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The Taiwan Heart Registries

Its Influence on Cardiovascular Patient Care

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ABSTRACT

Taiwanese heart registries for the main cardiovascular diseases have been conducted in the past 10 years, with the goal of examining the quality of cardiovascular patient care, which cannot be guaranteed by the universal Taiwan National Health Insurance. The results show suboptimal adherence to guideline recommendations. Door-to-balloon time and dual antiplatelet therapy use in acute coronary syndrome, standard medications for management of heart failure, low-density lipoprotein cholesterol levels in dyslipidemia, anticoagulant agent use in atrial fibrillation, and the understanding of sudden arrhythmia death syndrome were all found to be inadequate. However, all were improved, either by changing National Health Insurance policy or through continuous education for physicians and patients. Thus, specific cardiovascular disease registries could help examine the status of real-world practice, find inadequacies in guideline implementation and understanding of rare diseases, facilitate lobbying to policy makers and education for physicians and patients, and influence and improve cardiovascular patient care. (J Am Coll Cardiol 2018;71:1273–83) © 2018 by the American College of Cardiology Foundation.

Taiwan is an island country, located at the western Pacific Rim, southeast of mainland China. It has a land area of about 36,000 km^2, 23 million residents, 490 hospitals, and 26 medical centers. In March 1995, Taiwan established a universal National Health Insurance (NHI), which covers about 98% of the population. This program has attracted worldwide attention, not only because of its low cost and improved access to the health care system, but also for its real impact on increasing life expectancy and narrowing health disparities. Health care reform was associated with reductions in deaths of patients who were previously unlikely to have been insured and of patients with cardiovascular conditions (1).

In the NHI cohort dataset, the patients' original identification numbers are encrypted to protect privacy, and the encrypting procedure is consistent so that it is feasible to link the claims for each patient within the National Health Insurance research database (NHIRD). Thus, all patient data can be followed up continuously. This large dataset provides a good opportunity to retrospectively study disease epidemiology, pharmacology, comorbidities, and outcomes, including for cardiovascular diseases. Many scientific papers have been published using the data from the NHIRD in the past several years.

Although the Taiwan NHI program is successful in terms of its low cost and high satisfaction, it is not without problems. First, is a social and political problem: as a publicly managed policy, it cannot avoid political interference, which contributes to the ongoing budget deficit. Second, the NHIRD lacks detailed demographic and laboratory data for patients; thus, real-world medical practice status cannot be obtained from the data. Therefore, disease-specific registries to evaluate the status of contemporary medical practice and whether it adheres to guidelines are mandatory. In the past 10 years, several cardiovascular disease registries have been conducted in Taiwan. These include registries of acute coronary syndrome (ACS), heart failure (HF), dyslipidemia,

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ABBREVIATIONS AND ACRONYMS

AF = atrial fibrillation

ASCVD = atherosclerotic cardiovascular disease

BP = blood pressure

CPVT = catecholaminergic polymorphic ventricular tachycardia

D2B = door-to-balloon

HFpEF = heart failure with preserved ejection fraction

HFrEF = heart failure with reduced ejection fraction

IVF = idiopathic ventricular fibrillation

LDL-C = low-density lipoprotein cholesterol

LQTS = long QT syndrome

LVEF = left ventricular ejection fraction

NSTE-ACS = non-ST-segment elevation acute coronary syndrome

NSTEMI = non-ST-segment elevation myocardial infarction

PCI = percutaneous coronary intervention

SADS = sudden arrhythmic death syndrome

atrial fibrillation (AF), and sudden arrhythmic death syndrome (SADS). The percentage of enrolled patients with a specific disease of interest varies. For example, an estimated 24.4% of patients with ACS were captured in the ACS registry, and nearly 0.1% of patients with dyslipidemia were captured in the dyslipidemia registry (2,3). This review will discuss how these registries have influenced and continue to influence cardiovascular patient care in Taiwan (**Central Illustration**).

ACS REGISTRY

ACS, which includes ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI), and unstable angina, is now the most common cardiovascular disease in Taiwan. The age-adjusted incidence of acute myocardial infarction (MI) continuously increased, from 28.0/100,000 person-years in 1999 to 44.4/100,000 person-years in 2008 (4). The incidence seems to have plateaued after 2008, and was approximately 40 to 42/100,000 person-years from 2008 to 2011 (2). The percentage of STEMI decreased and that of NSTEMI increased progressively. In 2011, STEMI accounted for 33.2% of all acute MI cases, with the remainder being NSTEMI (2). Overall, the crude in-hospital mortality rate for acute MI in Taiwan decreased from 9.1% in 1997 to 6.5% in 2011. In NSTEMI, the mortality rate decreased from 12.2% to 7.2%, whereas the mortality rate of STEMI decreased from 7.3% to 5.1%.

The Taiwan Society of Cardiology (TSOC) established 2 nationwide ACS registries. The first registry, from October 2008 to January 2010, included 3,183 adult patients (≥20 years of age) with ACS who were admitted within 24 h to the 39 major hospitals in Taiwan (5). The second registry, from April 2012 to December 2015, recruited 2,357 patients with ACS who received percutaneous coronary intervention (PCI) during hospitalization from 24 hospitals, using the same inclusion criteria as the first registry (6). These 24 hospitals also joined the first registry. The cardiologists who recruited the cases were responsible for diagnosis and management, based on recommendations from international and local guidelines (7–9).

From the registries' results, we found several important issues relating to the quality of care for patients with ACS in Taiwan. The first issue concerns the door-to-balloon (D2B) time for PCI in ACS. PCI has become the major revascularization strategy for ACS in Taiwan, even in remote rural areas (10). For patients with STEMI in the first registry, primary PCI was performed in 97% of STEMI cases, whereas thrombolytic therapy was used in only 3%. The median D2B time in primary PCI was 96 min. In the first registry, the D2B time was long, with marked variability between different hospitals (5). After the registry results were reported, the NHI was inspired to initiate a national audit project in 2009 to improve the quality of ACS care. A recognized high-grade ACS care center must fulfill the criteria that primary PCI can be provided around the clock throughout the year and that ≥75% of treated patients with STEMI can achieve a D2B time of <90 min. This verification is necessary for an institution to be recognized as a major medical center by hospital accreditation from the government. Because the NHI is the only payer in the Taiwanese health care system, it can decide and regulate fees, and government-certified medical centers can obtain higher reimbursement than noncertified centers. After 2009, different hospitals in Taiwan developed various innovations of the strategies to shorten D2B time, including establishment of a regional network transfer system, an onsite cardiology team in the emergency room, direct emergency room tele-electrocardiographic triage of patients with chest pain, or a multiple-strategy approach (11–14). Through these efforts, the median D2B time was shortened to 71 min in the second registry. There was a corresponding increase in the percentage of patients with D2B <90 min (from 47% to 63%) between the 2 registries (6). The data from our first registry showed that a shorter D2B time (<45 min) had no further benefit for in-hospital mortality for patients with STEMI in Taiwan (15). This result was similar to a previous observation from the Cath-PCI Registry study in the United States, which showed that there was no further reduction of mortality with a shorter D2B time when it was <90 min (16).

PCI was performed in 75% of the non-ST-segment elevation acute coronary syndrome (NSTE-ACS) cases in the first registry (5). The median D2B times for patients with NSTE-ACS in the 2 registries were 42 and 33 h, respectively (6). In an analysis of the timing of PCI in patients with NSTE-ACS from our first registry, high-risk patients, defined as having Thrombolysis In Myocardial Infarction risk score ≥5 with PCI at 24 to 72 h from symptom onset, had the lowest risk of the primary endpoints (cardiac death or recurrent MI) at