Quality of care should be a core value within modern healthcare systems. Cardiovascular medicine is one of the most advanced medical subspecialties in providing evidence-based, state-of-the-art practices in developed countries. In spite of this, in the USA, medical interventions, not diseases themselves, resulted in approximately 44,000–98,000 fatalities per year and roughly 1 in 100 patients admitted to hospitals died because of a medical intervention. The risk of undergoing medical care is considered the worst compared to many industries and other human activities (Figure 1). We are aware that medicine has saved many more lives in history; therefore, we have conducted much research in both basic and clinical sciences to maximize saved lives and minimize injuries from medical interventions. Much clinical research has attempted to explore the association between disease management and patient outcomes, whereas basic science research has investigated the principles of such association, even before the association has been identified.

Clinical researchers investigate the association between disease management, such as drugs, devices, diagnostic tools, severity classification, and symptom gradients, and patient outcomes, including some surrogate measures. Well-conducted research has provided data relevant to clinical practice, and many more patients who were not investigated under the researches also receive the benefit of such proven disease management. However, who would not enjoy the state-of-the-art practice? Of course, there are other factors that become obstacles to the dissemination of state-of-the-art practice, such as lack of funds or a lower educational level of patients and the general public. Japan is a unique country among the developed countries in that, within its healthcare system, all patients can receive ideal standard practice under universal healthcare insurance with limited payment. If there is any variation in disease management between patients, however, the reasons

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![Figure 1. Quality metrics of major industries and human activities. (Adapted with permission from Amalberti R, et al.)](image-url)
should be considered.

It is not necessarily the case that similar patients received the same care. Some of the reasons are differences in the diseases themselves or patient preferences, but one significant reason is variation, which we term “quality of care”. Typically, quality of care is determined and measured by (1) structure, (2) process, and (3) outcome. To clarify the issues in quality of care, I have differentiated surrogates from outcomes, and imputed governance and healthcare regulations (Figure 2). The definitions of quality of care and its components are difficult to determine, and several definitions have been reported, but one definition of quality care is “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge”. Structure is defined as “the facilities, equipment, services, and manpower available for care and the credentials and qualifications of the health care professionals involved”. How is structure determined? Governance and healthcare regulations typically determine the components of structure, such as people and equipment invested. Process is defined as “content of care”, in other words, “how the patient is moved into, through, and out of the health care system and the services that are provided during the care episode”. Outcomes vary widely from biological changes in disease to physical function or satisfaction of family members, but we should be aware that some of the commonly utilized outcome measures are surrogates, such as the naming of physical conditions or change in blood components (vs. avoidance of cardiovascular events).

Many clinical researchers have tried to provide evidence for the associations between process and outcomes. Relationships between the use of drugs or devices and difference in incidences of diseases are typical examples. For instance, we have explored the association of the unrestricted use of drug-eluting stents (DES) and major cardiovascular events in patients with acute coronary syndrome (ACS). In that study, the process was the unrestricted use of DES in patients with ACS and the outcomes were all-cause death, myocardial infarction, definite stent thrombosis, stroke, any coronary revascularization, and major bleeding. It has been claimed that the unrestricted use of DES for patients with ACS is safe. Thus, can we say that the quality of care of patients with ACS should improve if we used DES rather than other treatment modalities? This phrase may or may not be true. There are many alternative explanations for particular observations, and no one can know the absolute truth. No observation is free from bias and confounders, even in well-conducted randomized controlled trials. There are also many issues with the lack of evidence for associations between process and outcomes, as well as with associations between frequently used surrogates and patient-oriented outcomes (Figure 2). We have to recognize the many limitations inherent to any clinical research. Thus, in the future, we should conduct more solid clinical research to confirm previous observed findings and explore new associations to improve the quality of care.

Expanding the scope from the typical clinical research (red-bordered square in Figure 2), we should be aware of other important components in the quality of care, namely structure and its determinants (governance and healthcare regulations). If the findings that suggest the unrestricted use of DES improved the long-term outcomes in patients with ACS are true, does the quality of care for such patients improve? The answer is no. If DES use were not approved for ACS patients? If the charge was not reimbursed by the insurance? If the ACS patient was not diagnosed correctly? If such patients cannot meet capable interventional cardiologists within the appropriate time? If radiology technicians are not available when such patients arrived? If, if, if… We are now aware of the importance of structure, governance, and healthcare systems to achieve state-of-the-art medical excellence in real-world medicine.

In this issue of the Journal, Tomoike and colleagues provide an excellent view on the geographical distribution of medical resources in cardiovascular medicine as part of a Japanese Circulation Society project. Readers should keep in mind that it is not necessarily the case that similar patients received the same care. Some of the reasons are differences in the diseases themselves or patient preferences, but one significant reason is variation, which we term “quality of care”. Typically, quality of care is determined and measured by (1) structure, (2) process, and (3) outcome.
mind that this report was based on a limited number of hospitals that responded to the survey, which the authors note as a limitation. However, the authors did their best to compare their data with the national census. It is also vital to keep in mind that urban areas had more resources whereas rural areas had fewer even in the same prefecture. The authors compared the resources in cardiovascular medicine to the population and obtained Gini coefficients. The Gini coefficient is a well-known scale of inequality, which ranges from 0 (perfect equality, ie, everyone has the same resources) to 1 (perfect inequality, ie, only one has all resources while all others have none). To better explain this, I will use a monetary example. The Gini coefficient of wealth in Japan was 0.32 in 2008 and that of the USA was 0.41 in 2010. Those of African countries were generally greater than 0.5. The Gini coefficient of wealth in Finland, a country well known for higher equality in healthcare, was still 0.28 in 2010. Compared with the index of wealth distribution, cardiovascular medicine generally provided equal practice, by comparison of the Gini coefficients, at approximately 0.15 among the surveyed hospitals in Japan. The study also sheds light on an area that needs improvement. The Gini coefficients of pediatric care were greater than 0.25.

These data represent one aspect of the structure of cardiovascular medicine in Japan. To improve the structure, good governance and good healthcare regulations are needed. As shown in the article, the equality of healthcare is generally good in Japan, but we still need the support of healthcare regulations. The breakdown of structure occurs if governance is poor or if age deterioration is allowed to occur. We frequently encounter a mismatch between structure and process in many aspects of reality. This article does not demonstrate the association between structure and process or outcomes. Therefore, well-designed clinical research studies to confirm the relationship between structure and true outcomes are strongly needed.

**Conflict of Interest**

Nothing to declare.

**References**