

The Management and Prognostic Factors of Acute Coronary Syndrome: Evidence from the Taiwan Acute Coronary Syndrome Full Spectrum Registry

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Cardiovascular disease (CVD) accounts for approximately one-third of all global deaths, and acute coronary syndrome (ACS) is the most severe form of CVD. It is of notable importance to develop ACS strategies for reducing major adverse cardiac events (MACE) and preventing complications. In the Taiwan ACS Full Spectrum Registry, 1-year mortality among patients with ST-segment elevation myocardial infarction, non ST-segment elevation myocardial infarction and unstable angina was 6.1%, 10.1%, and 6.2%, respectively. ACS patients with diabetes had significantly worse outcomes in terms of all-cause death and MACE compared to those without diabetes. In-hospital bleeding or chronic kidney disease (CKD) was independently associated with MACE, and ACS patients with both bleeding and CKD had the worst outcome. Use of clopidogrel in conjunction with an invasive strategy could decrease mortality and improve outcomes in the CKD population. CHADS₂ and CHA₂DS₂-VASc scores were useful predictors of subsequent MACE, and renal dysfunction could further improve the prognostic impact of the CHA₂DS₂-VASc score. For high-risk patients with non-ST-elevation acute coronary syndrome (NSTEMI-ACS), percutaneous coronary intervention (PCI) within 24-72 hours from symptom onset was demonstrably the optimal time. Suboptimal secondary preventive therapy demonstrated a need for further improvement. The ACS Full Spectrum Registry provided an in-depth analysis of ACS management in Taiwan.

Key Words: Bleeding • CHA₂DS₂-VASc • Chronic kidney disease • Diabetes • NSTEMI-ACS • Taiwan Acute Coronary Syndrome Full Spectrum Registry

INTRODUCTION

Cardiovascular disease (CVD) accounts for approximately one-third of global deaths, and coronary artery disease (CAD) is the leading cause of mortality and dis-

abilities both in developing and developed countries.¹ A more westernized lifestyle in the larger Asian population has resulted in an increased prevalence of CVD over the past decades. In Taiwan, CVD is the second-most common cause of mortality since 2010.² Acute coronary syndrome (ACS) is the most severe form of CVD and causes social and economic disasters in the middle-aged population, as well as having a major impact on morbidity and mortality in the whole country. Therefore, it is of notable importance to develop ACS strategies for reducing major adverse cardiac events (MACE) and preventing complications. The Taiwan Society of Cardiology (TSOC) had previously conducted a nation-wide registry in 39 hospitals, the Taiwan ACS Full Spectrum Registry, to evaluate the real-world data and medical practice in

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managing ACS patients. A total of 3183 patients were enrolled from October 2008 to January 2010 with a prospective, national, multicenter, non-interventional, and observational design. Patient recruitment and definition of ACS had been previously described in detail.³ In brief, patients who were aged 20 years or older, who were admitted to the hospital within 24 hours of first noting symptoms of ACS and who provided informed consent were eligible to be included in the study. Patient data, such as baseline characteristics, risk factors, clinical presentation, clinical diagnosis, in-hospital interventions as well as medications prescribed were collected from the time of admission to discharge. Patients were followed up at 3, 6, 9 and 12 months post-discharge and data were collected on medication usage, revascularization strategy, as well as clinical events such as death, myocardial infarction (MI), stroke, revascularization and re-hospitalization. Monitoring for source documentation and accuracy was performed in 5% of all case report forms at each recruiting site. This study was carried out in accordance with the local regulatory guidelines and international guidelines for Good Epidemiological Practice.⁴ Ethics committee approval was obtained at all trial sites, and written informed consent was given by the pa-

tients for their information to be stored in the hospital database and used for research. A total of 10 papers have been published from the Taiwan ACS Full Spectrum Registry through January 2016 (Table 1). In the present manuscript, we performed a mini-review describing different aspects of research from the above-mentioned papers to provide an in-depth quantitative analysis of ACS management in Taiwan.

CLINICAL CHARACTERISTICS, MANAGEMENT AND IN-HOSPITAL OUTCOMES

ACS is a result of atherosclerotic and thrombotic processes. It includes ST-segment elevation myocardial infarction (STEMI), non-STEMI (NSTEMI) and unstable angina (UA). Although clinical guidelines for ACS management have been published to allow high-quality patient care on a daily basis,⁵⁻⁸ observations from international registries indicate that ACS guidelines are not followed.⁹⁻¹¹ Published data from the Taiwan Acute Coronary Syndrome Descriptive Registry (T-ACCORD, a registry of UA and non-STEMI patients) also shows a similar gap between evidence-based guidelines and clinical

Table 1. Summary of 10 papers published from the Taiwan ACS full spectrum registry

Year	Titles	Study questions	Conclusions	References
2011	Clinical characteristics, management and in-hospital outcomes of patients with acute coronary syndrome - observations from the Taiwan ACS full spectrum registry	Current practices in ACS management, adherence to guidelines and in-hospital outcomes	Median DTN and DTB times were higher. Secondary preventive therapy during the in-hospital stay and at discharge were suboptimal. There is a need to close the gap between the guidelines and the actual ACS clinical management in Taiwan.	3
2013	Effects of clopidogrel on mortality, cardiovascular and bleeding outcomes in patients with chronic kidney disease - data from Taiwan acute coronary syndrome full spectrum registry	The efficacy and safety of clopidogrel in patients with ACS and CKD	Clopidogrel could decrease mortality and improve cardiovascular outcomes without increasing risk of bleeding in ACS patients with CKD.	18
2014	Predictors of 1-year outcomes in the Taiwan acute coronary syndrome full spectrum registry	Evaluate the ACS management and identify the predictors of clinical outcomes of death/myocardial infarction/stroke 1 year post hospital discharge	Policy adherence, especially with regard to dual antiplatelet therapy may hold the key to long-term favorable outcomes and improved survival rates in ACS patients in Taiwan.	13

Table 1. Continued

Year	Titles	Study questions	Conclusions	References
2014	Impact of impaired glomerular filtration rate and revascularization strategy on one-year cardiovascular events in acute coronary syndrome: data from Taiwan acute coronary syndrome full spectrum registry	The prognosis and impact of IGFR and invasive strategy on the cardiovascular outcomes in the ACS population	IGFR patients suffering from ACS had poor prognosis. An invasive strategy could improve cardiovascular outcome in the NSTE-ACS population.	21
2014	Use of CHADS ₂ and CHA ₂ DS ₂ -VASC scores to predict subsequent myocardial infarction, stroke, and death in patients with acute coronary syndrome: data from Taiwan acute coronary syndrome full spectrum registry	Whether CHADS ₂ and CHA ₂ DS ₂ -VASC scores were useful tools to assess the risk for adverse events among ACS patients	CHADS ₂ and CHA ₂ DS ₂ -VASC score were useful predictors of subsequent adverse events in ACS patients.	28
2015	Additive effect of in-hospital TIMI bleeding and chronic kidney disease on 1-year cardiovascular events in patients with acute coronary syndrome: data from Taiwan acute coronary syndrome full spectrum registry	Whether increased risk of CVE by IHB is influenced by CKD or both have detrimental effects on CVE	IHB or CKD is independently associated with poor cardiovascular outcome. Patients with both IHB and CKD have the worst outcome in ACS.	36
2015	Effects of door-to-balloon times on outcomes in Taiwanese patients receiving primary percutaneous coronary intervention: a report of Taiwan acute coronary syndrome full spectrum registry	The relationship between stratified DTB time and outcomes	DTB time is not a good determinant for outcomes in Taiwanese patients receiving primary PCI.	47
2016	Prognostic impact of renal dysfunction in patients with acute coronary syndrome-role beyond the CHA ₂ DS ₂ -VASC score: data from Taiwan acute coronary syndrome full spectrum registry	Whether the addition of renal dysfunction in the CHA ₂ DS ₂ -VASC score would improve the prognostic impact of the scoring system to predict prognosis among ACS patients	Renal dysfunction is a significant risk factor of future adverse events in ACS patients and may improve the prognostic impact of the CHA ₂ DS ₂ -VASC score.	32
2016	The relation between the timing of percutaneous coronary intervention and outcomes in patients with acute coronary syndrome with routine invasive strategy - data from Taiwan acute coronary syndrome full spectrum data registry	Optimal timing for high-risk NSTE-ACS patients	PCI within 24-72 hours from symptom onset is demonstrably the optimum time for high-risk NSTE-ACS patients. Delayed PCI over 72 hours is associated with the worst outcomes and should be avoided. For patients with low risks, routine early PCI < 24 hours after PCI is not beneficial.	55
2016	Diabetes and adverse cardiovascular outcomes in patients with acute coronary syndrome - data from Taiwan's acute coronary syndrome full spectrum data registry	The effect of Diabetes on adverse cardiovascular outcomes in ACS patients	Compared to patients without Diabetes, ACS patients with diabetes had significantly worse outcomes in terms of all-cause death and the combined results for death, re-infarction and stroke.	60

ACS, acute coronary syndrome; CKD, chronic kidney disease; CVE, cardiovascular events; DTB, door-to-balloon; DTN, door-to-needle; IGFR, impaired glomerular filtration rate; IHB, in-hospital bleeding; NSTE-ACS, non-ST-elevation acute coronary syndrome; PCI, percutaneous coronary Intervention; TIMI, thrombolysis in myocardial infarction.

practice in Taiwan; the research concluded that the prescription rate of dual antiplatelet therapy (DAPT) declined over time, mainly due to the physician's judgment leading to the discontinuation of clopidogrel and adherence to DAPT was associated with lower total mortality at 1 year.¹² Of the 3183 patients enrolled in the Taiwan Acute Coronary Syndrome Full Spectrum Registry, 52.3% were diagnosed with STEMI. Percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) were performed on 84.4% and 3.3% of the patients, respectively. Median door-to-needle (DTN) and door-to-balloon (DTB) times for reperfusion strategies in the STEMI patients were 65 and 96 minutes, respectively. DAPT with aspirin and clopidogrel was prescribed to 88.2% of the patients during admission and to 74.8% at discharge. At the time of discharge, beta-blockers were prescribed to 53.4% of the patients, statins to 60.5% and renin-angiotensin-aldosterone system (RAS) blockers to 63.0% of the patients. The overall in-hospital mortality was 1.8% and it was higher for STEMI patients (2.3%) than for non-STEMI patients (1.0%). In Taiwan, longer median DTN and DTB times and suboptimal therapy in secondary prevention demonstrated a need to narrow the gap between the guidelines and the real world ACS clinical management.³

PREDICTORS OF 1-YEAR OUTCOMES

1-year mortality among patients with STEMI, NSTEMI and UA was 6.1%, 10.1%, and 6.2%, respectively. DAPT fell from 74.8% of patients at discharge to 24.9% of patients at the 1-year follow-up. Patients who received aspirin and clopidogrel for more than 9 months were shown to have significantly lower incidence of death, MI and stroke 1 year after discharge as compared with patients in whom DAPT was discontinued or prescribed less than 9 months.¹³ Chronic kidney disease (CKD), in-hospital bleeding, diagnosis of NSTEMI, and antiplatelet therapy discontinuation were negatively associated with 1-year outcomes, whereas the use of drug-eluting stents and antiplatelet agents, clopidogrel and aspirin, were predictors of better outcomes. In Taiwan, adherence to DAPT was associated with long-term favorable outcomes and improved survival rates in ACS patients.

EFFECTS OF CLOPIDOGREL ON MORTALITY, CARDIOVASCULAR AND BLEEDING OUTCOMES IN PATIENTS WITH CKD

Because lower body weight could be associated with bleeding complication in ACS, weight-adjusted dose of antithrombotic agent is recommended in the international ACS guidelines.⁵⁻⁸ Compared with the Caucasian population, the Asian population usually has lower body weight and might possibly suffer from anti-thrombotic and antiplatelet overdose and consequently bleeding complication. CKD is a risk factor for CAD and bleeding with antithrombotic therapy in patients with ACS.^{14,15} Regarding the efficacy and safety of in-hospital and long-term clopidogrel therapy in ACS patients with CKD, which was defined as an estimated glomerular filtration rate (eGFR) of less than 60 ml/min per 1.73 m² calculated using the Modification of Diet in Renal Disease (MDRD) Study equation,¹⁶ our nationwide registry demonstrated an increased 2.4-fold risk of MACE including death, non-fatal MI and stroke at 12 months in CKD patients. Cox regression analysis showed that clopidogrel reduced all-cause death and MACE for CKD population. Patients with clopidogrel (-)/CKD (-), clopidogrel (+)/CKD (+) and clopidogrel (-)/CKD (+) have 2.4, 3.0 and 10.4-fold risk, respectively, to have MACE compared with those receiving clopidogrel treatment without CKD. Clopidogrel treatment was not associated with increased in-hospital thrombolysis in myocardial infarction (TIMI) bleeding in CKD population.¹⁷ Therefore, clopidogrel could decrease mortality and improve cardiovascular outcomes without increasing the risk of bleeding in ACS patients with CKD in Taiwan.¹⁸

IMPACT OF CKD AND REVASCULARIZATION STRATEGY ON ONE-YEAR MACE

The presence of inflammation, endothelial dysfunction, dyslipidemia and activation of the renin-angiotensin system are the main mechanisms by which CKD can induce or complicate CVD.¹⁹ Therefore, CKD is not only a coronary risk equivalent for ascertaining coronary risk, but also a risk factor for the development and progression of CVD.²⁰ The optimal revascularization strategy for patients with CKD has not been established in ACS. The

invasive strategy was defined as patients with STEMI undergoing primary PCI or fibrinolysis, and coronary angiography with intent to revascularize performed within 72 hours of symptom onset in non-ST-elevation acute coronary syndrome (NSTEMI-ACS), including NSTEMI and UA. Patients with CKD had more comorbidities but received fewer evidence-based medications during admission than those without CKD. The MACE-free survival rate is lower in CKD patients, in the whole, STEMI, and NSTEMI-ACS populations. Cox regression analysis showed CKD subjects had a higher in-hospital and 1-year MACE rate after adjusting for age, sex, medication at discharge and traditional risk factors. Kaplan-Meier curves revealed CKD patients without invasive strategy had the worst outcome in the STEMI as well as NSTEMI-ACS population. The invasive strategies, either with early angiography only or angioplasty, were associated with reduced MACE among CKD patients in the NSTEMI-ACS population. Therefore, CKD patients suffering from ACS had poor prognosis, and an invasive strategy could improve cardiovascular outcome in the NSTEMI-ACS population.²¹

CHADS₂ AND CHA₂DS₂-VASC SCORES TO PREDICT MACE IN ACS PATIENTS

There is no simple, convenience scoring system to identify the risk of adverse outcomes. The CHADS₂ [congestive heart failure; hypertension; age \geq 75 years; type 2 diabetes mellitus (DM); and previous stroke, transient ischemic attack (TIA), or thromboembolism (doubled) score] was originally used to estimate the risk of stroke in individuals with atrial fibrillation (AF), but is also a powerful predictor of stroke and death in patients with ischemic heart disease. A high CHADS₂ score may be an independent predictor of poor prognosis in CVD.^{22,23} The CHA₂DS₂-VASC score [congestive heart failure; hypertension; age \geq 75 years (doubled); type 2 DM; previous stroke, TIA, or thromboembolism (doubled); vascular disease; age 65-75 years; and sex category] extends the CHADS₂ score by considering additional risk factors for stroke, and was recently recommended in guidelines for antithrombotic therapy in patients with AF or atrial flutter.²⁴⁻²⁶ A previous study found that CHADS₂ score could identify ACS patients at higher risk for subsequent stroke or death and that the CHADS₂ and CHA₂DS₂-VASC

scores did not significantly differ in their power to predict mortality in ACS patients.²⁷ However, each additional component of the CHA₂DS₂-VASC score, such as peripheral vascular disease, female sex, and age 65-74 years, was associated with worse clinical outcomes in ACS patients as compared with the CHADS₂ score, wherein the CHA₂DS₂-VASC score is believed to have better prognostic predictive value for clinical outcomes. In Taiwan both scores were significant predictors of MACE in separate multivariate regression analyses. A Kaplan-Meier analysis of CHADS₂ and CHA₂DS₂-VASC scores of \geq 2 showed a higher rate of MACE as compared with scores of $<$ 2. CHA₂DS₂-VASC score was better than CHADS₂ score in predicting subsequent MACE and the area under the receiver operating characteristic curve significantly increased from 0.66 to 0.70. Patients with CHADS₂ scores of 0 or 1 were further classified according to CHA₂DS₂-VASC score, using a cutoff value of 2. The rate of MACE significantly differed between those with a score of $<$ 2 and those with a score of \geq 2 (4.1% vs. 10.7%, $p <$ 0.001). Hence, CHADS₂ and CHA₂DS₂-VASC scores were useful predictors of subsequent MACE in ACS patients.²⁸

PROGNOSTIC IMPACT OF RENAL DYSFUNCTION IN ACS PATIENTS BEYOND CHA₂DS₂-VASC SCORE

The CHA₂DS₂-VASC score was better than the CHADS₂ score in predicting subsequent MACE in ACS patients.²⁸ However, most of these scoring systems typically did not include renal dysfunction, which has been reported as an important risk factor of subsequent MACE in AF patients with ACS.^{27,29-31} ACS patients were divided into 3 groups based on eGFR: group 1, eGFR $>$ 90; group 2, eGFR between 60 and 90; and group 3, eGFR $<$ 60 mL/min/1.73 m². The occurrence of subsequent MACE including MI, stroke, or death was also recorded. As renal function progressively decreased from group 1 to 3, the patients became older and had a higher incidence of comorbidity, worse Killip classification, and less evidence-based medical therapies. The rate of subsequent MACE increased from 3.4% in group 1 to 7.4% in group 2 and 17.2% in group 3. Renal dysfunction and CHA₂DS₂-VASC scores were both significant predictors of MACE in multivariable regression analyses. Renal dysfunction can further stratify patients with CHA₂DS₂-VASC score of 0 or

1 into 3 groups with different adverse event rates (group 1, 3.0%; group 2, 4.1%; and group 3, 9.2%). A new scoring system (R-CHA₂DS₂-VASc score) derived by assigning one more point for eGFR < 60 ml/min per 1.73 m² to the CHA₂DS₂-VASc score could improve its predictive accuracy. Hence, renal dysfunction is a significant risk factor of future MACE in ACS patients, and may improve the prognostic impact of the CHA₂DS₂-VASc score.³²

ADDITIVE EFFECT OF IN-HOSPITAL TIMI BLEEDING AND CKD ON 1-YEAR MACE IN ACS PATIENTS

In-hospital bleeding is associated with the risk of subsequent MACE in ACS.^{33,34} CKD is a risk factor for CAD and bleeding with antithrombotic therapy in ACS patients.^{14,35} CKD defined as an eGFR of < 60 ml/min per 1.73 m² and 1-year MACE including death, non-fatal MI and non-fatal stroke were investigated from our registry. Both in-hospital TIMI bleeding and CKD are independently associated with an increased risk of MACE. The Kaplan-Meier curves showed significantly higher MACE rates among those with in-hospital TIMI bleeding and CKD in the whole, STEMI and NSTEMI-ACS populations. Patients with bleeding (+)/CKD (-), bleeding (-)/CKD (+) and bleeding (+)/CKD (+) had a 1.88-, 2.13- and 2.98-fold risk to suffer from MACE compared with those without bleeding and CKD. In-hospital TIMI bleeding or CKD was independently associated with poor cardiovascular outcome, and patients with both bleeding and CKD had the worst outcome in ACS.³⁶

EFFECTS OF DTB TIMES ON OUTCOMES IN ACS PATIENTS RECEIVING PRIMARY PCI

For patients with STEMI, primary PCI has been considered a life-saving treatment, and ACS guidelines recommend the DTB time should be no longer than 90 minutes.^{6,7,37} DTB time below 90 minutes is associated with significantly lower incidence of in-hospital or out-of-hospital mortality.^{38,39} However, the results obtained from analysis of patients with different DTB times below 90 minutes remain inconsistent in cardiovascular outcomes.⁴⁰⁻⁴⁴ Some observational studies recommended that a DTB time lower than 60 or 30 minutes was associ-

ated with a significantly reduced in-hospital mortality.^{40,41} However, the other studies showed similar outcomes among ACS patients with different DTB times under 90 minutes.⁴²⁻⁴⁴ The current evidence seems insufficient to support a stringent goal of DTB times. Instead, additional effort has been devoted to several strategies proposed to shorten the DTB time which are intended to improve clinical outcomes.^{45,46} From our nationwide registry, patients receiving primary PCI were categorized as group 1, 2, 3, and 4, according to the DTB time < 45, 45-90, 91-135, and > 135 minutes, respectively. There were significant variations in DTB times at baseline, which included patients salvaged at centers, patients with prior CVD, and those patients with different coronary artery flows separated into 4 groups. The in-hospital adverse event rates were identical among the 4 groups except for a higher rate of acute renal failure and a longer hospital stay observed in group 4. There was no decrease in the incidence of repeated revascularization, MACE including all-cause mortality, non-fatal MI, and target vessel revascularization, or cardiovascular composite including all-cause mortality, nonfatal MI, non-fatal hemorrhagic or ischemic stroke, ischemia-driven repeated revascularization and CABG at 1 year in group 1 with the DTB time < 45 minutes. Hence, the DTB time might be not an optimal determinant for outcomes in Taiwanese patients receiving primary PCI.⁴⁷

THE RELATION BETWEEN THE TIMING OF PCI AND OUTCOMES IN ACS PATIENTS WITH ROUTINE INVASIVE STRATEGY

International guidelines have indicated that use of a routine invasive strategy was favored for high-risk patients with NSTEMI-ACS with refractory angina, hemodynamic or electrical instability.^{5,8} Among initially stabilized NSTEMI-ACS patients, an early invasive strategy of coronary angiography is favored.⁴⁸⁻⁵¹ With early invasive management, an early approach may facilitate rapid diagnosis, earlier mechanical revascularization, and shorter hospital stays; however, there may also be the potential for early hazard arising from intervention on unstable plaques with fresh thrombus. Conversely, a delayed strategy may provide benefits through plaque passivation by optimal medical treatment followed by inter-

vention on more stable plaques. However, the optimal timing of angiography has not yet been well-defined. Several large trials have compared different strategies of early versus delayed intervention in patients with NSTEMI-ACS, but the optimal timing is still a matter of ongoing debate.^{48,49,52-54} In the Taiwan ACS registry, the TIMI risk score was used to stratify NSTEMI-ACS patients undergoing PCI into three groups: low (TIMI 0-2), intermediate (TIMI 3-4) and high risk (TIMI 5-7) and the relation between the timing of PCI and outcomes was analyzed. For primary outcomes including cardiac death and non-fatal MI, early PCI within 24 hours did not show benefits over late PCI in the low and intermediate risk groups. However, in the high risk group, patients who underwent PCI after 72 hours had significantly worse primary outcomes than those who underwent PCI within 24-72 hours. The unplanned revascularization and Killip class ≥ 3 were predictors for primary outcomes. For secondary outcomes including non-cardiac death, re-PCI, and TIMI major bleeding, the events rate was significantly higher for early (< 24 hours) or delayed PCI (> 72 hours) in low-risk patients when compared with patients who underwent PCI within 24-72 hours. Therefore, for high-risk NSTEMI-ACS patients, PCI within 24-72 hours from symptom onset is demonstrably the optimal time for PCI. Delayed PCI over 72 hours is associated with the worst outcomes and should be avoided. For NSTEMI-ACS patients with low risks, routine early PCI < 24 hours is not beneficial and can be harmful.⁵⁵ In addition, the use of statins is beneficial and can minimize the secondary outcomes.

DM AND MACE IN ACS PATIENTS

DM is a major public health problem worldwide and is strongly associated with CVD. Also, CAD is the most common cause of mortality in DM patients in Taiwan.^{56,57} In ACS patients, DM is associated with increased stent thrombosis, target lesion revascularization, re-MI, and MACE.^{58,59} In the Taiwan ACS registry, patients with and without DM in terms of baseline demographics, clinical presentation, risk factors, medical treatment, intervention, and outcomes were followed for 12 months after discharge. The primary endpoint was MACE, including death, re-MI and stroke within a 12-month period. The secondary endpoint consisted of the combined results

of death, re-MI, stroke, revascularization, and re-hospitalization over 12 months. Of the enrolled subjects, 36% had DM. Compared with the non-DM group, the DM patients had more traditional cardiovascular risk factors, higher probabilities of all-cause death (10.1% vs. 6.06%), MACE (15.7% vs. 10.93%), secondary outcomes (51.6% vs. 42.41%), stroke (12.7% vs. 7.4%), and peripheral artery diseases (4.0% vs. 1.4%). After adjusting the confounding variables, logistic regression analysis showed that patients in the DM group were at a higher risk of all-cause death and MACE. For those patients suffering from MACE, the mean survival time was 34.7 ± 10.4 days in the non-DM group and 33.3 ± 11.8 days in the DM group. The log rank test showed the two survival curves were significantly distinctive. Cox regression model analysis showed the odds ratio for all-cause death and MACE was higher in the DM group compared with the non-DM group. Therefore, ACS patients with DM had significantly worse outcomes in terms of all-cause death and MACE compared to those patients without DM.⁶⁰

LIMITATIONS

Our nation-wide registry has the limitation of being an observational, non-randomized study that allowed only for the establishment of an association between current clinical practices and the outcome. However, it does not allow causality to be examined. This registry also compares existing clinical practices in ACS management to guidelines that are based on data that is constantly evolving and, hence, can only be cautiously considered as a gold standard. However, in-hospital mortality rate is extremely low in the Taiwan ACS Full Spectrum Registry compared with registry data from other international studies and this probably results from the selection bias. Nonetheless, this registry provides valuable real-world data on the current practices across the full spectrum of ACS in Taiwan, which should help to improve the ACS management outcomes in this country.

CONCLUSIONS

The ACS Full Spectrum Registry provided an in-

depth quantitative analysis of ACS management in Taiwan. ACS patients with antiplatelet therapy discontinuation, in-hospital bleeding, DM, CKD or higher CHA₂DS₂-VASc score had significantly worse outcomes. For high-risk NSTEMI-ACS patients, PCI within 24-72 hours from symptom onset was demonstrably the optimum time for PCI. Suboptimal secondary preventive therapy demonstrated a need for further improvement.

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DISCLOSURE

The authors report no conflicts of interest in this work.

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