

Wherever people are, Omron will be there.

OMRON

# The Story of the Ohasama Study

## 135/85 mmHg

The global standard for home blood pressure measurement was developed out of the desire for a vibrant and healthy life.

OMRON



OMRON HEALTHCARE Co., Ltd.

53, Kunotsubo, Terado-cho, Muko, Kyoto 617-0002 Japan  
<http://www.healthcare.omron.co.jp/english/company.html>  
GK-11008C

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All for Healthcare



## Ohasama-machi

### Coordinates for Ohasama-machi

N39° 27' 59.6"

E141° 17' 8.6"



### Locations of study

Ohasama-machi, Hanamaki-shi, Iwate Prefecture (In 2006, Ohasama-machi, Hienuki-gun was amalgamated with the city of Hanamaki)  
(Population: 6,286 as of September 30, 2009 (Statistical data of Hanamaki city))

### Intended test subjects

Residents of the town of Ohasama

### Scope of study

Height, weight, medical interview, home blood pressure, ambulatory blood pressure, search for genes associated with hypertension and organ damage, glucose tolerance test, blood insulin, head MRI, carotid echo, pulse wave velocity, dementia test, ADL, lifestyle surveys, etc.

## The “Ohasama Study” opened the way for the development of a global standard.

If blood pressure can be measured at home, it may lead to the prevention of strokes. In 1986, Omron responded to the idea of frontline doctors.

The study was born of one doctor’s sincere wish for the good health of local residents. In 1986, Dr. Kenichi Nagai, at the time the young medical director of the Iwate Prefectural Ohasama Hospital, was proactively striving to raise healthcare awareness in the community along with providing daily consultations and treatment. The area around Ohasama-machi in Hanamaki City, located in the middle of the Iwate Prefecture, was in those days a typical Tohoku rural community and was notorious for high incidence rates of hypertension and strokes, which were attributable to the cold climate, and diets high in salt and deficient in animal protein and fat. Dr. Nagai found this situation too critical to overlook and consulted with Dr. Yutaka Imai of Tohoku University, who was a classmate of his at medical school, seeking ways to raise health awareness in the community.

Dr. Imai suggested encouraging the residents of Ohasama-machi to monitor their own blood pressure at home by distributing a home blood pressure monitor to each household. Dr. Nagai agreed emphatically with Dr. Imai’s idea.

At that time taking a blood pressure measurement was considered a medical practice that could only be carried out by a doctor or nurse. There were questions such as “Will the residents really participate in the project?” and “Are there any blood-pressure monitors that enable accurate measurement at home?” It seemed that there would be a number of obstacles to overcome. However, led by Dr. Imai, who was already convinced that home blood pressure monitoring would be a significant tool for a new type of self-health management, the study project was launched.

One day, Omron received a phone call from Dr. Imai asking if Omron would be willing to provide home blood pressure monitors for his study. The idea fit perfectly with Omron’s

desire to “contribute to better health for individuals through the dissemination of home medical care”.

In response to Dr. Imai’s request, Omron donated 300 home blood pressure monitors that were both accurate and easy to use, features that Omron uncompromisingly pursues in all its products. There were comments about the monitors such as, “With this accuracy we can make an accurate comparison between office and home blood pressure recordings” and “I didn’t know how easy it is to measure blood pressure at home.” All three parties involved in the study - doctors, residents, and Omron – were positive about the project, and their shared goal of promoting good health led to the commencement of a large-scale study using home monitoring of blood pressure among the residents of Ohasama-machi.

That study would provide extensive evidence used in the development of the global standard for home blood pressure measurement, and became known worldwide as the “Ohasama Study”.



## The residents of Ohasama-machi have continued full participation in the study for over 25 years.

Out of a desire to remain in good health they monitor their blood pressure at home daily. During the course of the study a strong bond formed between the residents and the doctors, which has been the foundation of the Ohasama Study to this day.

What has led to this study continuing for over 25 years? Why do the residents of Ohasama-machi continue so positively take their blood pressure at home? The answer to these questions is in the “feedback”. The Ohasama Study is not a simple data collection activity; it has always been intended to return real results to the residents in the form of good health. Ohasama-machi could be described as the town where all households have home-use blood pressure monitors. Residents continue to visit the Ohasama County Medical Center with their blood pressure passbooks in hand every Monday. At the medical center, doctors including Dr. Imai and local public health nurses serve as advisors to the visiting residents. They give advice about lifestyle modification or possible treatment based on the data from the individual’s home blood pressure monitoring, and may prescribe medication such as antihypertensive drugs if necessary. Residents feel a sense of satisfaction that daily home blood pressure monitoring positively enhances health self-awareness, and because doctors follow up on each individual’s blood pressure records as a precaution. Strong motivation generated by mutual trust has been the basis for the continued support of the Ohasama Study.

A total of 11,381 residents have participated in the study.

The relationship between home blood pressure monitoring and prognoses has been tracked for 15 years on average, and for 25 years at the most. On average, about 1,000 residents participate in the project each year.

The Ohasama Study is the only home blood pressure study in the world that has been continued for such an extended period with such a large number of participants. In this regard, Dr. Imai says, “We’ve been able to continue this project because it is not intended for research only, but genuinely for health check-ups.” Proof of this assertion lies in the fact that countless diseases have been diagnosed and many lives were saved.



“I had an aneurysm detected.” “An adrenal gland disorder was detected.” “My hypertension has been alleviated by reducing salt intake.” Voices such as these please Omron and the doctors engaged in the Ohasama Study the most. Health awareness is now so high that each household has at least one home-use blood pressure monitor and some households even have two or three. Their desire to remain healthy as long as possible encourages continued participation in the study. Supported by their encouragement, the Ohasama Study continues to this today.

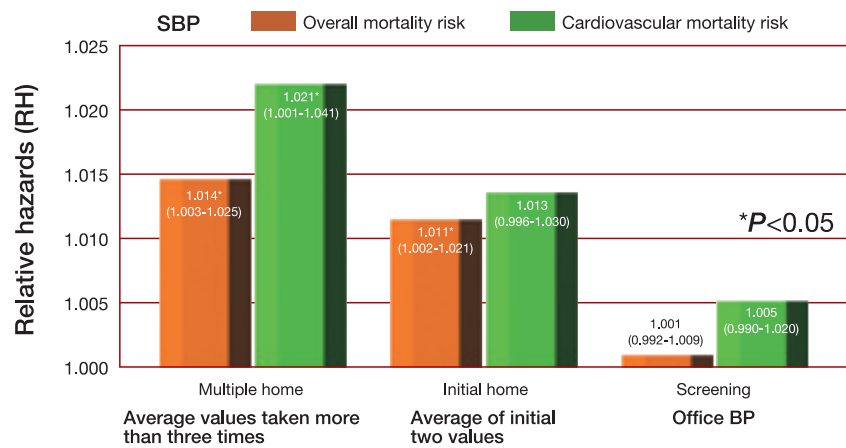


# The study has a proven track record in its performance. The evidence provided in the study led to the development of the reference value of 135/85 mmHg.

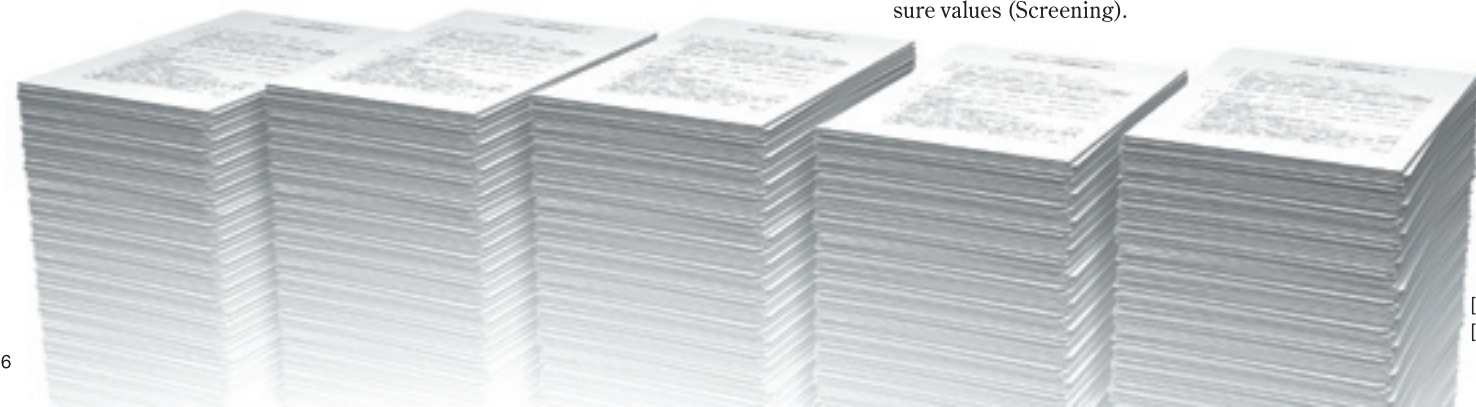
A total of 292 scientific papers have been published that reference the Ohasama Study. (as of March 2010)  
 Many facts that could not be found only through examinations and consultations in a doctor's office have been upsetting conventional knowledge in medicine.

By using home blood pressure monitoring, the Ohasama Study endeavors to raise the residents' health awareness while identifying blood pressure variation trends that would not be revealed simply by examinations and consultations in clinics. To identify trends, doctors compare three types of monitoring data, including blood pressure measurements taken at home, in a doctor's office, as well as ambulatory blood pressure (ABP). Among the many findings, the most significant has been the fact that home blood pressure is more strongly correlated with the development of risk for stroke and brain infarction, and demonstrates higher prognostic accuracy for cardiovascular death and overall mortality than office blood pressure measurements.

## Home blood pressure measurement has a stronger predictive power for cardiovascular mortality.



[Subjects] 1,789 Ohasama residents aged 40 or over  
 [Method] Prospective cohort study. Results were adjusted for age, sex, smoking status, history of cardiovascular disease, and the use of antihypertensive medication. Mean follow-up period was 6.6 years.



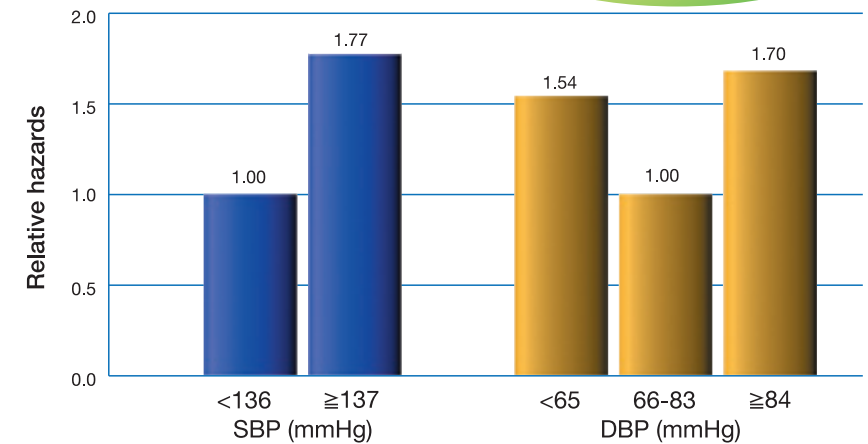
## The first evidence of home and office BP.

When comparing home blood pressure with office blood pressure by applying them to Cox's proportional hazards model as continuous variables, it revealed that the average of multiple (taken more than three times) home systolic blood pressure values (Multiple home) was most strongly related to cardiovascular mortality risk. Furthermore, it has turned out that the average of the first two home blood pressure values (Initial home) is also more strongly related to the mortality risk than the office blood pressure values (Screening).

## The first proposal of reference values for home blood pressure measurement.

In the study, the relative hazard of death was evaluated for each home blood pressure value. The results showed that the hazard ratio for the highest mortality rate due to hypertension was 1.7. According to this result, the home systolic and diastolic blood pressure levels calculated when the hazard ratio becomes 1.7, which are 137 mmHg and 84 mmHg respectively, were defined as reference values and blood pressure levels higher than these were defined as hypertensive. The scientific paper on this definition influenced the AHA guidelines for blood pressure measurement, the ESH guidelines for blood pressure measurement at home, and the JSH guidelines for the management of hypertension.

## The study influenced hypertension guidelines.

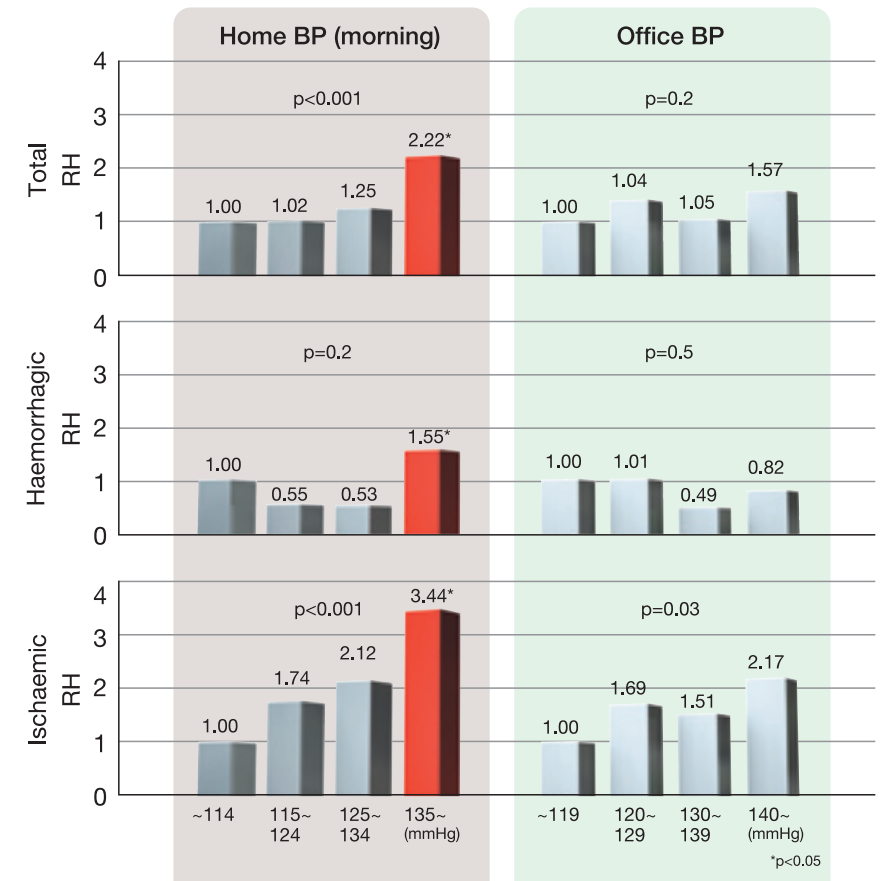


Tsuji I et al.1997; Am J Hypertens, 10:409-418  
 [Subjects] 1,913 Ohasama residents aged 40 or over  
 [Method] Prospective cohort study. Results were adjusted for age, sex, and antihypertensive treatment. Mean follow-up period was 5 years.

## Home blood pressure measurement is a better predictor of the risk of stroke.

A morning home systolic blood pressure of 135 mmHg or higher demonstrably increased the risk of ischaemic stroke. Also, for the office blood pressure, there was a tendency toward increased risk as systolic blood pressure level rises, but it was not significant.

## The first evidence revealing home BP and risk of stroke.



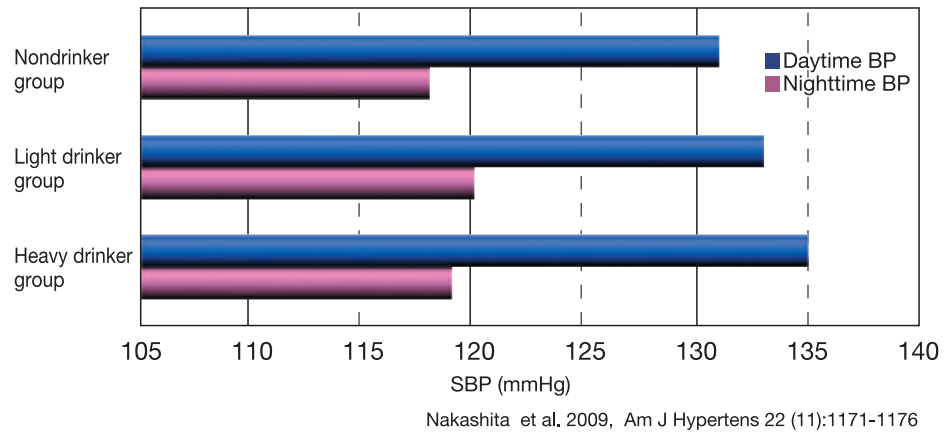
Okubo T et al. 2004, Blood Press Monit. 9:315-320  
 [Subjects] 1,702 Ohasama residents aged 40 or over  
 [Method] Prospective cohort study. Results were adjusted for age, sex, smoking status, the use of antihypertensive medication, history of heart disease, diabetes, and hypercholesterolemia. Mean follow-up period was 10.6 years.

# The study also revealed that various lifestyle habits including diet, alcohol intake, and smoking affect blood pressure.

Some participants have found that their morning blood pressure values are usually higher than their evening values, and others see large day-to-day changes in blood pressure. The early recognition of such signs and symptoms that can be detected only by home blood pressure monitoring allowed for early treatment, helping many people successfully maintain their health. In recent years, numerous papers revealing new evidence have been published and attract our attention with information such as “High fruit intake is strongly associated with a lower risk of future home hypertension”, “Heavy drinkers show elevated blood pressure in early-morning hours and daytime” and “Environmental tobacco smoke exposure in the work place or at home raises blood pressure in non-smokers”.

## Daily alcohol intake raises the morning/daytime blood pressure.

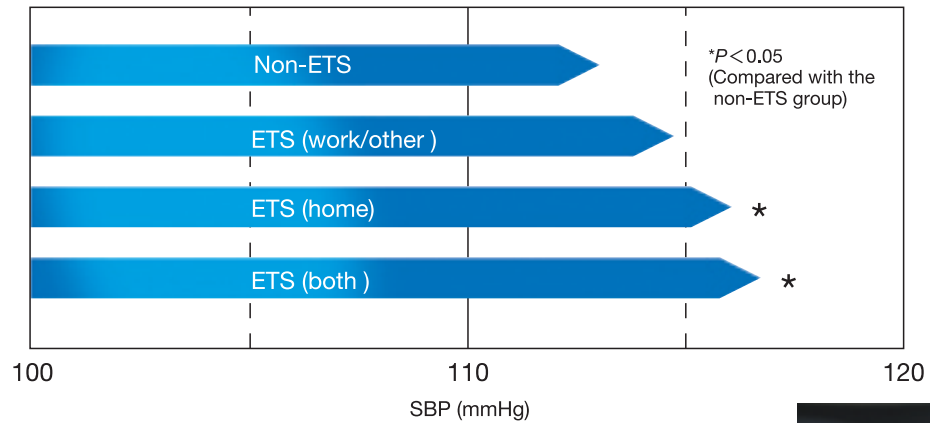
Two-hour moving average of blood pressure (2h-BP) was significantly higher in heavy drinkers, those who consume 180ml of alcohol (equal to 22g of pure alcohol) or more daily, than in nondrinkers, and daytime BP levels remained high. This suggests that large habitual alcohol intake may contribute to high morning/daytime BP.



[Subjects] 194 male Ohasama residents who answered the “Questionnaire Survey on Lifestyle Habits and Health” and measured their ABP (Average age: 66.9)  
 [Method] Subjects were divided into nondrinker and drinker groups; the drinker group was further divided into light (alcohol intake per day: below 180 ml) and heavy drinker groups (alcohol intake per day: 180 ml or more). The correlation between drinking habits and diurnal variation in BP was evaluated using multivariable analysis after correction for confounding factors such as salt intake.



## Passive smoking raises blood pressure even among nonsmokers.



Seki M et al, J Hypertens, 2010; 28, 1814-1820

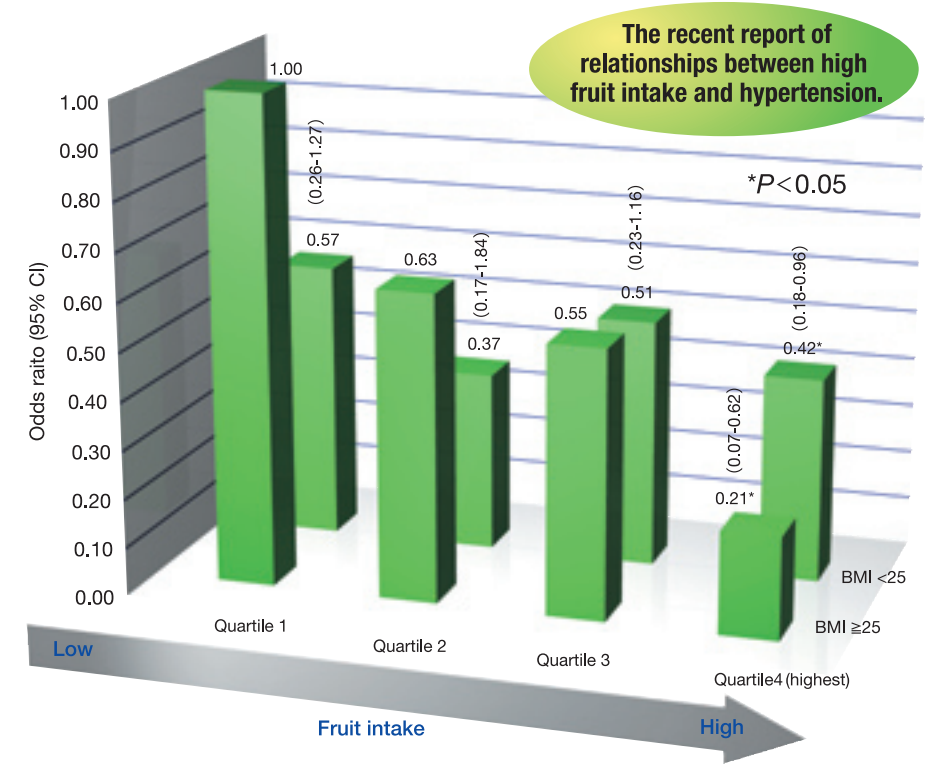
[Subjects] 579 Ohasama female residents aged 35 or over with no smoking history  
 [Method] Mean values of home BP values of three days or more were separated into four categories: unexposed women [non-ETS], women exposed at home [ETS(home)], at the workplace/other places [ETS(work/other)], and at home and at the workplace/other places [ETS(both)], and the variables were compared.



Morning home SBP in environmental tobacco smoke (ETS) exposure at work/other was significantly higher, by approximately 4 mmHg, than that in non-ETS. Also, morning home SBP in ETS exposure at home was significantly higher, by approximately 3 mmHg, than that in non-ETS.

## High fruit intake is associated with a lower risk of future hypertension.

The comparison in fruit intake between the high intake group and the moderate intake group demonstrated that the high intake group has a lower risk of the onset of hypertension than the moderate intake group by 60%. This result is particularly pronounced in subjects with a BMI of 25 kg/m<sup>2</sup> or more.



[Subjects] 745 Ohasama residents aged 35 or over

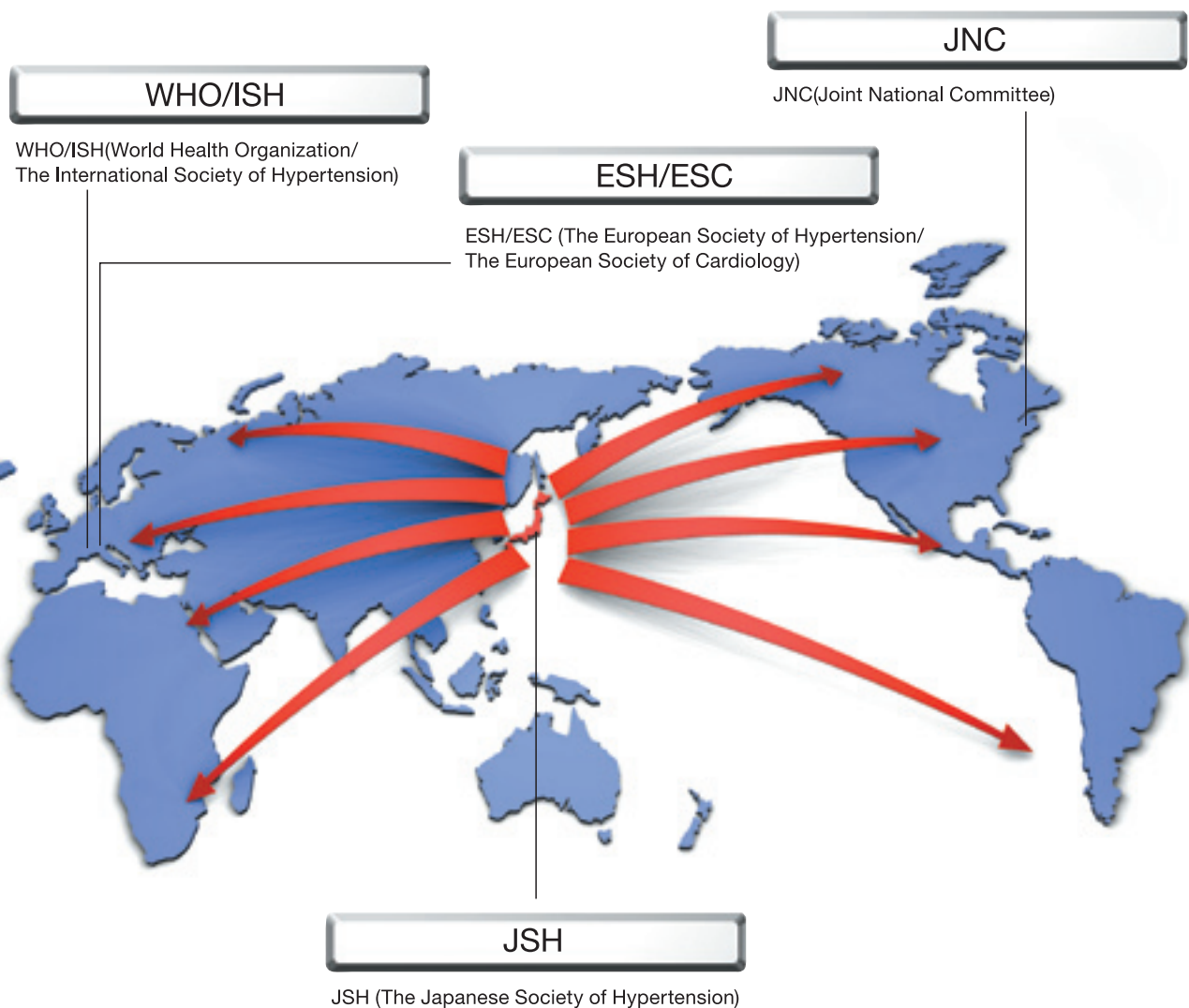
[Method] Fruit and vegetable intake was calculated based on the results of a questionnaire survey consisting of 141 items. Subjects were divided into quartiles according to the fruit intake; the odds ratio between fruit intake and onset of hypertension for each group was obtained through multivariable logistic regression analysis using the first quartile (low intake group) as a reference group. Results were adjusted for sex, age, smoking status, alcohol consumption, frequency of exercise, BMI, energy-adjusted fat and sodium consumption, baseline systolic home BP and history of diabetes, hypercholesterolaemia and cardiovascular disease. Mean follow-up period was 4.1 years.

Tsuboda-Utsugi et al, 2011, J Hum Hypertens, 25, 164-171

# The standard in Japan has set the precedent for the global standard. Globally-accepted study outcome.

Adopted by health organizations including the WHO and academic societies, the reference value of “135/85 mmHg” continues to gain acceptance internationally.

Now well-known outside of Japan as well, the findings of the Ohasama Study, which have been continuously disseminated from the small town in the Tohoku District, are highly regarded by medical and health experts worldwide. The world’s first large-scale general population study centering on home blood pressure monitoring influenced guidelines in the US and Europe. The guidelines of the Joint National Committee (JNC) of the USA in 1997, the WHO/ISH hypertension guidelines in 1999, the ESH/ESC guidelines in 2003 and 2007, and the Japanese Society of Hypertension (JSH) in 2004 and 2009 adopted 135/85 mmHg as the reference value in defining hypertension based on home blood pressure monitoring and ambulatory blood pressure monitoring in the Ohasama Study.



## Ohasama has become a common global term in the medical world. Messages from key opinion leaders (1)

These days, clinical and epidemiological studies using home blood pressure monitoring, which was pioneered by the Ohasama Study, are conducted at the forefront of medicine around the world. The major examples include the Didima Study in Greece, the PAMELA Study in Italy, Finn-Home Study in Finland, and the Belgian Population Study. Regardless of nationality, all people in the world share a desire to be healthy. We have received enthusiastic messages of support for the “Ohasama Study” from the world’s key opinion leaders who have conducted various studies using home blood pressure monitoring.



**Teruo Omae, MD, PhD,**  
President Emeritus of the  
National Cerebral and Cardiovascular  
Center  
Director of Hisayama Health C&C  
Center

### “Scientific achievements of the Ohasama Study”

As blood pressure readings markedly vary depending on measurement, psychological, and physical conditions, it is difficult to determine which measurements should be adopted as criteria. The issue that had already been raised at WHO conferences regarding blood pressure held in Geneva in the 1970s, which the author often attended, still remains unsolved. By whom and under what conditions should blood pressure be measured? According to studies on blood pressure measurement performed on a large number of subjects using a mercury manometer in various regions of the world, the final digit of the measured values was zero in most cases, e.g., 140/90 mmHg. For this reason, the necessity of the development and promotion of an automated sphygmomanometer, which provides objective measurements, was pointed out at the conferences. Attention should be paid to these points when discussing the prevalence of hypertension and percentage of normal blood pressure.

Japan has been the world’s leader in the development and promotion of instruments for the measurement of blood pressure. I have had a deep respect for Professor Yutaka Imai, a leading expert in the field, and been interested in his group’s Ohasama Study. Research involving community residents and medical institutions requires more effort and adequate preparations, compared to clinical studies, since their understanding and cooperation based on mutual trust - the foundation of preventive medicine and medical care, are essential. Professor Imai and his research group deserve to be praised for their research achievements over a long period of time. Finally, the Division of Blood Pressure at Home (chairperson: Professor Yutaka Imai) of the Japanese Society of Hypertension has published the “Guidelines for Self-monitoring of Blood Pressure at Home (second edition: September 2011).

### “The largest and most influential population study”

In 1986, Professor Yutaka Imai had the vision to start the Ohasama Study, which to date remains the largest and most influential population study on the self-measured blood pressure at home. A team of Japanese investigators led by Professor Imai’s study were the first to demonstrate that blood pressure self-monitoring offers several well recognized advantages of the more complex approach of ambulatory monitoring and that home blood pressure is a more accurate predictor of outcome than office blood pressure. In a large number of publications in top-ranking journals, the Ohasama investigators proposed and refined diagnostic thresholds for home blood pressure and carefully defined the modalities for its use in clinical practice. The work of Professor Imai and his team inspired many subsequent studies on the classification of high blood pressure into white-coat, masked, and sustained hypertension and on blood pressure variability as a potential cardiovascular risk factor. The Ohasama results importantly informed current guidelines on blood pressure measurement and led to the first trial ever, also coordinated by Professor Imai, of antihypertensive drugs guided by home blood pressure. Ohasama will continue to generating exciting results in the foreseeable future and has already entered textbooks as a landmark study.



**Jan A. Staessen, MD, PhD,  
FESC,FAHA**  
Studies Coordinating Centre,  
Laboratory of Hypertension,  
Division of Hypertension and  
Cardiovascular Rehabilitation,  
Department of Cardiovascular  
Diseases, University of Leuven,  
Belgium

●●●● **Ohasama has become a common global term in the medical world.**  
 ●●●● **Messages from key opinion leaders (2)**



**William B. White, M.D., FAHA, FACP, FASH**  
 Professor and Chief, Division of Hypertension and Clinical Pharmacology  
 Calhoun Cardiology Center,  
 University of Connecticut  
 School of Medicine  
 Farmington, Connecticut,  
 USA

**“The Importance of the Ohasama Study in Hypertension Research”**

Since 1993, when the first of more than 100 original papers was published on blood pressure characteristics at home by subjects in the Ohasama region of northeastern Japan, researchers and practicing physicians have been following the important work carried out by Professor Yutaka Imai and colleagues at Tohoku University School of Medicine in Sendai. The first papers in the early 1990s from Ohasama provided a frame of reference for home (self), 24-hour, daytime, and nighttime blood pressure in middle-age and older people in Japan. However, the results of a 6.6 year follow-up of the cohort of 1789 subjects demonstrating that home blood pressure, but not ‘screening’ blood pressure, predicted cardiovascular mortality was a very novel and important finding in the field of blood pressure monitoring research. The work in Ohasama continued to provide data on the relationships between out-of-office blood pressure and stroke morbidity using ambulatory recordings and showed that nighttime blood pressure was superior to daytime blood pressure for predicting strokes. Valuable data from the general population in Ohasama has also been incorporated into the International Database on Ambulatory Blood Pressure and Cardiovascular Outcomes (IDACO).

From 2000 to the present day, a number of interesting observations relating to blood pressure, pathophysiology, and genetic polymorphisms have arisen from the Ohasama population including, but not limited to, renin-angiotensin system genes, epithelial sodium channel gene mutations, and haplotypes of aldosterone synthase, an enzyme which has become a new target for antihypertensive therapy.

During the years that the Ohasama population study has been ongoing, investigators from Sendai have presented their research findings to audiences all around the globe and have hosted interna-

tional meetings at their own institution bringing together many active researchers in clinical hypertension from Europe, Japan, and North America. This is a real credit to my colleagues in Sendai who have demonstrated such long-term dedication to their work. Studies in the Ohasama region have made a significant impact and have greatly enhanced our understanding of out-of-office blood pressure measurements and cardiovascular outcomes, particularly as it relates to genomics, the environment, and the management of hypertension.

**“Congratulations on the Ohasama Study”**

The establishment of the Ohasama Study in 1986 by Professor Yutaka Imai was a brilliant and far sighted initiative that has influenced the way hypertension is evaluated and managed worldwide and continues to improve our knowledge of this most important preventable risk factor.

The Ohasama Study more than any other has helped demonstrate the importance of measuring blood pressure not only in the clinic but also using ambulatory and home blood pressure recorders. These are now established in the clinical armamentarium of physicians treating hypertension and have become a gold standard in clinical research on hypertension.

Important information derived from the study has defined the distribution of a whole range of blood pressure parameters in a rural community in Japan and the results have held up when tested in other populations around the world. Reference values for these blood pressure measurements were established as well as their predictive capacity for mortality and for the major consequences of elevated blood pressure.

As early as 1997, major findings from the study were incorporated in the influential Report of the Joint National Committee from the United States. From 1999, they were included in the World Health Organization-International Society of Hypertension guidelines on the management of hypertension and have been a component of virtually every important guideline ever since.

Besides the contribution from this study of bringing home and ambulatory blood pressure measurements into the mainstream of clinical medicine, there have been many important co-findings defining, for example, the significance of variations in blood pressure and the relative importance of nighttime and daytime blood pressure.

For this and so much more, we are grateful to Yutaka Imai and his colleagues, the sponsors, and the citizens of Ohasama and look forward to many more important findings and landmark papers from the collaboration.



**Garry Jennings MD,**  
 Director Baker IDI Heart & Diabetes Institute,  
 Melbourne, Australia

**“The glory of Asia: The Ohasama Study”**

I got to know about the Ohasama Study more than 12 years ago when I first met with Dr. Takayoshi Ohkubo in Leuven. Dr. Ohkubo has recently left Sendai. However, nobody can deny that he is a key collaborator of Professor Imai, the father of the Ohasama Study, and is still a key player in the Ohasama Study.

I then started to pay close attention to the publications of the Ohasama Study. A few years later, I met with Professor Imai in Leuven during a meeting of the European Society of Hypertension Blood Pressure Monitoring Working Group. After I returned to China in 2003, I had more opportunities to meet with him at scientific meetings. I learnt a lot and am still learning from him, and from the Ohasama Study, for building my own research team and population cohorts in Shanghai. A few years ago, I was fortunate enough to be invited to join the International Advisory Board by Professor Imai for one of his large projects funded by the Japanese government.

The Ohasama Study is unique for many reasons. To begin with, it is the first, if not the only, large-scale population-based prospective observational study involving three different methods of blood pressure measurement, namely, clinic, home, and ambulatory blood pressure.

Secondly, it is the first population based study on hypertension and cardiovascular disease in Asia in which blood pressure was properly evaluated. Previous population studies in Asia often included blood pressure, but usually only had 1 or 2 readings obtained in the clinic.

Thirdly, the Ohasama Study assessed a large number of cardiovascular phenotypes, such as brain lesions measured by MRI, and investigated genetic determinations of these phenotypic measurements. Genes or genetic variants identified from either genome wide association studies or candidate gene research have to be tested in population studies, such as the Ohasama cohort.

Fourthly, the Ohasama Study is productive not only in enriching our knowledge on blood pressure and other cardiovascular measurements, but also in educating a group of young investigators on cardiovascular epidemiology. These young scientists will elaborate on the concept and spirit of the Ohasama Study wherever they are.

Fifthly, the Ohasama Study has established wide collaborations with several research groups inside and outside of Japan. These international collaborations allow us to do scientific research using a large, cross-ethnicity database.

Among the tremendous scientific contributions of the Ohasama Study, several are especially noteworthy. It helped establish normal or reference limits of home and ambulatory blood pressure monitoring on the basis of prospective data of cardiovascular events. These values had been incorporated in the Japanese hypertension guidelines and other national and international hypertension guidelines.

It helped to identify a number of genes or genetic variants that may be related to blood pressure regulation. A recent publication of the Ohasama Study first reported that a deletion/insertion polymorphism of the adrenomedullin 2 gene was associated with ambulatory blood pressure, renal function, and cerebrovascular lesions (Hypertens Res 2011; 34:1327-32).

The Ohasama Study built the scientific basis for several inventions in blood pressure monitoring. Professor Imai proposed the concept of bedtime blood pressure measurement according to a pre-defined clock time, which finally led to the invention of blood pressure monitors with this special function.



**Ji-Guang Wang, MD, PhD**  
 Professor of Cardiovascular Medicine  
 Director, The Shanghai Institute of Hypertension  
 Director, Centre for Epidemiological Studies and Clinical Trials  
 Ruijin Hospital  
 Shanghai Jiaotong University  
 School of Medicine  
 Shanghai, China.



**Jeong Bae Park, MD, PhD**  
 Professor of Medicine, Cheil General Hospital, Kwandong University  
 College of Medicine  
 Korea

**“Congratulations on the Ohasama Study History Book.”**

The Ohasama Study was initiated in 1986 by Professor Yutaka Imai, Tohoku University Graduate School of Pharmaceutical Science and Medicine, Japan, and has become an important milestone in a series of blood pressure (BP) behavioral studies to address the role of home and ambulatory BP in residents of Ohasama to their cardiovascular (CV) diseases for more than 10 years. The study is the first epidemiologic study to shed light on the superiority of home BP measurements and ambulatory BP monitoring over casual clinical BP for the prediction of future CV and cerebrovascular events and established the MUST-use of home BP in diagnosis and management of patients with hypertension rather than just clinical BP. Patients with a cutoff value of greater than 135/80mmHg by 24-hour monitoring and 135/85mmHg by home BP measurements are now classified as having hypertension and this standard is now accepted worldwide. The Ohasama Study also found that white coat hypertension, previously recognized as benign and false, predicts true hypertension 8 years later and higher CV events. They further discovered that higher BP at night, larger BP variability, and greater pulse rates at home are strongly and independently associated with a greater risk of CV mortality. The Ohasama Study has succeeded in providing valuable information on almost every respect of BP behavior in the general population and in patients with hypertension, and the tactics of the MUST-use of home BP has been applied in clinical practice far ahead of time. Thanks, Ohasama Study!

## In keeping with the evolution of medicine and technologies, the Ohasama Study continues to address challenges.

**More comprehensive and in-depth. To continue pursuing good health in people's lives, the Ohasama Study continues to address challenges including launching the new HOMED-BP Study.**

Based upon 25 years of substantial achievements and know-how, the Ohasama Study is now entering a new phase. For example, in antihypertensive treatment for hypertensive patients, to what extent should home blood pressure be lowered? The HOMED-BP Study\*, which has begun to establish a new standard for this antihypertensive target, is attracting remarkable attention at home and abroad as it attempts to review Japanese antihypertensive drug treatments, which have been dependent on evidence from the USA and Europe, and to provide evidence for the Japanese by the Japanese.

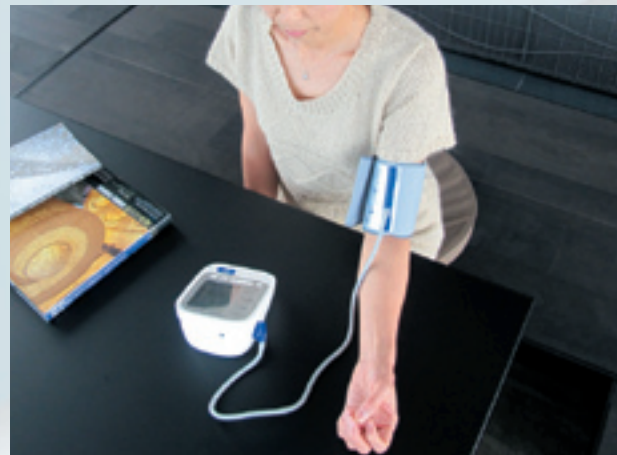
\*Hypertension Objective Treatment Based on Blood Pressure Measurement by Electrical Devices

**The Ohasama Study is the only research that has conducted continuous large-scale examination, including a total of 2,441 head MRI measurements, a total of 1,350 OGTTs, and a detailed lifestyle questionnaire survey of 4,268 participants.**

“It is not research but medical checkups.” As Dr. Imai says, the area of examination that the Ohasama Study covers now is not limited only to home blood pressure monitoring but has expanded to include fundus examination, electrocardiograms, head MRI scans, carotid artery echography, urinary albumin excretion, electrolyte, lipids, glucose tolerance, plasma renin activity, arteriosclerosis, dental examinations, and depression screening. It is expected that new findings on the correlation between home blood pressure and other indices will result from this examination data.



In line with our corporate attitude of “Contributing to healthy living through measurement technology”, Omron has been a consistent supporter of the Ohasama Study and contributor to the diffusion of home blood pressure monitors since we first provided 300 of them for the study in 1986. Featuring high accuracy and usability, our monitors made home blood pressure measurement familiar to and easier for the residents, and significantly raised their health awareness. According to its stage of advancement, the Ohasama Study has added the monitoring of central aortic blood pressure, pulse wave velocity (PWV) that measures arterial stiffness, and ABI that checks for blockage of arteries. For this wide range of measurements, Omron's “biometric sensing technology” and “algorithms” are utilized. Meeting the needs of patients and the medical world with its advanced technologies, Omron continues working together with the Ohasama Study for a healthy future.







Professor, Department of  
Planning for Drug Development  
and Clinical Evaluation, Tohoku  
University Graduate School

## Yutaka Imai

## Active health awareness leads to early detection of various diseases. Home blood pressure monitoring is an extremely useful and effective tool.

The scope of our study now includes not only the relationship between blood pressure and diseases but also the relationship between blood pressure and stress.

Since 1986, our laboratory has been studying the relationship between home blood pressure and diseases in Ohasama-machi, Iwate Prefecture. To date, our study has revealed that the home blood pressure values predict more accurately future adverse events than office blood pressure values, that “ambulatory blood pressure measurement”, in which blood pressure is measured every 30 minutes for 24 hours, can also accurately and appropriately predict future diseases, and even that those with small decreases in blood pressure during sleep are prone to diseases. In recent years, we have also been studying how lifestyle habits such as diet and exercise relate to disease and how mental health conditions including stress and depression are associated with diseases.



**We have been able to continue the study for so long because of the feedback provided to the participants.**

We have been working on the Ohasama Study to increase residents' motivation for good health by considering their viewpoint. Therefore, while the study is valuable research for us, it is a health checkup for the residents. At the beginning of the study, the examination was limited only to home blood pressure values, but it has expanded to include examination items for many other fields such as the head MRI scan, diabetes screening and dementia testing. For this reason, the health awareness level of town residents is very high. Even people whose blood pressure is not very high measure their blood pressure at home daily and they use these values as a health indicator.

**We have also seen a noticeable decrease in the number of cancer deaths.**

When I examined in detail how the Ohasama Study influenced the health awareness of residents, I found that the growth of health care costs was slowed and the total number of fatalities was reduced. This indicates that the residents' healthy life span was extended. Looking at the causes of death, deaths from cerebrovascular diseases remained unchanged, but deaths from cancer were apparently reduced.

I think that the early detection and early treatment of cancer can be attributed to changes in awareness of health as a result of home blood pressure monitoring and the like. This suggests that home blood pressure monitoring is an extremely valuable medical tool.

**We hope to continue positively patient education on home blood pressure monitoring.**

The data obtained from home blood pressure monitoring serves as very significant health information. According to one survey, 75% of hypertensive patients owned a home-use blood pressure monitor, but only 45% of these patients showed the data recorded on these units to their physicians.

In order to ensure effective use of the valuable data provided by home blood pressure monitors, practicing internists should promote awareness of the importance of home blood pressure monitoring among their patients.

# Good Health and Smiles. The people who supported the Ohasama Study

This study has lasted for so long thanks to the cooperation of Ohasama residents, who voluntarily measure their blood pressure at home daily, and the work of public health nurses who support them. Residents have cheerily made many favorable comments, such as “self-monitoring of blood pressure raises our health awareness incredibly.”

**Ms. Yuko Asanuma,**  
public health nurse



When you make a habit of monitoring your blood pressure, it becomes easier to notice health anomalies. I often hear people mention that they visited the hospital earlier than they otherwise would have and thereby kept their disease under control.

We have seen many people who were cured of illness thanks to the check-ups. The Ohasama Study was an event of great importance for us.



**Mr./Mrs. Toshinori and  
Chieko Sasaki**

When I ask someone what his or her blood pressure was that morning, I always receive an answer quickly. And it is also surprising that everyone can measure his or her blood pressure well.



**Ms. Naomi Fukushima,**  
nurse

In fact, as a result of this study, I was diagnosed with a disease. I have truly come to realize the importance of early detection and treatment.

Ms. Sasaki, who is also one of the study participants, was able to avoid the danger of sudden death because variant angina was detected using the Omron potable ECG monitor, even though the disease was not discovered in a hospital. In addition to home blood pressure monitors, Omron provides many other types of healthcare devices to contribute to health promotion for the residents in Ohasama.

**Ms. Toshiko Sasaki,**  
public health nurse



**Mr./Mrs. Keiichi and  
Matsu Sasaki**

We write down our daily blood pressure values in a notebook. I think that recording this information has helped us to stabilize our blood pressure.



**Mr. Akio Asanuma**

I've been participating in the Ohasama Study from the beginning. It's enjoyable because everyone has increased their health awareness, and all the participants know each other.



**Supervisor Yutaka Imai**

- 1946 Born in Maebashi City, Gunma Prefecture
- 1971 Graduated from Faculty of Medicine, Tohoku University
- 1975 Resident of Second Department of Internal Medicine, Tohoku University
- 1980 – 1982 Visiting Researcher, Department of Medicine, Monash University, Australia
- 1991 Assistant Professor, Second Department of Internal Medicine, Tohoku University Hospital
- 1998 Associate Professor, Second Department of Internal Medicine, Faculty of Medicine, Tohoku University
- 1999 Professor, Department of Clinical Pharmacology and Therapeutics, Tohoku University Graduate School of Pharmaceutical Sciences and Medicine
- 2000 Professor of Internal Medicine and Professor of Clinical Pharmacology and Therapeutics, School of Medicine, Tohoku University Graduate School of Medicine (concurrently assumed)
- 2000 Vice Director of Tohoku University Hospital Clinical Research Center
- 2004 Tohoku University 21 Century COE Program  
Program Leader of “Comprehensive Research and Education Center for Planning of Drug Development and Clinical Evaluation (CRESCENDO)”
- 2010 Professor, Department of Planning for Drug Development and Clinical Evaluation, Tohoku University Graduate School of Pharmaceutical Sciences

**Specialized field**

Cardiovascular internal medicine, Clinical pharmacology and epidemiology of hypertension, Analysis of blood pressure data

**Professional and society membership**

Serves as board member or councilor of the Japanese Society of Hypertension, Japanese Association for Cerebro-cardiovascular Disease Control, Japanese Association of Hypertension, Japanese Society of Internal Medicine, Japanese Circulation Society, Japan Geriatrics Society, Japan Epidemiological Association, International Society of Hypertension, Hypertension Council of American Heart Association, European Society of Hypertension, etc.

**Honors and awards received**

A number of awards including The 51st Kahoku Culture Award, Award of Minister of Education, Culture, Sports, Science and Technology, Prevention Prize of Japan Heart Foundation/Japanese Association for Cerebro-cardiovascular Disease Control, Japanese Society of Hypertension Award

# Omron will continue on this course as long as there is a path to follow.

Omron began to research healthcare measuring devices based on "health engineering" in 1961 and launched the first digital blood pressure monitor in 1973. Since then, we have continuously developed products that allow home blood pressure monitoring to be utilized for personal health management or in medical practice. During this process, we have continually refined "biometric sensing technologies" and improved "measurement algorithms" through numerous clinical trials conducted with the cooperation of medical institutions. Through the pursuit of accuracy and usability, as well as the utilization of these technologies and knowledge, Omron will continue contributing to health promotion by the dissemination of home blood pressure monitors.

## In OMRON

1961 The Central R&D Laboratory of Tateishi Electric (the forerunner of Omron) undertakes research on health and medical devices.

Started the development of a simple blood pressure monitor



Omron's first blood pressure monitor: manometer-typed manual monitor:HEM-1.

Establishment of Tateishi Life Science Laboratory (name changed to Omron Life Science Laboratory in 1990)



Omron's first digital blood pressure monitor for home-use: HEM-77



Omron's first digital automatic blood pressure monitor for home-use: HEM-88

First entry into the overseas market (Germany)



Digital manual blood pressure monitor (low price as below 10,000 JPY, first in the market)

Blood pressure monitor with oscillometric method: HEM-400C  
HEM-700C

**Omron provides blood pressure monitors for the Ohasama Study:**  
HEM-401C

## In the Medical World

1896 Riva Rocci in Italy introduced the first blood pressure monitoring method of pressuring the upper arm with a cuff.

1905 Nicolai Korotkoff in Russia published the article on the blood pressure monitoring by listening to the arterial sounds which occurred from cuff pressuring.

1961

1964

1966 The International Society of Hypertension (ISH) was established.

1973

1974

1977 World's first Guideline for hypertension treatment by Joint National Committee.

1978 The Japanese Society of Hypertension (JSH) was established.

1981

1982

1984

1985 "White-coat hypertension" was recognized overseas.

1986 **Ohasama Study was started.**

## In OMRON

Development of finger blood pressure monitor.

Acquired Marshall, an OEM provider in the U.S.  
Established branches in Germany and Hong Kong



World's first fuzzy logic automatic blood pressure monitor: HEM-706



Blood pressure monitor with constant-speed deflation control: HEM-707  
World's first wrist blood pressure monitor



Blood pressure monitor with world's fastest measurement technology: HEM-757



World's smallest wrist blood pressure monitor: HEM-630



New pre-formed cuff "Comfit Cuff" blood pressure monitor: HEM-770A



Japan's first wrist blood pressure monitor with advanced positioning sensor: HEM-6371T



Omron's blood pressure monitor sales exceeded 50 million units.



Omron's original blood pressure monitor with full automatic cuff wrapping system: HEM-1000



Industry-first blood pressure monitor with morning hypertension indicator



Developed solar-powered blood pressure monitor: HEM-4500-SOL

Downsized and lightened model blood pressure monitor: HEM-7301-IT

Sales of blood pressure monitors for home use exceeded 100 million units worldwide.



Wellness Link started. HEM-7250-IT

Sales of blood pressure monitors for home use exceeded 120 million units worldwide.

## In Medical World

1988 "Japanese Study Group for Physiology and Management of Blood Pressure" was established.  
"Nocturnal hypertension" was reported.

1990 First diagnosis guideline of "Guide for the Treatment of Hypertension" was presented by the Ministry of Health, Labor and Welfare and the Japan Medical Association.

1991

1992

1996 The Ohasama Study was adopted as a guideline by the Joint National Committee of the U.S.A.

1999 The Ohasama Study was adopted as WHO guidelines.

2000 First "Guideline for Hypertension Treatment" was launched by Japan Society of Hypertension.

2001

2002 "HOMED-BP Study (monitor long-term prognosis of hypertension patients with the guidelines of self-measured blood pressure at home)," with participation from Tohoku University and many other medical institutes in Japan, is started.

2003 "Guidelines for Self-monitoring of Blood Pressure Monitor at Home" was launched by Japan Society of Hypertension. It expresses how to monitor and the standard value of blood pressure specifically.

2004 The Ohasama Study was adopted as a guideline by the European Society of Hypertension.

2006

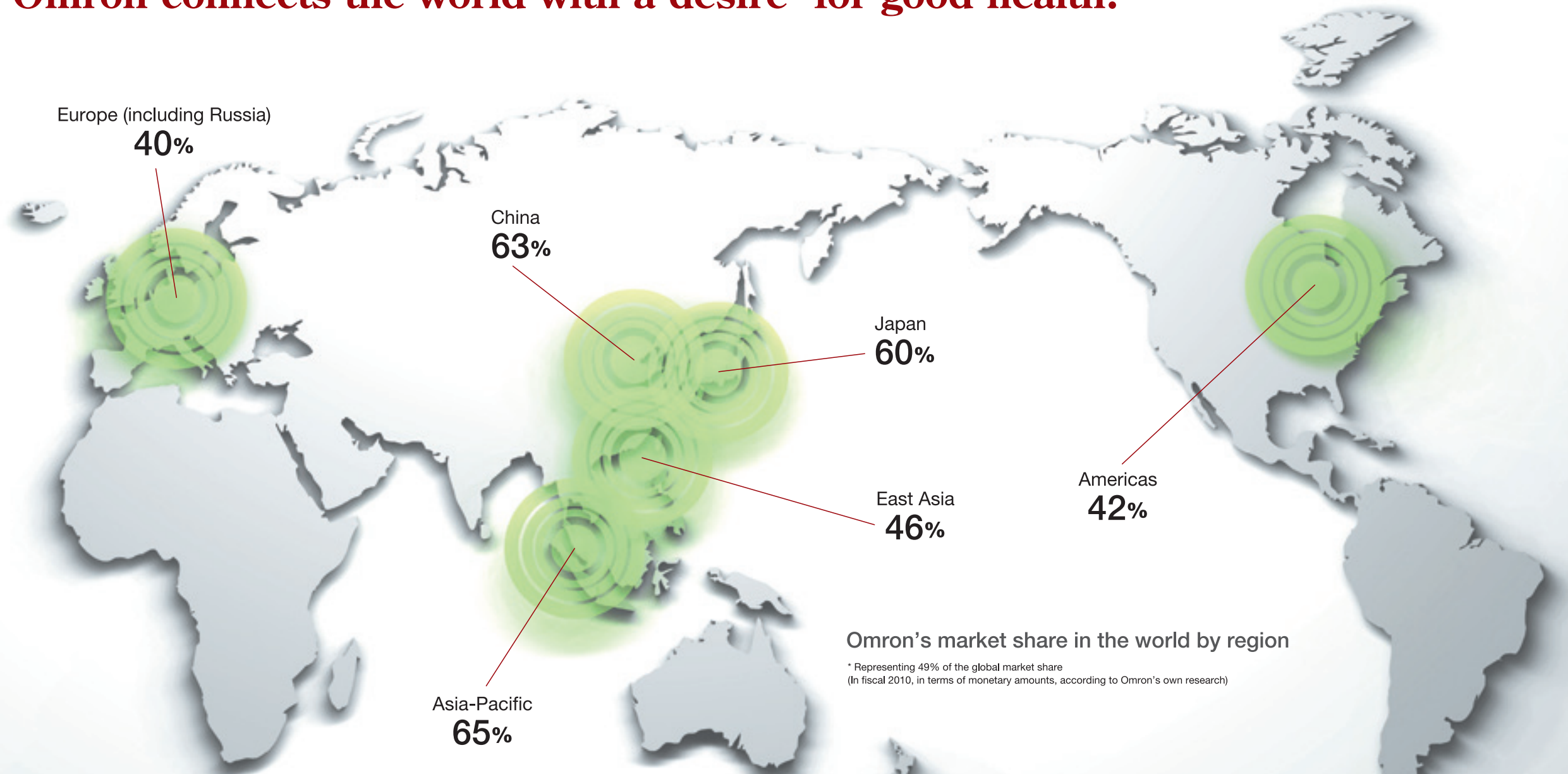
2008

2009 Normal blood pressure level of home monitoring was outlined as "less than 125/80 mmHg (less than 135/85 mmHg for elderly people)" in "Hypertension Treatment Guidelines 2009" published by Japan Society of Hypertension.

2010

2011

# Ranked No. 1 in the global market share for home-use blood pressure monitors.\* Omron connects the world with a desire for good health.



## Why Omron products have been continuously well received in many countries across the world

As of September 2011, the cumulative total unit of Omron blood pressure monitors sold globally exceeds 120 million. Omron is also ranked No. 1 in global market share, with an overwhelming 49%. These figures demonstrate our customers' confidence in Omron products both in Japan and abroad. At Omron, we constantly strive to prove ourselves worthy of the confidence and support of our customers all over the world by putting a sharp focus ensuring the accuracy and usability of our products in tangible ways, while also providing intangible benefits in the form of improvements in service and maintenance systems.

■ Omron won the 1st prize in the category of Pharmacist-recommended blood pressure monitor in "Pharmacy Today (February 2011 Issue)" published by the American Pharmacists Association. Compared to the manufacturer that was ranked second with a recommendation rating of 7%, Omron enjoyed overwhelming popularity with a rating of 61%.

■ Omron's blood pressure monitor has been awarded the gold prize in seven consecutive years by "Best Pharmacy Partner" where pharmacies in Germany select innovative technologies and excellent services.

■ Looking to our global activities, Omron has served as the Japanese representative on the Blood Pressure Monitor Standards Development Committee in the International Organization for Standardization (ISO) since 2002, and actively participates in World Health Organization (WHO) projects, including the "development of low-cost solar-powered blood pressure monitors" that started in 2008 to promote blood pressure monitoring in areas with limited healthcare resources.

■ As part of our social action program, Omron supported the activities of UNICEF through the donation of a portion of home-use blood pressure monitor sales. By providing healthcare services, such as vaccination and vitamin A supplementation intended for about 50,000 individuals including children below the age of five and pregnant women, we carried out our mission of "Contributing to the realization of a healthy and comfortable life for people around the world".