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Association of Physician Certification Policy and Quality of Care: Evidence of percutaneous coronary intervention certification program in Taiwan

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ABSTRACT

Objectives: The aim of this study was to compare procedural, short-term and two-year outcomes of percutaneous coronary intervention (PCI) between board-certified and non-board certified interventional cardiologists in Taiwan.
Background: Most studies of associations between quality and certification have analyzed populations in the Western developed countries.
Methods: This retrospective population-based study analyzed 2057 patients who had received PCI in 11 hospitals in 2007. The outcome measures were procedural, 30-day, and 2-year adverse events.
Results: Sixty certified physicians performed 1771 PCI procedures whereas 84 non-certified physicians performed 286 procedures. Patients treated by non-certified physicians had significantly higher rates of in-hospital mortality (6.99% vs. 2.82%, respectively; $p \leq 0.001$) and same-stay CABG (1.40% vs. 0.06%, respectively; $p \leq 0.001$). The results of multilevel logistic regression and Cox multivariate regression indicated that patients treated by non-certified physicians also had higher probabilities of in-hospital death (OR = 2.92, 95% CI: 1.20–7.08) and two-year death (hazard ratio, 1.63; 95% confidence interval, 1.18–2.24).
Conclusions: This is the first study in Asia in investigating the association between board certification policy and surgical outcomes, and the results confirmed that the board certification policy is also effective for Asian population. The policy implications of these findings are discussed.

1. Introduction

The clinical competency and knowledge of healthcare professionals are essential for good clinical outcomes and must be ensured by training courses and criteria

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established by professional associations of medical specialists. Ideally, board certification in a medical specialty provides the structural domain needed for high quality in process and outcome domains [1]. Studies generally agree that board certification in medical and surgical specialties positively affects care quality [2,3]. In addition to certifications in medical specialties and subspecialties, the American Board of Internal Medicine has begun offering certifications in certain life-threatening procedures such as interventional cardiology and electrophysiology [4,5]. Growing evidence of the positive association between volume and clinical outcomes [6–10] has increased the use of physician operated level as a criterion for initial credentialing and subsequent renewal [11–13]. Studies of associations between board certification in a cardiology procedure and outcomes [4,14,15] consistently show a positive association [4,15].

The prevalence of cardiovascular disease was lower in Asian population than that of non-Asian population [16]. A longitudinal study found that Asian population had a lower Major Adverse Cardio Event (MACE) than that of white population after percutaneous coronary intervention (PCI) procedure [17]. Even low in prevalence rate in cardiovascular disease in Asian population, the PCI surgical procedures have been increasing over years at selected Asian population [18,19]. Most of studies on the topic of the association between board certification and clinical outcomes have been performed in populations in the US and in other developed countries [3,4,14]. There is still lack of empirical evidence regarding how a certification policy in PCI affects prognosis in an Asian population. To improve the competency of PCI operators and to maintain high quality, the Taiwan Society of Cardiology adopted a program for certifying interventional cardiologists in 2007, which was based on a similar program adopted in the United States in 1999 [5,12]. The aim of this study was to compare procedural outcomes, 30-day outcomes between patients treated by board-certified and non-board certified interventional cardiologists. Survival at 2 years after PCI discharge was also compared between the two groups of patients. Further we assumed that the effect of board certification policy may not differ between Asian and non-Asian population though difference was found in PCI surgical outcomes between racial groups.

2. Materials and methods

2.1. Data source

This retrospective population-based study analyzed administrative claims data obtained from the Southern branch of the National Health Insurance (NHI) bureau. The analysis included claims data for all PCI procedures performed in all hospitals located in the southern Taiwan region. To obtain reimbursement from the compulsory universal health insurance system, all participating hospitals that provide acute inpatient care must contract with the NHI to provide care for their beneficiaries. Therefore, the NHI administrative claim is the largest and most complete healthcare dataset in the country. The use of such datasets in clinical research has some limitations but has been validated in many studies [20,21].

2.2. Study sample

The subjects were patients aged 45 and over who received PCI in 2007, one year after implementation of the PCI certification program. Patients who had received PCI procedures were identified by procedure codes 36.00, 36.01, 36.02, 36.05, 36.06 and 36.09 in the *International Classification of Disease*, Ninth Revision, Clinical Modification; (ICD-9-CM), and those who had received coronary artery bypass graft (CABG) were identified by procedure code 36.1. In addition to ICD-9-CM codes, data collection included the type and number of stents received by each patient. The analysis excluded patients who had received PCI or CABG within the previous year and patients who had received both bare metal stent (BMS) and drug-eluting stent (DES) at the same admission. Therefore, the final study population included 2057 patients who had received coronary vessel stent implantation procedures in 11 hospitals. All patients were followed up for 2 years after discharge or until death, whichever occurred first.

2.3. Board certification in interventional cardiology

After recognizing the advantage and benefit of the program for board certification in interventional cardiology established by the American Board of Internal Medicine, the Taiwan Society of Cardiology implemented a PCI certification program 2007. A physician can apply for a board certification in PCI only after completing all necessary training at training institutions and after performing at least 75 interventional procedures. Notably, the minimum of 75 interventional procedures required for certification in Taiwan is much lower the minimum of 250 procedures required in the United States. The selected threshold of 75 procedures was based on the annual PCI caseload suggested by the ACCF/AHA/SCAI task force [13] for maintaining the minimum proficiency required to perform the procedure. Taiwan hospitals and physicians are also required to provide their certification identification numbers to receive reimbursement from the BNHI. The certification status of each physician was easily determined since the NHI dataset includes all board certification information.

2.4. Outcome measures

During the index hospitalization period, data for two procedural outcomes, in-hospital mortality and same-stay CABG were collected as in previous studies [5,12,22]. In-hospital mortality was defined as any death during hospitalization for a PCI procedure, whether or not the death was associated with PCI. The same-stay CABG was defined as CABG performed after a PCI and during the same hospital admission. Myocardial infarction (MI) was excluded since defining MI has proven to be problematic [13]. At 30 days and at 24 months after PCI discharge, three outcomes were recorded, death, hospital admission for myocardial