

Evaluating the Economic Impact of CTA in the Emergency Department at the University of Michigan Health Systems

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About GE-AUR Radiology Research Academic Fellowships
Since its inauguration in 1992, the GE Healthcare GERRAF (GE-AUR Radiology Research Academic Fellowships) has been one of the most sought after awards in academic radiology. Already, they have helped dozens of academic radiologists through:

- Strengthening the research interest of radiologist-investigators by broadening their opportunities for continuing scholarship
- Fostering original clinical and health services research in technology assessment, health and economic outcome methods, and decision analysis

A unique GERRAF benefit is the program's exceptionally strong focus on mentoring, both within the Fellow's institution and as part of the many formal educational activities that GERRAF conducts.

Chest pain is the second most common presenting symptom for ER patients. The assessment of chest pain is a costly process with few guidelines to assist the clinician in determining the most appropriate sequence of diagnostic cardiac tests. This is further complicated by the fact that an average of two-thirds of the patients presenting with chest pain have no cardiac disease or events and are discharged; one-third are admitted and treated.

Current testing protocols vary between hospitals for triage of chest pain patients. The range of available tests for patients to diagnose chest pain remains constant – including exercise ECG, SPECT stress testing, stress echocardiography and cardiac catheterization – while the ordering of these tests for ER patients follow a variety of clinical protocols.

While centers triage patients differently, there are standard protocols among some chest pain centers for further diagnostic testing based on the level of severity. These patient classifications are:

Level 1 – Patient presents with elevated enzyme and ECG data that is consistent with myocardial infarction (MI). These patients are admitted to the cardiac care unit (CCU) for cardiac catheterization for diagnosis and treatment.

Level 2 – Clinician suspects unstable angina yet patient does not respond to typical treatment. These patients are likely at high risk for MI and are typically admitted to CCU for further monitoring, testing and possible treatment.

Level 3 – Patient has potentially unstable angina but a lower risk of MI. History, signs and symptoms and diagnostic testing (ECG) may be discordant. These cases are difficult to diagnose and patients typically undergo a series of tests and are sometimes admitted.

Comparison of reimbursement codes further shows CTA as a competitive economic alternative to coronary catheterization/angiography and myocardial SPECT.

- Dr. Aine Kelly

Level 4 – A low probability that patient has unstable angina; ECG tests are often inconclusive for this group, leading to additional imaging tests. Patients in this group have a lower threshold for discharge and are deemed less at risk of cardiac events than Level 3.

Level 5 – Patient has a history of pneumonia, trauma or other muscular (injury or disease); another diagnosis other than MI is more likely. Some cardiac testing may still occur, depending upon facility policy.

For those patients that are most difficult to diagnose – Level 3 and Level 4 – the need for standard protocols among chest pain centers and ERs is great.

Cost-effectiveness of CTA for Chest Pain Management

In 2005, as a result of the GERRAF award from GE Healthcare, a study on the cost-effectiveness of CTA in the ER for chest pain management was initiated. A decision model based on published values for the prevalence of disease in the U.S. adult population was formed. Virtual patients were created and statistics from the ER for the likelihood of cardiac disease included.

The decision model further subjects the virtual patient to different tests, using values for test sensitivity and likelihood (or percentage) of disease. The testing simulates real life – some virtual patients are diagnosed incorrectly.

Test effectiveness is further compared for accuracy in detection of cardiac disease and cost. That data is then analyzed against each test's known sensitivity and specificity.

The real value of CTA is how specific the test is for correctly identifying cardiac disease. If a CTA is normal, it is likely that the patient does not have cardiac disease with a high degree of clinical confidence.



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About the University of Michigan Health Systems

The University of Michigan Health Systems (UMHS) is an award-winning healthcare system made up of several hospitals and health centers, including:

- University Hospital
- C.S. Mott Children's Hospital
- Women's Hospital
- 30 health centers and 120 outpatient clinics

UM Hospitals and Health Center consistently rank high on the Honor Roll of America's Best Hospitals, compiled by *U.S. News & World Report* and was ranked 14th best in 2007. In 2007, UM C.S. Mott Children's Hospital ranked as the top children's hospital in the state and among the 25 best in the nation, according to a survey by *Child* magazine.

Procedure and CPT Code	Professional Fee	Technical/Facility Fee	Total
Cardiac Stress Testing			
93015	No data available		
93016*	122		122
93017**		584	584
93017*	284		284
	284	584	868
Planar Myocardial Imaging			
78460	235	859	1094
78478 +Wall motion	100	587	687
78480 + EF	100	499	599 2380
Planar with multiple testing			
78461	346	1440	1786
MyoSPECT			
78464 single	277	1354	1631
78465 multiple	300	1760	2060
MyoPET			
78491single	200	3343	3543
78492 multiple	230	3343	3573
Left Heart Catheterization			
	254	4478	4732
Stress echo			
	644	812	1456
Coronary CT function			
	90	288	378
Coronary CT bypass or not			
	250	854	1104
	340	2042	2382

Within the University of Michigan Health System, CTA is used mostly on Level 4 patients. With a negative CTA, confidence is high that the patient does not have the onset of a cardiac event or MI and they are discharged. However, the jury is still out on Level 3 patients. More data and cost analysis is required; therefore, the study is focused on this patient classification.

Using a decision model, tests are evaluated based on:

- Sensitivity
- Specificity
- Side effects
- True and false positive rates and downstream costs

Prognosis includes negative test results and the likelihood the patient will be diagnosed with coronary artery disease (CAD) at a later date.

Preliminary results for prognosis, sensitivity and specificity support CTA as useful tool to help in our ruling out cardiac disease in intermediate and low risk patients. Comparison of reimbursement codes further shows CTA as a competitive economic alternative to coronary catheterization/angiography and myocardial SPECT.

The next phase of this study is the comparison of costs for individual tests against prior test evaluation as described. Specifically, CTA will be compared against cardiac catheterization. Thirty virtual patient cases include the identification of a lesion via catheterization with CTA showing significant morphological changes. In addition, our goal is to survey 100 patients who had CTA and angiography to further document their perceptions of each study and preference. Results will be reported in subsequent issues of CT Clarity. ■

*Professional fee only code
 **Technical/facility fee only code