is currently free of the condition will acquire it at some time during the remainder of his/her expected lifespan. The lifetime risk estimate accounting for the competing risk of death can provide a direct means of communicating disease risk and can be used as a universal measure of the burden of disease in a population.

The lifetime risk of cardiovascular diseases for the Japanese population, which had not previously been estimated, was reported recently.[15–17] However, these studies did not investigate the effect of blood pressure, by category, on the lifetime risk of these diseases. In this issue of the journal, Takahashi *et al.*[18] present the lifetime risk estimates of stroke according to different levels of blood pressure for middle-aged men and women. The authors analyzed the data relating to the participants enrolled in the Radiation Effects Research Foundation Adult Health Study, who have been longitudinally followed since 1958. For the cohort of index age 55 years, 7487 participants were identified as being stroke-free and alive. Stroke was the event of interest, and death was treated as a competing risk event. In accordance with the Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) classification,[19] the baseline blood pressure of the participants was categorized as either normal (systolic blood pressure (SBP) $<$ 120 mm Hg and diastolic blood pressure (DBP) $<$ 80 mm Hg) or indicative of pre-hypertension (SBP 120–139 mm Hg and/or DBP 80–89 mm Hg), stage 1 hypertension (SBP 140–159 mm Hg and/or DBP 90–99 mm Hg) or stage 2 hypertension (SBP $>$ 160 mm Hg and/or DBP $>$ 100 mm Hg). Gender-specific lifetime risks of stroke for various blood pressure-based levels were estimated using cumulative incidence analysis, adjusting for the competing risk of non-stroke death. Their observed probabilities illustrated that approximately 1 in 5 men and women of middle age in Japan will suffer from a stroke in their remaining lifespan. These estimates were similar to those reported in the Suita study.[15] In the analysis of Takahashi *et al.* across blood pressure categories, there was a graded increase in lifetime risk with increasing blood pressure levels. Because this study was conducted in a very specific population of atomic bomb survivors exposed to radiation, its generalizability is limited, which the authors have duly acknowledged in their report. Interestingly, their estimates were similar to the lifetime risks for stroke reported in other studies from Japan. The association between A-bomb radiation exposure, hypertension and stroke risk will be interesting to explore for this unique study cohort.

Interpreting the lifetime risk estimates requires consideration of several factors. Lifetime risk estimates give a long-term perspective for a disease, which is particularly important for stroke and other conditions, for which exposure to risk factors in middle age can alter the incidence of disease in the later part of life.[20] Furthermore, depending

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on the relative rate of the increase in mortality from competing causes, the lifetime probability of a disease such as stroke might increase[21] even when, owing to the control of risk factors, the age-specific disease incidence has decreased. Additionally, lifetime estimates are based on the assumption that risk exposure and age-specific rates remain stable during an individual's lifespan. One-time assignment of risk factor status at the index age without updating for later crossover may influence the estimated differences between risk factor levels. By contrast, shorter-term age-conditional risk estimates are less susceptible to changes in incidence and to mortality rate changes in the long term. In addition, shorter-term age-conditional risk estimates are more relevant to individuals who are approaching ages when cardiovascular rates rise rapidly.[21] Because the lifetime risk estimates do not distinguish between short- or immediate-term and long-term risks, the lifetime risk should be combined with short-term risk estimates as appropriate when counseling individuals or developing a message to distribute to the general population.

Only a few published reports have presented risk-factor-stratified lifetime risk estimates for cardiovascular diseases. Further studies of risk-factor-stratified lifetime risks for cardiovascular diseases are needed to examine and describe the overall survival in the presence and absence of the established atherosclerotic risk factors and for different magnitudes of the risk factors. This information might be useful for inclusion in future guidelines, both in facilitating the setting of priorities by policymakers and in increasing public awareness of and interest in the prevention of cardiovascular diseases.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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