Value of GRACE and SYNTAX scores for predicting the prognosis of patients with non-ST elevation acute coronary syndrome

Xiao-Feng Wang, Ming Zhao, Fei Liu, Guo-Rong Sun

Abstract

BACKGROUND
GRACE and SYNTAX scores are important tools to assess prognosis in non-ST-elevation acute coronary syndrome (NSTE-ACS). However, there have been few studies on their value in patients receiving different types of therapies.

AIM
To explore the value of GRACE and SYNTAX scores in predicting the prognosis of patients with NSTE-ACS receiving different types of therapies.

METHODS
The data of 386 patients with NSTE-ACS were retrospectively analyzed and categorized into different groups. A total of 195 patients who received agents alone comprised the medication group, 156 who received medical therapy combined with stents comprised the stent group, and 35 patients who were given agents and underwent coronary artery bypass grafting (CABG) comprised the CABG group. General information was compared among the three groups. GRACE and SYNTAX scores were calculated. The association between the relationship between GRACE and SYNTAX scores and the occurrence of major adverse cardiovascular events (MACEs) was analyzed. Pearson’s correlation analysis was used to determine the factors influencing prognosis in patients with NSTE-ACS. Univariate and multivariate analyses were conducted to analyze the predictive value of GRACE and SYNTAX scores for predicting prognosis in patients with NSTE-ACS using the Cox proportional-hazards model.

RESULTS
The incidence of MACE increased with the elevation of GRACE and SYNTAX scores (all P < 0.05). The incidence of MACE was 18.5%, 36.5%, and 42.9% in the medication group, stent group, and CABG group, respectively. By comparison, the incidence of MACE was significantly lower in the medication group than in the stent and CABG groups (all P < 0.05). The incidence of MACE was 6.2%, 28.0%
INTRODUCTION

Acute coronary syndrome (ACS), mainly comprising ST segment elevation myocardial infarction (STEMI) and non-ST segment elevation acute coronary syndrome (NSTE-ACS), is a common cardiac disease. Usually these patients present as acute coronary insufficiency and unstable plaque caused by coronary atherosclerosis[1-3]. Rapid progression of NSTE-ACS may lead to serious complications. Thus, supplementary aids are needed to estimate the prognosis of patients with NSTE-ACS[3,4]. Definite diagnosis and accurate risk stratification are essential for the subsequent treatment of NSTE-ACS. Therapies vary in NSTE-ACS patients with different major adverse cardiovascular event (MACE) risk[5,6]. Currently, the risk assessment model GRACE score is used to predict the prognosis of patients with NSTE-ACS. However, it does not
MATERIALS AND METHODS

General information
A retrospective analysis was conducted in 386 patients with NSTE-ACS admitted to Cangzhou Central Hospital (Hebei Province, China) from March 2017 to December 2020. They were categorized into three groups based on the treatment they received. Of them, 195 patients receiving agents were enrolled in a medication group, 126 patients receiving agents plus stent treatment were enrolled in a stent group, and 35 patients who were administrated with agents and underwent coronary artery bypass grafting (CABG) were enrolled in a CABG group. Enrollment criteria were as follows: patients aged 18-years-old to 75-years-old, diagnosis of NSTE-ACS confirmed by clinical symptoms and relevant examination, and single- or multi-vessel stenosis ≥ 50% validated by coronary angiography. Exclusion criteria included: patients with poor physical performance; patients with a previous history of myocardial infarction; patients with comorbidities of heart failure, myocarditis, or myocardiopathy; patients with arrhythmia; patients with severe kidney, liver, and lung diseases; patients with an infection, malignant tumors, or severe anemia; and pregnant women. Baseline demographic and clinical characteristics data are summarized in Table 1.

Research methodology
Patients received treatment based on their angiographic features of coronary lesions. All patients were administered enteric aspirin oral 300 mg (Approval No. J20171021; Bayer HealthCare Pharmaceuticals Inc., Whippany, NJ, USA) and clopidogrel 300 mg (approval No. J20180029; Sanofi (Hangzhou) Pharmaceuticals Co. Ltd., Hangzhou, China) for secondary prevention of cardiovascular diseases. Patients in the stent group underwent coronary angiography and conventional stent implantation surgery. Patients in the CABG group were given medicine and CABG surgery.

Baseline data were collected from the three groups including gender, age, history of diseases (hypertension, diabetes, hyperlipidemia), unstable angina or acute non-ST-elevation myocardial infarction. GRACE and SYNTAX scores were calculated. Data on patient prognosis were obtained through telephone follow-up or clinical visits. Hospitalization and coronary angiography were advised for patients with symptoms such as typical chest pain or ischemia. The end points of follow-up were the occurrence of major adverse cardiovascular events (MACEs) after the treatments including cardiac death, non-fatal myocardial infarction, and target lesion revascularization. MACE was estimated. Patients were followed-up for 46 mo.

Evaluation criterion
The incidence of MACE was investigated in patients with different GRACE scores receiving different treatments. According to the GRACE score, patients were divided into tertiles as low- (0 to 88 points), intermediate- (89 to 117 points), and high (≥ 118 points)-risk groups. Also, the incidence of MACE was examined in patients with different SYNTAX scores receiving different treatments. According to the SYNTAX score, patients were sorted into tertiles as low- (0 to 22 points), intermediate- (23 to 32 points), and high (≥ 33 points)-risk groups. Factors influencing NSTE-ACS were analyzed.

Statistical analysis
SPSS18.0 software was used for the statistical analyses in this study. The logged data were rechecked and analyses were conducted after the outliers were deleted and removed. Measurement data are expressed as the mean ± SD, and inter-group differences were compared using the Student’s t-test. The statistical relationship between the two variables was determined using Spearman’s rank correlation coefficient. Count data are expressed as the frequency and percentage. Kruskal-Wallis
Table 1 Baseline characteristics of patients with non-ST-elevation acute coronary syndrome, n = 386

| Items                                  | n (%)          |
|----------------------------------------|----------------|
| Age in yr, mean ± SD                   | 61.25 ± 4.09   |
| Gender                                 |                |
| Male                                   | 243 (63.0)     |
| Female                                 | 143 (37.0)     |
| Unstable angina                        | 327 (84.7)     |
| Hypertension                           | 262 (69.4)     |
| Diabetes                               | 95 (24.6)      |
| Hyperlipidemia                         | 62 (16.1)      |
| Major adverse cardiovascular events    | 108 (28.0)     |
| Recurrent angina                       | 115 (29.8)     |
| NYHA class I or above                  | 17 (4.4)       |
| Nonfatal recurrent myocardal infarction| 8 (2.1)        |
| Target vessel revascularization        | 22 (5.7)       |
| Death                                  | 4 (1.0)        |
| Number of stents                       | 247 (64.0)     |
| CABG                                   | 35 (9.1)       |

CABG: Coronary artery bypass grafting; NSTEACS: Non-ST elevation acute coronary syndrome; NYHA: New York Heart Association.

RESULTS

The incidence of MACE increased with the elevated scores of GRACE and SYNTAX (all P < 0.05; Table 2). The rates of MACE were 18.5%, 36.5%, and 42.9% in the medication group, stent group, and CABG group, respectively. The MACE rate was significantly lower in the medication group than in the stent and CABG groups (all P < 0.05). However, the difference in MACE rate between the stent group and CABG group was not significant (P > 0.05).

The rates of MACE were 6.2%, 28.0%, and 40.0% in patients receiving medication, stent, and CABG, respectively, in the low GRACE score tertile group (all P < 0.05; Table 3). The rates of MACE were 31.0%, 30.3%, and 42.9% in patients receiving medication, stent, and CABG, respectively, in the intermediate GRACE score tertile group (all P > 0.05). The rates of MACE were 16.9%, 46.2%, and 43.8% in patients receiving medication, stent, and CABG, respectively, in the high GRACE score tertile group (all P < 0.05).

The rates of MACE were 16.2%, 35.4%, and 60.0% in patients receiving medication, stent, and CABG, respectively, in the low SYNTAX score tertile group (all P < 0.05); 37.5%, 40.9%, and 41.7%, respectively, in the intermediate SYNTAX score tertile group (all P > 0.05); and 50.0%, 75.0%, and 25.0%, respectively, in the high SYNTAX score tertile group (all P < 0.05; Table 4).

Univariate Cox regression analyses showed that GRACE (hazard ratio [HR] = 1.212, 95% confidence interval [CI]: 1.083 to 1.176; P < 0.05) and SYNTAX (HR = 1.160, 95%CI: 1.104 to 1.192; P < 0.05) scores were factors contributing to the risk of MACE (all P < 0.05). Multivariate analyses of GRACE and SYNTAX scores revealed that GRACE (HR = 1.091, 95%CI: 1.015 to 1.192; P < 0.05) and SYNTAX (HR = 1.031, 95%CI: 1.076 to 1.143; P < 0.05) scores were independent factors influencing MACE (all P < 0.05).
Table 2 Incidence of major adverse cardiovascular events in patients with different GRACE and SYNTAX scores, n = 386

| Groups | n   | MACE | Incidence of MACE, % | Hc value | P value |
|--------|-----|------|----------------------|----------|---------|
| GRACE scores (points) |    |      |                      |          |         |
| Low risk group (0-88)  | 95  | 13   | 13.7                 | 7.398    | 0.031   |
| Intermediate risk group (89-117) | 151 | 48   | 31.7                 |          |         |
| High risk group (≥ 118) | 140 | 47   | 33.6                 |          |         |
| SYNTAX scores (points) |    |      |                      | 4.381    | 0.042   |
| Low risk group (0-22)  | 330 | 85   | 25.8                 |          |         |
| Intermediate risk group (23-32) | 42  | 17   | 40.5                 |          |         |
| High risk group (≥ 33) | 14  | 6    | 42.9                 |          |         |
| Treatment              |     |      |                      | 8.123    | 0.021   |
| Medication group       | 195 | 36   | 18.5                 |          |         |
| Stent group             | 156 | 57   | 36.5                 |          |         |
| CABG group              | 35  | 15   | 42.9                 |          |         |
| Total                  | 386 | 108  | 28.0                 |          |         |

Hc value: The test statistic for the Kruskal-Wallis test; MACEs: Major adverse cardiovascular events.

Table 3 Major adverse cardiovascular events rate in patients with different GRACE risk scores receiving different treatments, n (%)

| GRACE risk scores (points) | n   | Medication group | Stent group | CABG group | Overall MACE rate | Hc value | P value |
|---------------------------|-----|------------------|-------------|------------|-------------------|----------|---------|
| Low risk group (0-88)     | 95  | 65 (63.2)        | 25 (25.8)   | 5 (10.0)   | 13 (13.7)         | 5.231    | 0.041   |
| Intermediate risk group   | 151 | 71 (33.0)        | 66 (20.3)   | 14 (6.2)   | 48 (31.8)         | 2.742    | 0.086   |
| High risk group ≤ 118     | 140 | 59 (16.9)        | 65 (46.2)   | 16 (7.8)   | 47 (33.6)         | 5.381    | 0.040   |
| Total                     | 386 | 195 (27.2)       | 156 (40.5)  | 35 (15.2)  | 108 (28.0)        | 4.412    | 0.044   |

CABG: Coronary artery bypass grafting; Hc value: The test statistic for the Kruskal-Wallis test; MACE: Major adverse cardiovascular events.

Table 4 Major adverse cardiovascular events rate in patients with different SYNTAX risk scores receiving different treatments, n (%)

| SYNTAX risk scores (points) | n   | Medication group | Stent group | CABG group | Overall MACE rate | Hc value | P value |
|-----------------------------|-----|------------------|-------------|------------|-------------------|----------|---------|
| Low risk group (0-22)       | 330 | 185 (56.0)       | 130 (46.9)  | 15 (9.8)   | 85 (25.8)         | 12.213   | 0.001   |
| Intermediate risk group     | 42  | 8 (19.5)         | 22 (48.9)   | 12 (5.5)   | 17 (40.5)         | 1.984    | 0.214   |
| High risk group ≥ 33        | 14  | 2 (50.0)         | 4 (30.8)    | 8 (29.0)   | 6 (42.9)          | 8.432    | 0.014   |
| Total                       | 386 | 195 (35.8)       | 156 (40.5)  | 35 (15.2)  | 108 (28.0)        | 4.412    | 0.044   |

CABG: Coronary artery bypass grafting; Hc value: the test statistic for the Kruskal-Wallis test; MACE: major adverse cardiovascular events.

DISCUSSION

The incidence of NSTE-ACS is high, which involves about 75% of patients with ACS. Due to the occlusion of multiple coronary arteries and the rapid disease progression, the management of patients with ACS should be performed targeting the stratified risk[11-13]. The GRACE score is one of the most common risk scoring systems in clinical practice to risk stratify ACS patients based on real clinical symptoms and basic patient data; however, it does not take into account ACS.[14-16]. The SYNTAX score is
a tool to risk stratify ACS patients based on anatomic features of coronary artery lesions. Nevertheless, it does not analyze clinical features and cannot realize the general characteristics of patients[17-22]. Therefore, this study discussed the significance of GRACE combined with SYNTAX scores for the assessment of prognosis of NSTE-ACS.

The findings of this study showed that the incidence of MACE increased with the elevated scores of GRACE and SYNTAX ($P < 0.05$). The incidence of MACE was 18.5%, 36.5%, and 42.9% in the medication group, stent group, and CABG group, respectively, with the medication group lower than the stent and CABG groups ($P < 0.05$). Moreover, the incidence of MACE varied in patients receiving different treatments, particularly in the medication group. The incidence of MACE was 6.2%, 28.0%, and 40.0% in patients with a low GRACE risk score, and 16.9%, 46.2%, and 43.8% in patients with a high GRACE risk score in the medication group, stent group, and CABG group, respectively (all $P < 0.05$). This suggests that it is feasible to use GRACE score for the risk stratification of patients with NSTE-ACS. In terms of SYNTAX score, the incidence of MACE was 16.2%, 35.4%, and 60.0% in patients with a low risk score and 50.0%, 75.0%, and 25.0% in patients with a high risk score in the medication group, stent group, and CABG group, respectively (all $P < 0.05$). These data indicate that the SYNTAX score can effectively predict the prognosis of NSTE-ACS by stratifying patients into high-, intermediate-, and low-risk groups based on which appropriate care can be given.

Meanwhile, univariate and multivariate Cox analyses showed that GRACE and SYNTAX scores were independent predictors of the occurrence of MACE (all $P < 0.05$). GRACE and SYNTAX scores have significant predictive value for the assessment of prognosis of NSTE-ACS. In the current study, no significant difference was discovered in long-term prognosis between patients with an intermediate GRACE risk score and patients with an intermediate SYNTAX risk score. It can be attributed to different treatments based on different patient conditions or relevant factors influencing the treatment such as results bias caused by treatment switching. As a limitation to this study, the limited number of cases in the single-center retrospective study may be not powered enough to completely reflect the real-life situation. Multicenter large sample long-term follow-up studies are warranted in the future to further demonstrate these findings.

**CONCLUSION**

In summary, GRACE and SYNTAX scores have significant value for assessing prognosis in NSTE-ACS.

**ARTICLE HIGHLIGHTS**

**Research background**
The GRACE score and SYNTAX score are established clinical risk stratification tools for acute coronary syndromes. However, they were seldomly discussed in patients with non-ST elevation acute coronary syndrome (NSTE-ACS) receiving different types of therapies.

**Research motivation**
Correct diagnosis and early treatment are critical to improve clinical outcomes in patients with NSTE-ACS. Risk stratification may be helpful for the planning of treatment strategy.

**Research objectives**
This study tested the ability of the GRACE and SYNTAX scores to predict outcomes in patients with NSTE-ACS.

**Research methods**
Patients with NSTE-ACS who received agents for secondary prevention of cardiovascular diseases, who received medical therapy plus stents or who underwent coronary artery bypass graft (CABG) surgery were enrolled in the study. GRACE and SYNTAX scores were estimated, and patients in the three groups were further
subdivided into GRACE and SYNTAX score tertile groups. Data on prognosis and outcomes of these patients were collected over a 46 mo follow-up period. The incidence of major adverse cardiovascular events (MACEs) was calculated. The relationship between GRACE and SYNTAX scores and prognosis and outcomes of this population were analyzed and the abilities of GRACE and SYNTAX scores to predict prognosis and outcomes especially MACE were tested.

**Research results**

The incidence of MACE was lower in patients having low and high GRACE and SYNTAX scores who received agents than in patients who underwent stent placement or CABG. Multivariate Cox regression analyses revealed that GRACE and SYNTAX scores were independent factors influencing the occurrence of MACE in patients with NSTE-ACS.

**Research conclusions**

GRACE and SYNTAX scores are useful in predicting MACE in risk stratifying patients with NSTE-ACS who undergo CABG.

**Research perspectives**

The findings need further studies with a larger number of participants to be confirmed.

**REFERENCES**

1. Hedayati T, Yadav N, Khanagavi J. Non-ST-Segment Acute Coronary Syndromes. *Cardiol Clin* 2018; 36: 37-52 [PMID: 29173680 DOI: 10.1016/j.ccl.2017.08.003]

2. Ralapanawa U, Kumarasiri PVR, Jayawickreme KP, Kumarihamy P, Wijeratne Y, Ekanayake M, Dissanayake C. Epidemiology and risk factors of patients with types of acute coronary syndrome presenting to a tertiary care hospital in Sri Lanka. *BMC Cardiovasc Disord* 2019; 19: 229 [PMID: 31638908 DOI: 10.1186/s12872-019-1217-x]

3. Sakaguchi M, Ebara S, Hasegawa T, Matsumoto K, Nishimura S, Yoshikawa J, Shimada K. Coronary plaque rupture with subsequent thrombosis typifies the culprit lesion of non-ST-segment-elevation myocardial infarction, not unstable angina: non-ST-segment-elevation acute coronary syndrome study. *Heart Vessels* 2017; 32: 241-251 [PMID: 27325227 DOI: 10.1007/s00380-016-0682-6]

4. Kofoed KF, Kelbaek H, Hansen PR, Torp-Pedersen C, Hofsten D, Klovgaard L, Holmvang L, Helqvist S, Jorgensen E, Galatius S, Pedersen F, Bang L, Saunamaki K, Clemmensen P, Linde JJ, Heitmann M, Wendelboe Nielsen O, Raymond IE, Kristiansen OP, Svendsen IH, Bech J, Dominguez Valls-Lamora MH, Kragelund C, Hansen TF, Dahlgard Hove J, Jorgensen T, Forntiz GG, Steffensen R, Jurlander B, Abdulla J, Lyngbæk SK, Therkelsen SK, Abdulla J, Jensen JS, Gislason G, Kober LV, Engstrom T. Early Versus Standard Care Invasive Examination and Treatment of Patients With Non-ST-Segment Elevation Acute Coronary Syndrome. *Circulation* 2018; 138: 2741-2750 [PMID: 30565996 DOI: 10.1161/CIRCULATIONAHA.118.037152]

5. Raposeiras-Roubin S, Abu-Assi E, Lopez-Lopez A, Bouzas-Cruz N, Castileche-Busto M, Cambeiro-González C, Álvarez-Alvarez B, Virgós-Lamela A, Varela-Román A, García-AcuñaJM, González-Juanatey JR. Risk stratification for the development of heart failure after acute coronary syndrome at the time of hospital discharge: Predictive ability of GRACE risk score. *J Cardiol* 2015; 66: 224-231 [PMID: 25623483 DOI: 10.1016/j.jcc.2014.12.015]

6. Poldervaart JM, Langedijk M, Backus BS, Dekker IMC, Six AJ, Doevendans PA, Hoes AW, Reitmaa JB. Comparison of the GRACE, HEART and TIMI score to predict major adverse cardiac events in chest pain patients at the emergency department. *Int J Cardiol* 2017; 227: 656-661 [PMID: 27810290 DOI: 10.1016/j.ijcard.2016.10.080]

7. Reaney PDW, Elliott IH, Noman A, Cooper JG. Risk stratifying chest pain patients in the emergency department using HEART, GRACE and TIMI scores, with a single contemporary troponin result, to predict major adverse cardiac events. *Emerg Med J* 2018; 35: 420-427 [PMID: 29622596 DOI: 10.1136/emermed-2017-207172]

8. Chan MY, Sun JL, Newby LK, Lokhnygina Y, White HD, Moliterno DJ, Théroux P, Ohman EM, Simoons ML, Mahaffey KW, Pieper KS, Giugliano RP, Armstrong PW, Calliff RM, Van de Werf F, Harrington RA. Trends in clinical trials of non-ST-segment elevation acute coronary syndromes over 15 years. *Int J Cardiol* 2013; 167: 548-554 [PMID: 22341697 DOI: 10.1016/j.ijcard.2012.01.065]

9. Mitarai T, Tanabe Y, Akashi YJ, Maeda A, Ako J, Ikari Y, Ebina T, Namiki A, Fukui K, Michishita I, Kimura K, Suzuki H. A novel risk stratification system "Angiographic GRACE Score" for predicting in-hospital mortality of patients with acute myocardial infarction: Data from the K-ACTIVE Registry. *J Cardiol* 2021; 77: 179-185 [PMID: 32921529 DOI: 10.1016/j.jcc.2020.08.010]

10. Yadav M, Généreux P, Palmerini T, Caixeta A, Madhavan MV, Xu K, Brener SJ, Mehran R, Stone GW. SYNTAX score and the risk of stent thrombosis after percutaneous coronary intervention in...
patients with non-ST-segment elevation acute coronary syndromes: an ACUITY trial substudy. *Catheter Cardiovasc Interv* 2015; **85**: 1-10 [PMID: 24408084 DOI: 10.1002/ccd.25396]

11 **Shavy M**, Klein E, Cohen T, Shlomo N, Rozenbaum Z, Pereg D. Value of Adding the CHA2DS2-VASc Score to the GRACE Score for Mortality Risk Prediction in Patients With Acute Coronary Syndrome. *Am J Cardiol* 2019; **123**: 1751-1756 [PMID: 30922543 DOI: 10.1016/j.amjcard.2019.02.045]

12 **Lang Y**, Ran X, Wang L, Li W. [Risk Factors of Death in Patients with Acute ST-segment Elevation Myocardial Infarction after PCI and the Combined Application of CTRP-1 with GRACE Score in Prognosis Evaluation of PCI Treated Patients]. *Sichuan Da Xue Xue Bao Yi Xue Ban* 2019; **50**: 941-945 [PMID: 31880129]

13 **Chen X**, Shao M, Zhang T, Zhang W, Meng Y, Zhang H, Hai H, Li G. Prognostic value of the combination of GRACE risk score and mean platelet volume to lymphocyte count ratio in patients with ST-segment elevation myocardial infarction after percutaneous coronary intervention. *Exp Ther Med* 2020; **19**: 3664-3674 [PMID: 32346430 DOI: 10.3892/etm.2020.8626]

14 **Gong Y**, Goodman SG, Brieger D, Gale CP, Chew DP, Welsh RC, Huyynh T, DeYoung JB, Baer C, Gynes GT, Udell JA, Fox KAA, Yan AT; Canadian GRACE/GRACE-2 and CANRACE Investigators. GRACE risk score: Sex-based validity of in-hospital mortality prediction in Canadian patients with acute coronary syndrome. *Int J Cardiol* 2017; **244**: 24-29 [PMID: 28645803 DOI: 10.1016/j.ijcard.2017.06.055]

15 **Yu T**, Tian C, Song J, He D, Wu J, Wen Z, Sun Z. Value of the fT3/fT4 ratio and its combination with the GRACE risk score in predicting the prognosis in euthyroid patients with acute myocardial infarction undergoing percutaneous coronary intervention: a prospective cohort study. *BMC Cardiovasc Disord* 2018; **18**: 181 [PMID: 30209880 DOI: 10.1186/s12872-018-0916-z]

16 **Stamatelopoulos K**, Mueller-Hennemann M, Georgiopoulos G, Sachse M, Boeddinghaus J, Sopova K, Gatsiou A, Amrhein C, Biener M, Vafaie M, Athanasouli F, Stakos D, Pateras K, Twerenbold R, Badertscher P, Nestelberger T, Dimmeler S, Katus HA, Zeiher AM, Mueller C, Giannitsis E, Stellos K. Amyloid-β (1-40) and Mortality in Patients With Non-ST-Segment Elevation Acute Coronary Syndrome: A Cohort Study. *Ann Intern Med* 2018; **168**: 855-865 [PMID: 29799975 DOI: 10.7326/M17-1540]

17 **White HD**, Westerhout CM, Alexander KP, Roe MT, Winters KJ, Cyr DD, Fox KA, Prabhakaran D, Hochman JS, Armstrong PW, Ohman EM; TRILOGY ACS investigators. Frailty is associated with worse outcomes in non-ST-segment elevation acute coronary syndromes: Insights from the Tailored platelet Inhibition to cLarify the Optimal strateGy to medicallY manage Acute Coronary Syndromes (TRILOGY ACS) trial. *Eur Heart J Acute Cardiovasc Care* 2016; **5**: 231-242 [PMID: 25897147 DOI: 10.1177/2048872615581502]

18 **Mao Q**, Zhou D, Li Y, Wang Y, Xu SC, Zhao XH. The Triglyceride-Glucose Index Predicts Coronary Artery Disease Severity and Cardiovascular Outcomes in Patients with Non-ST-Segment Elevation Acute Coronary Syndrome. *Dis Markers* 2019; **2019**: 6891537 [PMID: 31815485 DOI: 10.1155/2019/6891537]

19 **Zhang L**, Wu WC, Ma H, Wang H. Usefulness of layer-specific strain for identifying complex CAD and predicting the severity of coronary lesions in patients with non-ST-segment elevation acute coronary syndrome: Compared with Syntax score. *Int J Cardiol* 2016; **223**: 1045-1052 [PMID: 27592047 DOI: 10.1016/j.ijcard.2016.08.277]

20 **Farooq V**, Vergouwe Y, Généreux P, Bourantas CV, Palmerini T, Caixeta A, Garcia-Garcia HM, Diletti R, Morel MA, McAndrew TC, Kappetein AP, Valgimigli M, Windecker S, Dawkins KD, Steyerberg EW, Serruys PW, Stone GW. Prediction of 1-year mortality in patients with acute coronary syndromes undergoing percutaneous coronary intervention: validation of the logistic clinical SYNTAX (Synergy Between Percutaneous Coro

21 **De Servi S**, Crimi G, Calabrò P, Piscione F, Cattaneo M, Maffeò D, Toso A, Bartorelli A, Palmieri C, De Carlo M, Capodanno D, Barozzi C, Tomasi L, Della Riva D, Angiolillo DJ, Palmerini T. Relationship between diabetes, platelet reactivity, and the SYNTAX score to one-year clinical outcome in patients with non-ST-segment elevation acute coronary syndrome undergoing percutaneous coronary intervention. *EuroIntervention* 2016; **12**: 312-318 [PMID: 27320425 DOI: 10.4244/EIJV12I3A51]

22 **Chen X**, Guo Y, Lai L, Zhang S, Li Z. Intracoronary and peripheral blood levels of TNF-like Cytokine 1A (TL1A) in patients with acute coronary syndrome. *Medicine (Baltimore)* 2020; **99**: e20305 [PMID: 32481400 DOI: 10.1097/MD.00000000000020305]
