JACC: CARDIOVASCULAR IMAGING VOL. 11, NO. 9, 2018


# Comparison of International Guidelines for Assessment of Suspected Stable Angina

## Insights From the PROMISE and SCOT-HEART

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**ABSTRACT**

**OBJECTIVES** This study sought to compare the performance of major guidelines for the assessment of stable chest pain including risk-based (American College of Cardiology/American Heart Association and European Society of Cardiology) and symptom-focused (National Institute for Health and Care Excellence) strategies.

**BACKGROUND** Although noninvasive testing is not recommended in low-risk individuals with stable chest pain, guidelines recommend differing approaches to defining low-risk patients.

**METHODS** Patient-level data were obtained from the PROMISE (Prospective Multicenter Imaging Study for Evaluation of Chest Pain) and SCOT-HEART (Scottish Computed Tomography of the Heart) trials. Pre-test probability was determined and patients dichotomized into low-risk and intermediate-high-risk groups according to each guideline's definitions. The primary endpoint was obstructive coronary artery disease on coronary computed tomography angiography. Secondary endpoints were coronary revascularization at 90 days and cardiovascular death or nonfatal myocardial infarction up to 3 years.

**RESULTS** In total, 13,773 patients were included of whom 6,160 had coronary computed tomography angiography. The proportions of patients identified as low risk by the American College of Cardiology/American Heart Association, European Society of Cardiology, and National Institute for Health and Care Excellence guidelines, respectively, were 2.5%, 2.5%, and 10.0% within PROMISE, and 14.0%, 19.8%, and 38.4% within SCOT-HEART. All guidelines identified lower rates of obstructive coronary artery disease in low- versus intermediate-high-risk patients with a negative predictive value of ≥0.90. Compared with low-risk groups, all intermediate-high-risk groups had greater risks of coronary revascularization (odds ratio [OR]: 2.2 to 24.1) and clinical outcomes (OR: 1.84 to 5.8).

**CONCLUSIONS** Compared with risk-based guidelines, symptom-focused assessment identifies a larger group of low-risk chest pain patients potentially deriving limited benefit from noninvasive testing. (Scottish Computed Tomography of the Heart Trial [SCOT-HEART]; NCT01149590; Prospective Multicenter Imaging Study for Evaluation of Chest Pain [PROMISE]; NCT01174550) (J Am Coll Cardiol Img 2018;11:1301-10) © 2018 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

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ISSN 1936-878X https://doi.org/10.1016/j.jcmg.2018.06.021

**ABBREVIATIONS AND ACRONYMS**

**ACC** = American College of Cardiology

**AHA** = American Heart Association

**CAD** = coronary artery disease

**CCTA** = coronary computed tomography angiography

**CI** = confidence interval

**ESC** = European Society of Cardiology

**HR** = hazard ratio

**NICE** = National Institute of Health and Care Excellence

**OR** = odds ratio

**PTP** = pre-test probability

The safe and efficient assessment of individuals presenting with suspected stable angina is fraught with challenge. At an individual level, clinicians and patients alike are highly motivated to determine the cause of symptoms and identify the presence of underlying coronary artery disease (CAD) that may place the patient at high risk of future cardiovascular events. Given the resource-intensive nature of cardiac investigations, this tendency toward risk aversion must be balanced on a population level by efficient diagnostic pathways that minimize unnecessary or inappropriate testing.

Optimizing this balance of safety and efficiency underpins the principles of international clinical guidelines. In recent years, 3 distinct approaches have been independently adopted by the American College of Cardiology/American Heart Association (ACC/AHA) (1,2), the European Society of Cardiology (ESC) (3), and the U.K. National Institute of Health and Care Excellence (NICE) (4,5).

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Both the ACC/AHA and ESC guidelines adopt the concept of Bayesian probability whereby initial estimation of prior probability is updated according to diagnostic test results to determine the post-test probability of obstructive CAD. Within these risk-based strategies, pre-test probability (PTP) is determined from the DF-CASS (Diamond-Forrester/Coronary Artery Surgery Study) (ACC/AHA) (2) and CADC (Coronary Artery Disease Consortium) (ESC) (3) clinical risk scores that incorporate age, sex, and chest pain typicality. Knowledge of PTP is used to categorize patients into 1 of 3 diagnostic risk groups: low; intermediate; or high. Both guidelines agree that noninvasive testing for CAD has greatest utility (Class I recommendation) in the intermediate-risk group, which is arbitrarily defined as 10% to 90% in the United States and 15% to 85% in Europe. In contrast, the recently updated NICE guidance for the diagnosis of suspected stable angina has abandoned this probabilistic approach in favor of a symptom-focused assessment (4). Following clinical evaluation, patients adjudged to have typical or atypical symptoms or an abnormal resting electrocardiogram are categorized into a possible angina group for whom additional noninvasive imaging with coronary computed tomography angiography (CCTA) is recommended. The remainder are classified as nonanginal, and no further testing is indicated.

However, the impact of these recommendations on the appropriate selection of patients for the application of these tests remains underexplored in prospective clinical trials. Indeed, while all 3 of the guidelines recognize the limited utility of diagnostic testing in low-risk individuals, each has adopted important differences in approach to defining this cohort. To our knowledge, no prior study has systematically compared the results of the 3 approaches to identify obstructive CAD and clinical outcomes. Thus, we studied the efficiency and safety of the 3 major guidelines for the diagnosis of obstructive CAD in patients with stable chest pain within the context of 2 recent large clinical studies—the North American, PROMISE (Prospective Multicenter Imaging Study for Evaluation of Chest Pain), and the SCOT-HEART (Scottish Computed Tomography of the Heart) trial.

## METHODS

**STUDY COHORTS.** Patient-level data were obtained from the PROMISE and SCOT-HEART trial cohorts. These are prospective multicenter randomized controlled trials investigating the utility of CCTA in the diagnosis and management of patients undergoing assessment of suspected stable angina due to CAD. The pragmatic designs (6,7) and principal findings (8,9) of these studies have been reported previously. The intervention arm in both studies consisted of CCTA, which was compared with usual care. Details of cohort-specific inclusion and exclusion criteria have been previously described (10). To confirm guideline utility in distinct clinical settings and across populations, the study cohorts were analyzed separately.

**GUIDELINE-DETERMINED DIAGNOSTIC GROUPS.** For the ACC/AHA and ESC guideline analysis, PTP of CAD was determined according to the DF-CASS and CADC risk models, respectively. Diagnostic risk groups (low, intermediate, high) were then defined as specified in each guideline (Online Table 1). For

institutional research funds from GE Healthcare and HeartFlow; and serves on a data safety monitoring board for GE Healthcare. Dr. Fordyce serves on advisory boards for Bayer, Novo Nordisk, Boehringer Ingelheim, and Sanofi. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

Manuscript received June 26, 2018; accepted June 29, 2018.