Long-term systolic blood pressure variability was associated with increased incidence of type 2 diabetes.

With the use of electric health record, long-term changes of health check-up results such as blood pressure could easily be obtained. However, pathophysiological significance of long-term blood pressure variability has not been sufficiently understood. Diabetes prevalence increases rapidly globally and is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation. Prevention of diabetes is an urgent issue globally.

Professor Hiroshi YATSUYA, and his group including Ms. Zean SONG, a graduate student at the Nagoya University Graduate School of Medicine, have examined the association between long-term blood pressure variability and the incidence of type 2 diabetes in the Aichi Workers' Cohort Study. They followed 3017 individuals free of diabetes at baseline for a median of 9.8 years and examined the association of long-term variability of systolic blood pressure using a measure called root mean square error (RMSE, Figure 1) with type 2 diabetes. Multivariable Cox proportional hazard model was used to adjust for potential confounding variables including sex, age, smoking and exercise habits, salt intake, obesity, family history of diabetes, and blood glucose level at baseline.

They found that the degree of long-term variability of systolic blood pressure was associated with significantly increased incidence of type 2 diabetes (Hazard ratio: 1.79, 95% confidence interval: 1.15-2.78) (Figure 2). Examples of systolic blood pressure change pattern of low, intermediate and high variability (RMSE) groups are presented in Figure 3. The investigators also examined the associations of the other variability measures including standard deviation [SD], coefficient of variation [CV], maximum and mini- mum difference [MMD], variability independent of the mean [VIM], and average real variability [ARV]) with type 2 diabetes incidence. And similar findings were observed when ARV was used but not others.

The findings will be presented as a Young Investigator Award presentation of the Asian Pacific Society of Hypertension in the 29th Scientific Meeting of the International Society of Hypertension on October 14, 2022 in Kyoto and was published in the formal journal of Japan Hypertension Society, *Hypertension Research.*

Figure 1. Concept of root mean square error (RMSE) of systolic blood changes over years

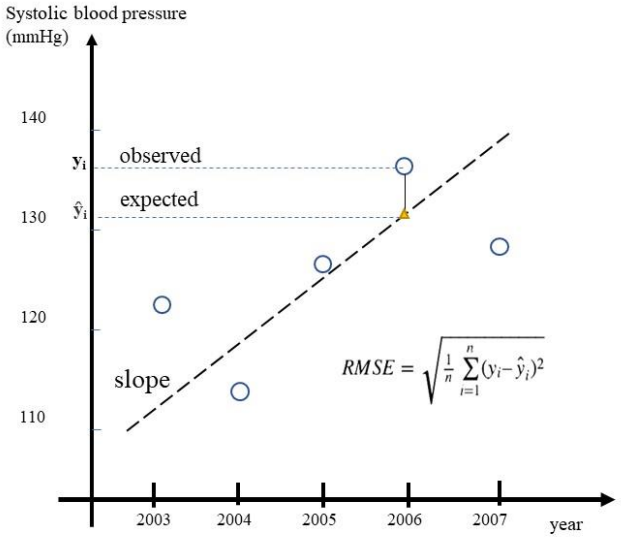
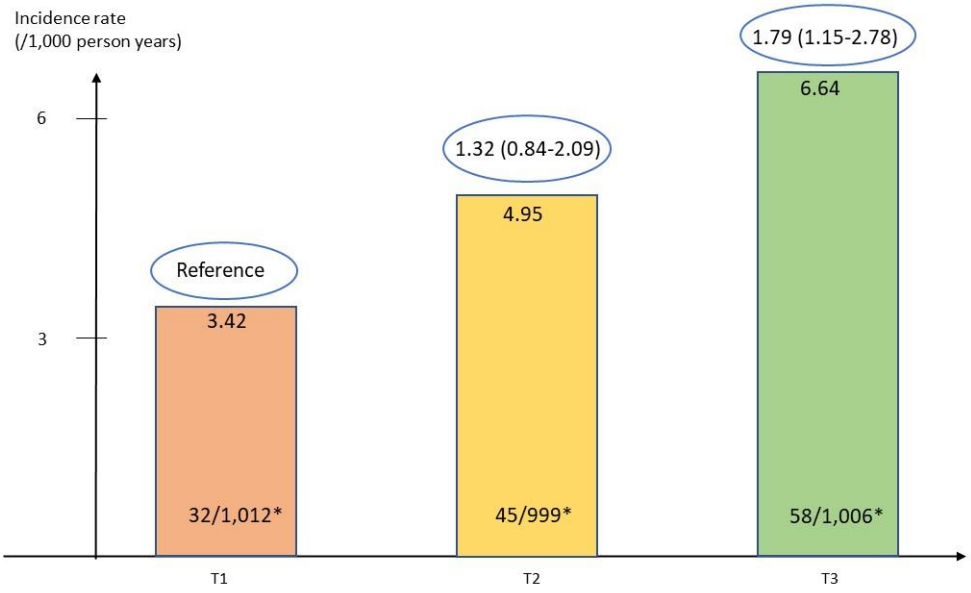


Figure 2.



T2DM incidence rate (in the bar) and multivariable-adjusted hazard ratios (95% confidence intervals, in the ovals) according to systolic blood pressure RMSE tertiles

*: number of incidence/number of at risk participants at baseline

Figure 3-1. Examples of systolic blood pressure change pattern of low variability group

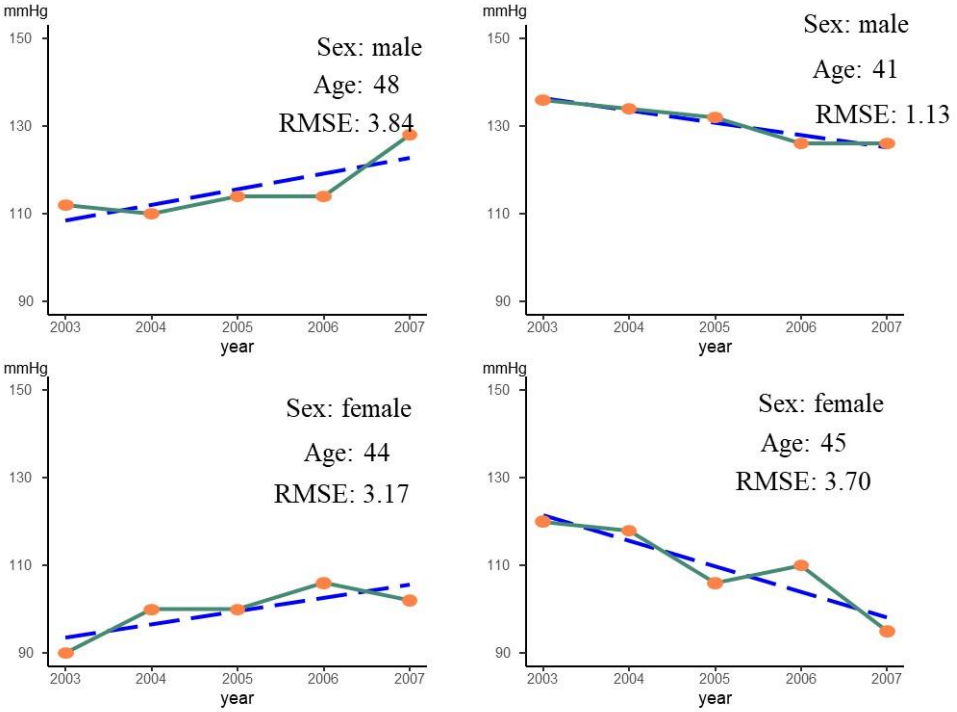


Figure 3-2. Examples of systolic blood pressure change pattern of intermediate variability group

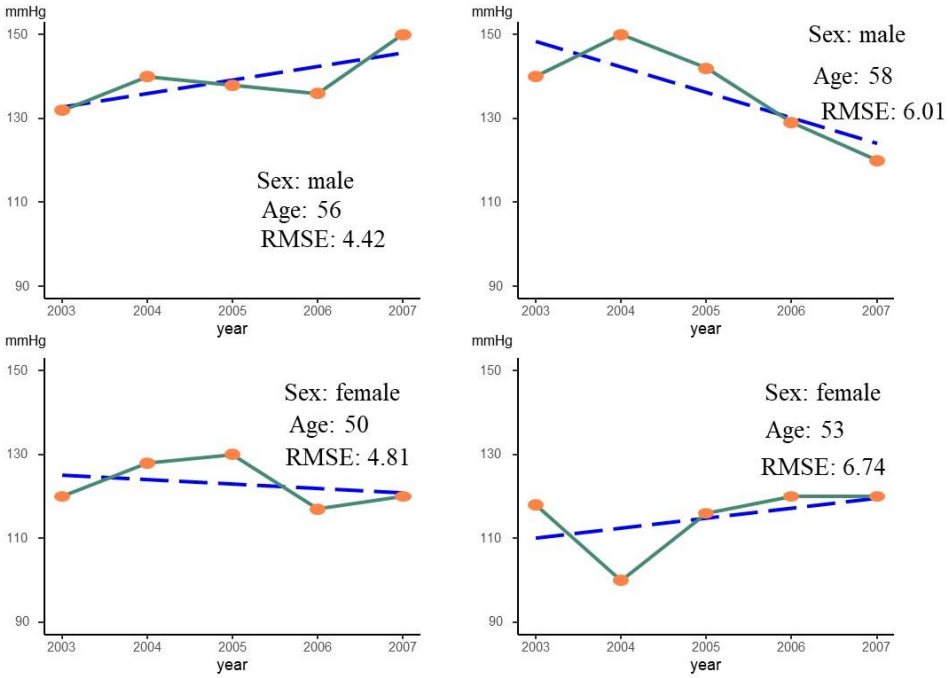
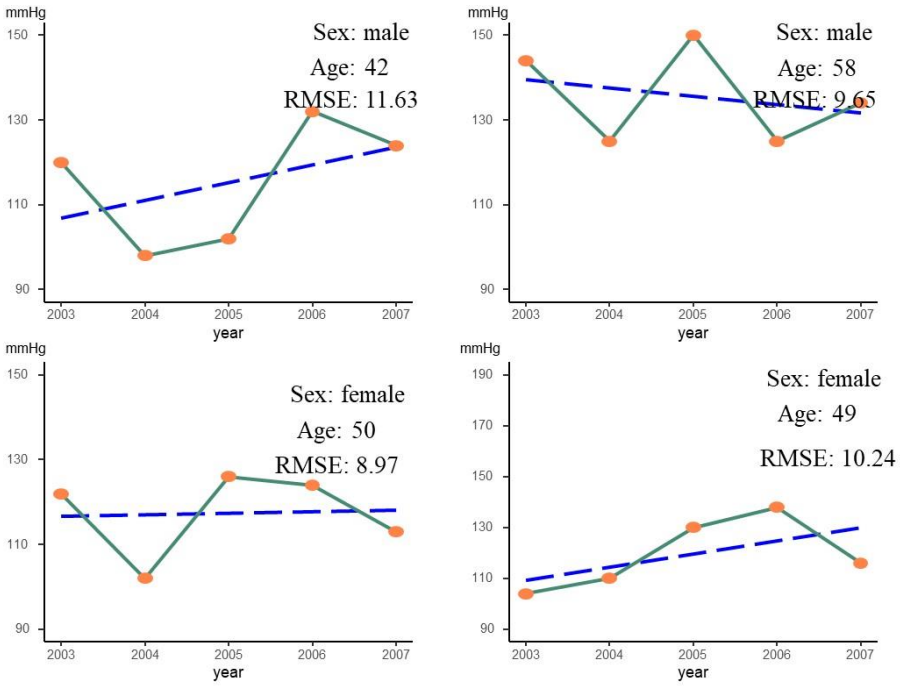
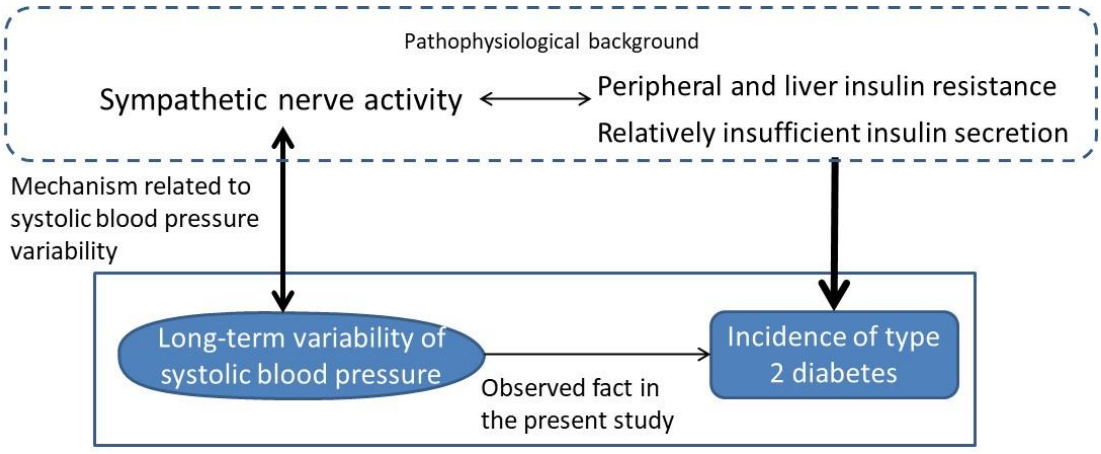


Figure 3-3. Examples of systolic blood pressure change pattern of high variability group



One of the implications would be to use longitudinal blood pressure data to identify high risk individuals for developing diabetes. Understanding of the pathophysiological mechanism of long-term systolic blood pressure variability and the possible pathways from the variability to the development of type 2 diabetes (Figure 4) is necessary for future development of a prevention program using systolic blood pressure variability.

Figure 4.



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