

Coronary Computed Tomography Angiography Versus Traditional Care: Comparison of One-Year Outcomes and Resource Use

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Study objective: Three large, multicenter, randomized, clinical trials have shown that coronary computed tomography (CT) angiography allows efficient evaluation and safe discharge of patients with low- to intermediate-risk chest pain who present to the emergency department (ED). We report 1-year event rates and resource use from the American College of Radiology Imaging Network-Pennsylvania 4005 multicenter trial.

Methods: Patients with low- to intermediate-risk chest pain and presenting to the ED were randomized in a 2:1 ratio to a coronary CT angiography care pathway or traditional care. Subjects were contacted by telephone at least 1 year after ED presentation. Medical record review was performed for all cardiac hospitalizations, procedures and diagnostic tests, and adverse cardiac events. Our main outcome was the composite of cardiac death and myocardial infarction within 1 year. The secondary outcome was resource use.

Results: One thousand three hundred sixty-eight patients enrolled and 1,285 (94%) had direct participant or proxy contact at 1 year. All others had record review or death index search. From index presentation through 1 year, there was no difference between patients in the coronary CT angiography arm versus traditional care with respect to major adverse cardiac event (1.4% versus 1.1%; difference 0.3%; 95% CI -5.5% to 6.0%). From hospital discharge through 1 year, there was also no difference in ED revisits (36% versus 38%; difference -2.1%; 95% CI -7.9% to 3.7%), hospital admissions (16% versus 17%; difference -0.9%; 95% CI -6.7% to 4.9%), or subsequent cardiac testing (13% versus 13%; difference -0.4%; 95% CI -6.2% to 5.5%). One of 640 subjects with a negative coronary CT angiography result had a major adverse cardiac event within 1 year of presentation (0.16%; 95% CI 0.004% to 0.87%).

Conclusion: A coronary CT angiography-based strategy for evaluation of patients with low- to intermediate-risk chest pain who present to the ED does not result in increased resource use during 1 year. A negative coronary CT angiography result is associated with a less than 1% major adverse cardiac event rate during the first year after testing. [Ann Emerg Med. 2015;■:1-9.]

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INTRODUCTION

The optimal pathway for the evaluation of patients with low to intermediate risk who present to the emergency department (ED) with chest pain and possible acute coronary syndrome remains a topic of intense investigation and controversy. Three large multicenter trials (Coronary Computed Tomography for Systematic Triage of Acute Chest Pain Patients to Treatment,¹ American College of Radiology Imaging Network-Pennsylvania [ACRIN PA] 4005,² and Multicenter Study to Rule Out Myocardial Infarction by Cardiac Computed Tomography [ROMICAT] II³) have demonstrated, in aggregate, that

[†]All study participants are listed in the [Appendix](#).

a coronary computed tomography (CT) angiography-based pathway allows more efficient evaluation of these patients and safe discharge of those with a negative study result. Two of the three studies measured cost of care; both demonstrated lower ED costs, although the ROMICAT II trial showed higher inpatient costs in the coronary CT angiography arm but overall cost neutrality at 28 days.

Although the rate of ED recidivism was unchanged at 30 days, there was concern over increased short-term resource use because patients in the coronary CT angiography arms of all 3 trials underwent more testing.^{4,5} However, this was primarily a result of the design of two of the studies, which mandated testing in the coronary CT angiography arm,

Editor's Capsule Summary*What is already known on this topic*

Coronary computed tomography (CT) angiography can identify chest pain patients at low risk for 30-day adverse events.

What question this study addressed

The 1-year risk of major adverse cardiac events in patients who were enrolled in a coronary CT angiography clinical trial.

What this study adds to our knowledge

One of 640 patients (0.16%) with a negative coronary CT angiography result had a major adverse event at 1 year. Major adverse events and resource use at 1 year did not differ between the patients who received imaging in the emergency department and those who underwent traditional testing.

How this is relevant to clinical practice

In patients who have a negative CT angiography result, the incidence of major adverse cardiac events at 1 year is very low, and they may not benefit from repeated risk stratification. Given the low event rate, larger studies will be needed to determine the optimal strategy for the evaluation of low-risk chest pain patients.

when possible, but did not require testing in the traditional care arm.

Although single-center trials have demonstrated long-term safety (≥ 1 year) for patients after negative coronary CT angiography results,^{6,7} 1-year event rates and resource use have not been reported for any multicenter randomized controlled trial, to our knowledge. We analyzed patient outcomes and resource use within 1 year for the ACRIN PA 4005 trial.

MATERIALS AND METHODS**Study Design and Selection of Participants**

The design of the ACRIN PA 4005 trial has been described previously.² Briefly, 1,392 subjects presenting to EDs at 5 centers from July 2009 to November 2011 were randomized in a 2:1 ratio to a coronary CT angiography care pathway, in which the first evaluation was a coronary CT angiography, or a traditional care pathway, in which the subject's health care provider selected which tests, if any, would be performed. Eligible subjects were aged at least 30 years, with a chief complaint consistent with potential acute

coronary syndrome, an ECG not demonstrating acute ischemia, an initial Thrombolysis in Myocardial Infarction risk score⁸ of 0 to 2, and provider-determined need for admission or objective testing to exclude acute coronary syndrome. Objective testing included plans for a functional (stress) or anatomic (coronary CT angiography or catheterization) evaluation. Subjects were enrolled 7 AM to midnight, 7 days per week, and potential subjects presenting outside these hours were eligible to be enrolled the next morning if the manner of further testing had not already been decided on. Patients unable or unwilling to participate in follow-up were excluded from enrollment.

The primary hypothesis of the trial was that patients without significant coronary artery disease on coronary CT angiography have a less than 1% rate of 30-day cardiac death or myocardial infarction. This report focuses on major secondary aims, including comparison of 1-year rates of death, myocardial infarction, revascularization, and resource use.

The study was approved by the institutional review boards of all sites.

Data Collection and Processing

Structured data collection was performed prospectively at the index visit in accordance with standardized reporting guidelines⁹ and key definitions¹⁰ and included demographic and clinical characteristics, the ECG, treatment, diagnostic testing, and disposition.

Subjects were contacted by telephone at 30 days and 1 year after ED presentation and queried about myocardial infarction, ED visits or hospitalizations, revascularization, cardiac testing (coronary CT angiography, stress testing, echocardiography, and catheterization), cardiologist visits, and cardiac medication use. Medical record review was performed for all potential cardiac hospitalizations, cardiac diagnostic tests, myocardial infarction, and all deaths. If the subjects or secondary contacts were unavailable, records at the presenting and neighboring hospitals were reviewed for repeated visits. When these methods failed to provide survival information, we searched the Social Security Death Master File (<http://www.ssdmf.com>) for vital status (January 14, 2013). An independent committee adjudicated all potential myocardial infarctions and cardiac-related deaths, using standard definitions.^{10,11}

Primary Data Analysis

The trial was powered to test the principal hypothesis that the 30-day major adverse cardiac event rate (including myocardial infarction and cardiac death) among patients found not to have significant coronary artery disease on coronary CT angiography exceeds 1%. Given expectations

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