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EDITORIAL COMMENT

# The Appropriate Use of Risk Scores*

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Risk prediction for cardiovascular events has gained popularity in patients undergoing percutaneous coronary intervention (PCI). Methods of estimating the risk of various cardiovascular disease outcomes at different time periods following a variety of interventions using risk score sheets are available now on the Internet. Yet, the desire to predict the future using these scores has begun to impact clinical practice in selection of patients and treatment modalities. When choosing the appropriate risk prediction model, one should take into account the population of interest, risk factors, treatment, procedure to be performed, and the time frame in relation to the cardiovascular outcome. Historically, cardiovascular risk scoring systems were designed to estimate the probability that a person would develop cardiovascular disease within the next 5 or 10 years (1). Because these systems provide an indication of those most likely to develop cardiovascular disease, they also indicate those most likely to benefit from prevention or treatment. In the past, such cardiovascular risk scores acted as tools to help determine who should be offered preventive drugs to lower blood pressure or cholesterol levels.

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Since the introduction of the Framingham risk score (1), however, we have experienced an influx of risk scores, many of which (TIMI [Thrombolysis In Myocardial Infarction], SYNTAX [SYNergy between PCI with TAXUS and Cardiac Surgery], EuroSCORE [European System for Cardiac Operative Risk Evaluation], and STS [Society of Thoracic Surgeons]) (2–5) are dedicated to direct patient management, and more recently, to the selection of patients undergoing transcatheter aortic valve replacement. Attempts have been made to further refine these risk scores in an effort to help guide the technical aspects of the procedure, such as stent selection, dual antiplatelet therapy duration, and so forth.

In 2012, the interventional cardiologist continues to face the practical dilemma of whether or not to implant a drug-eluting stent (DES) or bare-metal stent for the treatment of coronary lesions in symptomatic patients presenting with acute coronary syndrome (ACS). Although the introduction of DES into clinical practice has led to dramatic decreases in restenosis and associated target vessel revascularization rates, the incidence of stent thrombosis (ST), although low, still poses a major hazard, particularly due to the associated high mortality (6).

In this issue of *JACC Cardiovascular Interventions*, Dangas et al. (7) take this approach a step further by developing a risk score to predict risk for ST based on clinical parameters among ACS patients. The authors should be congratulated on their efforts to simplify the decision-making process. To this, the authors used 2 large patient databases from the HORIZONS-AMI (Harmonizing Outcomes with RevasculariZatiON and Stents in Acute Myocardial Infarction) and ACUITY (Acute Catheterization and Urgent Intervention Triage strategY) trials (8,9), then divided them into a risk score development cohort and a validation cohort. The authors identified several clinical parameters that allow for stratifying patient risk for ST: type of ACS, smoking status, diabetes mellitus, prior PCI, laboratory values, timing of intervention, lesion characteristics, TIMI flow, and number of vessels treated.

But is there a need for yet another scoring system to predict what is already known? As practicing physicians are increasingly confronted with prediction tools for a variety of clinical conditions, each case should be evaluated individually, according to the appropriate clinical scenario, and employed in appropriate patients in whom it has been validated.

Along these lines, in-depth evaluation of the proposed ST prediction tool indicates that most of the parameters included in the Dangas et al. (7) ST risk score were known from previous ST studies (10,11). Conversely, other parameters, such as early discontinuation of antiplatelet therapy and technical issues related to stent deployment (10), both of which are considered powerful predictors for ST, were neither evaluated nor included in the proposed risk score. Although the model is able to categorize patients as low (1.36%), intermediate (3.06%), and high risk (9.18%) for ST, disregarding the potential likelihood of a patient to comply with a long-term dual antiplatelet therapy regimen after DES implantation would place the patient at prohibitive risk for ST. Accordingly, a low-risk patient who needs a spinal surgery should not receive a DES despite his low-risk score for ST. This model does not account for these common scenarios; therefore, it may be misleading to cardiologists or may lead to inappropriate use of this score.

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The proposed model is based on pooled ST risk data from HORIZONS-AMI (high-risk, ST-segment elevation myocardial infarction [STEMI]) and ACUITY (low- to intermediate-risk, ACS patients); and each study also reported different ST rates at 1 year (8,9). Regarding this risk difference, the poolability of patients from these 2 studies for the purpose of this analysis is in question. Additionally, although the pathophysiological process and outcomes of ST at 30 days, 30 days to 1 year, and outward are fundamentally different, the proposed risk score is inclusive up to 1 year from stent implantation. Therefore, it is possible that there are different risk factors and different levels of risk for each of these 2 study populations, as well as for the subacute, late, and very late occurrences of ST. Because the pathophysiological development of neointimal formation is time dependent, the validity of a risk score that is formulated on acute, subacute, and late ST patients is grossly confounded (12,13). Likewise, physicians should be cautioned against a creep in the utilization of this model for other patient populations, such as stable PCI patients, as this model was not tested nor validated for this large patient population.

In addition, the proposed risk score was mainly based on first-generation DES, and for the STEMI population in the HORIZONS-AMI study, it was limited to only the TAXUS stent, which was previously reported to be associated with high ST rates when compared with second-generation DES. Accumulating data from both large randomized trials and real-world registries indicate the safety of second-generation (vs. first-generation) DES (14). Differences in stent properties, such as polymer, drug release, and vessel healing, may impact the rates and mechanisms of ST. Thus, it is yet to be seen whether the proposed ST risk score is still relevant in the era of second-generation DES. Further, the proposed risk score model does not differentiate between the different mechanisms for early ST, which is typically more mechanical, and very late ST, which is related to neoatherosclerosis (15).

Prediction models are a useful tool in the physician's arsenal to facilitate appropriate decision-making processes and to weigh the benefits and risks of any intervention. Identifying correlates and predictors for cardiac events is critical to improve outcome; therefore, lumping all of the parameters into a risk score model is sometimes too simplistic and risky. It is imperative that the user of such a prediction tool be aware of its capabilities and performance, as well as its limitations, in various clinical scenarios. A newly developed risk score for ST should be robust and should be tested across broad study populations, stents, and antiplatelet regimens. A new model should also be validated in a setting different from the one in which it was derived. Unfortunately, this is not the case with the newly proposed model. Nevertheless, the model is an important attempt to develop an interesting and important tool to reduce ST rates. Until such an encompassing tool is developed and validated, one should rely on the known ST risk factors and tailor an appropriate treatment for each patient.

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