JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
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PUBLISHED BY ELSEVIER

VOL. 67, NO. 1, 2016
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2015.09.104

EDITORIAL COMMENT

The Management of Acute Chest Pain

What Lies Beyond the Emergency Department Doors?*

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With >8 million emergency department (ED) visits annually in the United States and a reported 2% of patients discharged from the ED with a missed acute coronary syndrome, the optimal management of acute chest pain in the ED is a dilemma faced by many clinicians (1). Risk stratification on the basis of the initial history, physical examination, electrocardiogram, and troponin measurement is essential early in the triage process. For patients with low to intermediate risk for short-term death and myocardial infarction (MI), the evaluation is focused on identifying those who can be safely discharged from the ED after an observation period, with or without a noninvasive study to evaluate for ischemia (stress test) or coronary artery obstruction (coronary computed tomography angiography [CCTA]). With the advent of high-sensitivity troponins (hsTn), the ability to rule out MI in the ED has improved (2). Previous protocols utilized creatine kinase myocardial band or regular troponin. Therefore, strategies incorporating hsTn have not yet been widely studied.

However, there is also a second goal of the ED evaluation: risk stratification for future events. Although clinical studies of chest pain algorithms and investigations have confirmed that low- to intermediate-risk patients are generally at exceedingly low risk in terms of short-term death and MI (3,4), to date, all of the trials have been underpowered for hard events. Therefore, decisions on the next steps after acute MI is ruled out are usually on the basis of clinician experience, health care system issues, or societal factors.

In this issue of the *Journal*, Dedic et al. (5) report on the BEACON (Better Evaluation of Acute Chest Pain with Coronary Computed Tomography Angiography) trial, a multicenter study of chest pain evaluation in

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which patients were randomized to early CCTA compared with standard optimal care *after* hsTn had ruled out MI in the ED. The trial was composed of 500 patients, with a mean age of 54 years, who had presented with low- to intermediate-risk acute chest pain and were followed for 30 days. As expected, there was no difference in mortality (with only 1 death overall) or in major adverse cardiac events. As a result of power issues, the primary endpoint of the trial was the need for coronary revascularization. There was a 2% excess of procedures in the CCTA arm (9% vs. 7%, $p = 0.40$), but the investigators had powered the trial to detect a 9% absolute difference in revascularization rates between the 2 arms if CCTA was to be considered superior. There were also no differences in the pre-specified key secondary outcome measures of discharge from the ED, length of stay, and repeat ED visits. The only clear advantage of CCTA appeared to be in the reduction of costs of about 34% due to significant reductions in outpatient testing after the index ED visit. In the hsTn era, we anticipate that such surrogate outcomes of efficiency of care and optimal use of resources will become increasingly important.

The BEACON trial brings to light some important observations regarding trials in this field. Like many trials of strategies for chest pain in the ED, the primary endpoint was evaluated only within 30 days. When considering short-term surrogate endpoints, 2 key trials have demonstrated advantages for a CCTA-guided approach (3,4). For the CCTA group, both the more recent ACRIN-PA (American College of Radiology Imaging Network-Pennsylvania) and ROMICAT-II (Rule Out Myocardial Infarction using Computer Assisted Tomography II) trials showed that

*Editorials published in the *Journal of the American College of Cardiology* reflect the views of the authors and do not necessarily represent the views of *JACC* or the American College of Cardiology.

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there was a 25% to 35% higher rate of discharge from the ED and a 7-h shorter length of stay. In contrast to the BEACON trial, ROMICAT-II found increased downstream testing, although without reducing subsequent ED visits in the CCTA group. So, what are the determinants of short-term outcome that will best inform practice, and from the data at hand, can we determine the optimal strategy to be employed? The alternatives to CCTA remain a functional study with standard treadmill exercise tests, stress myocardial perfusion imaging, or stress echocardiography. For the most part, the reasons for choosing among these tests appear to be very center-specific, and depend upon expertise and availability of testing. In addition, we must look at health care systems. Patients in the BEACON trial were generally evaluated in the ED with a discharge plan for subsequent follow-up in designated chest pain clinics within 48 to 72 h. By contrast, due to limitations in securing and adhering to outpatient follow-up visits, there is a greater likelihood in the United States that a more advanced work-up is done in the acute setting (6). Opportunities to save on resource utilization and costs can also drive the next steps. The European BEACON trial was associated with cost savings, whereas the American ROMICAT-II study showed no significant cost savings up to 30 days. There are also societal issues that play a role in what is carried out in the ED. The fear of litigation is more of a concern to ED physicians in the United States, leading to a perceived greater need to evaluate the patient more thoroughly before discharge (6).

Another important issue is the long-term management of patients beyond the first 30 days. In one randomized comparison with standard exercise stress testing, CCTA was associated with both reduced ED visits and cardiac admissions (7), whereas in another, there was no difference (8). What is becoming apparent is that the visit to the ED affords the opportunity to optimize medical risk factor care, including antiplatelet agents, lipid-lowering agents including statins, and management of hypertension, as well as educating the patient on the aforementioned. These interventions will have long-term consequences. One advantage of CCTA is that by characterizing plaque burden and the nature of plaque, we may be able to have better adherence to secondary prevention guidelines (9), which should improve long-term cardiovascular outcomes.

Given the success of ED rapid triage algorithms using imaging, biomarkers, or both, the field is now moving beyond the issue of safe discharge for patients at low to intermediate risk, to long-term prevention of CV events and efficient use of resources. Long-term management of these patients to reduce resource utilization and return visits to the ED and to provide better cardiovascular outcomes needs further evaluation in long-term studies. We encourage all clinical investigations of chest pain in the ED to follow patients long term so that we can better understand the true impact on patient health and costs. As accessibility increases and radiation doses are lowered, CCTA-based protocols continue to be a viable, and often attractive, option, but they may not be the only option. We call for a collaborative effort between ED physicians and the cardiovascular community to incorporate these data into a tailored approach to short- and long-term management of low- to intermediate-risk patients that best suits the needs of their patients and the capabilities of their health care systems.

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KEY WORDS acute coronary syndrome, coronary angiography, risk factors, secondary prevention, triage, troponin