

Johns Hopkins University School of Medicine
Appropriate Use Criteria
Priority Clinical Area: Stable Chest Pain
Setting: Ambulatory and Emergency Department

INTRODUCTION

The purpose of this project was to evaluate the highest grade evidence in the literature pertaining to the utility of coronary CTA in outpatients and emergency department patients with suspected coronary artery disease (CAD) focusing on patient outcomes and costs, in keeping with high-value practice.

LITERATURE REVIEW

Coronary Artery Disease Literature Review
Conducted Feb. 11, 2019

Katie Lobner, Welch informationist, in cooperation with subject specialists performed a broad search of the literature from 1990 to present to identify research investigations, systematic reviews and meta-analyses measuring the utility of advanced imaging (CT, MRI or nuclear medicine) in CAD and/or chest pain.

("Coronary artery disease"[mh] OR "coronary arteriosclerosis"[mh] OR "acute coronary syndrome"[mh] OR "coronary artery atherosclerosis"[mh] OR "arteriosclerotic cardiac disease"[mh] OR "arteriosclerotic heart disease"[mh] OR "coronary atherosclerosis"[mh] OR "coronary arteriosclerosis"[mh] OR "coronary artery calcification"[mh] OR "coronary arterial calcification"[mh] OR "coronary artery obstruction"[mh] OR "coronary arterial obstruction"[mh] OR "coronary artery stenosis"[mh] OR "coronary obstruction"[mh] OR "coronary artery occlusion"[mh] OR "coronary arterial occlusion"[mh] OR "coronary artery acute occlusion"[mh] OR "coronary occlusion"[mh] OR "coronary artery thrombosis"[mh] OR "coronary thrombosis"[mh]) AND ("Magnetic Resonance Imaging"[mh] OR "MRI"[mh] OR "MRI" [tiab] OR "Tomography, x-ray computed"[mh] OR "CT"[tiab] OR "computed tomography"[tiab] OR "nuclear medicine"[mh] OR "radionuclide imaging"[mh:noexp] OR "radionuclide imaging"[tiab] OR "scintiscanning"[mh] OR "scintiangiocardigraphy"[mh] OR "perfusion imaging"[mh] OR "scintigraphy"[mh] OR "myocardial perfusion imaging"[mh] OR "radionuclide angiography"[mh:noexp] OR "radionuclide angiography"[tiab] OR "radionuclide ventriculography"[mh] OR "gated blood-pool imaging"[mh] OR "Tomography, Emission Computed"[mh] OR "emission computed tomography"[tw] OR "positron-emission tomography"[mh] OR "positron emission tomography computed tomography"[mh] OR "tomography, emission-computed, single-photon"[mh] OR "cardiac-gated single-photon emission computer-assisted tomography"[mh] OR "single photon emission computed tomography computed tomography"[mh]) AND ("randomized controlled trial" OR "meta-analysis" OR "systematic review"[pt]) AND 2000:3000[dp] AND eng[la]

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Inclusion Criteria

- Primary diagnosis of CAD (pre-intervention)
- Randomized controlled trial, systematic review or meta-analysis
- Evaluated effectiveness of cardiac imaging for diagnosis, management and outcomes in CAD
- Adult patients
- CT: 64 slice or higher
- MRI: 1.5 T or higher
- Nuclear medicine: standard cardiac tests
- Search for studies focused on women and underrepresented minorities

Exclusion Criteria

- Pediatric
- Pathology other than CAD; e.g., cardiomyopathy
- Post-treatment CAD
- Less common diseases such as lupus
- Experimental imaging protocols (i.e., comparison of contrast doses, novel radionuclide agents, MRI protocols, etc.)
- No studies evaluating utility of premedication for CT, MRI or nuclear medicine
- Abstract detailing the protocol design prior to performing the randomized controlled trial

Additionally, clinical practice guidelines & consensus statements were identified using this search:

("Coronary artery disease"[mh] OR "coronary arteriosclerosis"[mh] OR "acute coronary syndrome"[mh] OR "coronary artery atherosclerosis"[mh] OR "arteriosclerotic cardiac disease"[mh] OR "arteriosclerotic heart disease"[mh] OR "coronary atherosclerosis"[mh] OR "coronary arteriosclerosis"[mh] OR "coronary artery calcification"[mh] OR "coronary arterial calcification"[mh] OR "coronary artery obstruction"[mh] OR "coronary arterial obstruction"[mh] OR "coronary artery stenosis"[mh] OR "coronary obstruction"[mh] OR "coronary artery occlusion"[mh] OR "coronary arterial occlusion"[mh] OR "coronary artery acute occlusion"[mh] OR "coronary occlusion"[mh] OR "coronary artery thrombosis"[mh] OR "coronary thrombosis"[mh]) AND ("Magnetic
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Resonance Imaging"[mh] OR "MRI"[mh] OR "MRI" [tiab] OR "Tomography, x-ray computed"[mh] OR "CT"[tiab] OR "computed tomography"[tiab] OR "nuclear medicine"[mh] OR "radionuclide imaging"[mh:noexp] OR "radionuclide imaging"[tiab] OR "scintiscanning"[mh] OR "scintiangiocardiology"[mh] OR "perfusion imaging"[mh] OR "scintigraphy"[mh] OR "myocardial perfusion imaging"[mh] OR "radionuclide angiography"[mh:noexp] OR "radionuclide angiography"[tiab] OR "radionuclide ventriculography"[mh] OR "gated blood-pool imaging"[mh] OR "Tomography, Emission Computed"[mh] OR "emission computed tomography"[tw] OR "positron-emission tomography"[mh] OR "positron emission tomography computed tomography"[mh] OR "tomography, emission-computed, single-photon"[mh] OR "cardiac-gated single-photon emission computer-assisted tomography"[mh] OR "single photon emission computed tomography computed tomography"[mh]) AND ("practice guideline"[pt]) AND 2000:3000[dp] AND eng[la]

Literature Search Results

Results from the search strategy were uploaded to Covidence and screened in duplicate by two radiology faculty with subspecialty training in body imaging, with disagreements resolved by consensus, followed by the same process for full text review.

PRISMA of Investigation Review

- 606 references imported for screening
 - 0 duplicates
- 606 studies screened against title and abstract
 - 423 studies excluded
- 183 studies assessed for full-text eligibility
 - 37 excluded
- 146 studies total (some papers fit in more than one category)

Clinical Practice Guidelines Review

- 40 guidelines
 - 0 duplicates
- 40 studies screened against title and abstract

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- Three excluded
 - 37 studies assessed for full-text eligibility
- 18 excluded
 - 19 guidelines total

Literature Review Results

Investigations that only evaluated patients with **stable chest pain** (N=22) included:

- One meta analysis
- One systematic review
- 15 randomized controlled trials
- Five prospective studies

Strength of evidence for stable chest pain

- 17 studies with Oxford Grade 1 evidence
- Five studies with Oxford Grade 2 evidence

Evidence tables are found separately on the Johns Hopkins Medicine's Appropriate Use Criteria [website](#).

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APPROPRIATE USE CRITERIA

Title	Clinical scenario 1: Low pretest probability and able to perform ETT	Clinical scenario 2: Intermediate pretest probability and able to perform ETT	Clinical scenario 3: High pretest probability and able to perform ETT	Clinical scenario 4: Low pretest probability and unable to perform ETT	Clinical scenario 5: Intermediate pretest probability and unable to perform ETT	Clinical scenario 6: High pretest probability and unable to perform ETT
Definition	All of the following <ul style="list-style-type: none"> • able to exercise • EKG interpretable • low pretest probability of CAD 	All of the following <ul style="list-style-type: none"> • able to exercise • EKG interpretable • intermediate pretest probability of CAD 	All of the following <ul style="list-style-type: none"> • able to exercise • EKG interpretable • high pretest probability of CAD 	All of the following <ul style="list-style-type: none"> • unable to exercise OR EKG interpretable or abnormal • low pretest probability of CAD 	All of the following <ul style="list-style-type: none"> • unable to exercise OR EKG interpretable or abnormal • intermediate pretest probability of CAD 	All of the following <ul style="list-style-type: none"> • unable to exercise OR EKG interpretable or abnormal • high pretest probability of CAD
AUC rules						
Consistent with AUC	<ul style="list-style-type: none"> • Coronary CTA 	<ul style="list-style-type: none"> • Coronary CTA • SPECT (Nuclear medicine perfusion) • Stress MRI • Stress echocardiography 	<ul style="list-style-type: none"> • Stress echocardiography • Stress MRI • SPECT (Nuclear medicine perfusion) 	<ul style="list-style-type: none"> • Coronary CTA 	<ul style="list-style-type: none"> • Coronary CTA • SPECT (Nuclear medicine perfusion) • Stress MRI • Stress echocardiography 	<ul style="list-style-type: none"> • SPECT (Nuclear medicine perfusion) • Stress MRI • Stress echocardiography
Allowable by AUC	<ul style="list-style-type: none"> • Coronary artery calcium screening 	<ul style="list-style-type: none"> • PET/CT 	<ul style="list-style-type: none"> • Coronary CTA • PET/CT 	<ul style="list-style-type: none"> • Coronary artery calcium screening • SPECT (Nuclear medicine perfusion) • Stress MRI 	<ul style="list-style-type: none"> • PET/CT 	<ul style="list-style-type: none"> • Coronary CTA • PET/CT

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				• Stress echocardiography		
Does not meet AUC	<ul style="list-style-type: none"> • SPECT (Nuclear medicine perfusion) • Stress MRI • PET/CT 	• Coronary artery calcium screening	• Coronary artery calcium screening		• Coronary artery calcium screening	• Coronary artery calcium screening
Not applicable (No AUC)						

MULTIDISCIPLINARY TEAM

A multidisciplinary team with autonomous governance, decision-making and accountability for developing or modifying AUC was empaneled to develop AUC for patients with stable chest pain. The multidisciplinary team developing these AUC includes seven or more practicing physician members and more than one practicing physician with expertise in the clinical topic related to the AUC being developed or modified. Specifically, each team includes at least one practicing physician in the nonradiology specialty or specialties related to the AUC and at least one practicing physician in the radiology subspecialty related to the AUC. For acute chest pain, the relevant specialties and subspecialties are:

- Cardiovascular radiology
- Cardiology
- Internal medicine

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The Johns Hopkins University School of Medicine requires that all practicing physicians participating in the development of AUC disclose any conflicts of interest using the International Committee of Medical Journal Editors conflict of interest form. This information is publicly available in a timely fashion upon request, for a period of not less than five years after the most recent published update of the relevant appropriate use criteria. The members of the CAD/Stable Chest Pain AUC development team are listed here:

Coronary Artery Disease:

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Disclosure: Developers may receive future royalties from licensure of AUC to CMS-approved clinical decision support mechanisms.

TRANSPARENT AND TIMELY UPDATING OF CRITERIA

A literature search for each AUC will be repeated and reviewed annually, and AUC will be updated if sufficient strong evidence is identified to necessitate revision.