Innovation Health Services

24/7 cardiac imaging support

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Executive Summary

A Premier Cardiac Imaging Team Providing Around-the-Clock Support to Reduce Heart Attacks, Lower Costs, and Expedite Discharge

Innovation Health Services (IHS) is a physician-owned digital medical practice of imaging cardiologists, cardiac radiologists, technologists, and software engineers providing around-the-clock clinical support to hospitals, independent practices, imaging centers, and emergency departments throughout North America, at a fraction of the cost of full-time equivalent physicians. Spread amongst time zones, and embracing the most innovative technologies, we are a premier team of cardiac imaging experts committed to definitive, cost-effective diagnostics proven to reduce the number of preventable heart attacks, decompress busy emergency departments, and improve patient satisfaction. We embrace a "CT First" approach to chest pain triage, as endorsed by the 2021 ACC/AHA Chest Pain Guidelines.[1] Our mission is to expand access to subspecialty cardiovascular care using telemedicine. We believe life-saving diagnostics should not be restricted to large, tertiary medical centers. Using cloud-based technology and a collaborative team of imaging experts, we are scaling state-of-the-art cardiac diagnostics to hospitals and healthcare systems small and large. Our model is designed to complement local programs, extending hours of operation, and providing essential back-up support as we work collaboratively to establish long-term partnerships.

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The health and economic impact of heart disease is substantial. In the United States alone, heart disease accounts for over 800,000 deaths each year and approximately 1 billion dollars every day in medical costs and lost productivity U.S.[2] However, 90% of heart attacks can be prevented with early detection and treatment.[3] Unfortunately, **traditional pathways to diagnose heart disease are inefficient, leading to poor health outcomes and high costs**. Traditional pathways for detecting heart disease have relied heavily on evaluating patient symptoms utilizing stress testing. However, about half of patients who suffer heart attacks experience no early symptoms, and about 90% of stress tests are interpreted as "normal."[4] Consequently, many patients suffer preventable heart attacks and incur high medical costs due to diagnostic inefficiencies and waste.

The standard of care for evaluating heart disease is undergoing a paradigm shift, with greater focus on direct coronary plaque imaging using cardiac CT, so vulnerable patients can be identified and treated early before they suffer heart attacks. Cardiac CT allows for direct visualization of coronary plaque, even at early stages, so patients can be appropriately risk-stratified for future heart attacks, and tailored therapy can be initiated in a timely manner. There is more evidence cardiac CT improves patient outcomes than any other diagnostic test, including a **30% reduction in future heart attacks**.[5-7] In 2021, the American College of Cardiology (ACC) and the American Heart Association (AHA) updated Chest Pain Guidelines,[1] elevating cardiac CT to a Class I indication (Level of Evidence A), and endorsing CT as the preferred frontline test for a large number of patients with chest pain.

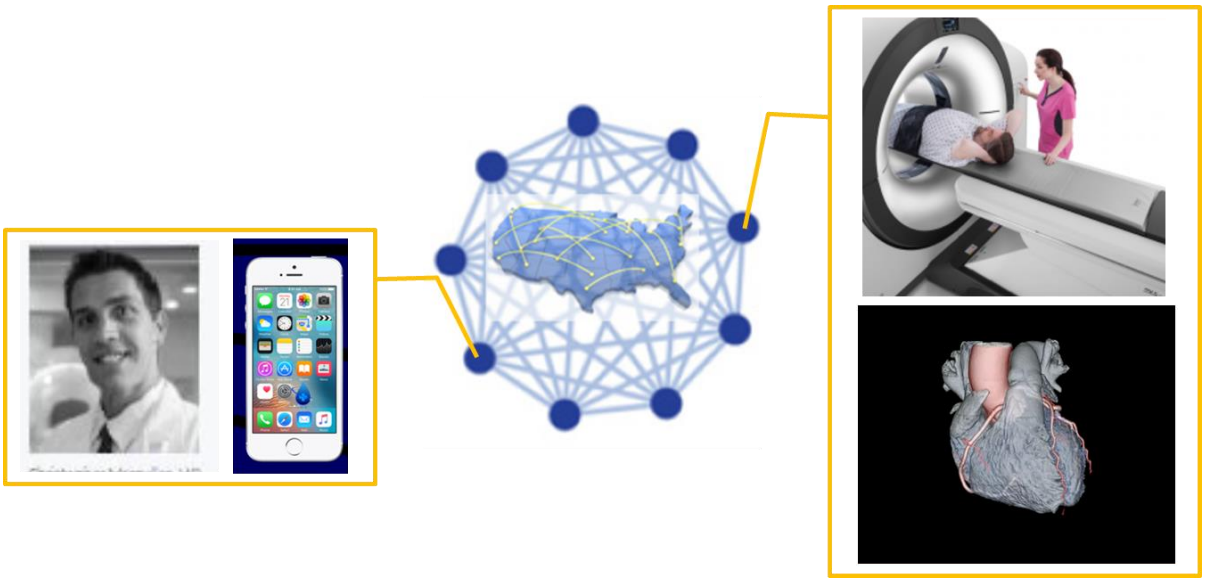
The greatest barrier to growth and adoption of Cardiac CT is a national shortage of accredited physicians. While it should come as no surprise that utilization of cardiac CT increased by 355% since 2010,[8] the majority of hospitals throughout the U.S. are either unable to implement cardiac CT or unable to offer the service around-the-clock due to a limited number of accredited physicians. The U.S. is headed towards a significant physician shortage over the next decade. By 2033, it is estimated the U.S. could have a shortfall of up to 124,000 physicians, including a significant number or accredited imagers.[9] The number of accredited imagers within the U.S. is small, and these physicians tend to be concentrated at tertiary hospitals in large, urban markets. Community hospitals, outpatient imaging centers, and free-standing emergency departments often don't have the luxury of an in-house cardiac imaging team due to constraints such as cost and the challenges of local hiring. This leads to a substantial disparity in cardiovascular care, with poor access to potentially life-saving diagnostics for patients served by these healthcare centers.

Innovation Health Services (IHS) is solving this problem. Founded in 2014, IHS is the largest digital medical practice of accredited cardiologists and radiologists providing around-the-clock cardiac imaging services to hospitals, medical practices, and emergency departments within North America. **We use telemedicine to expand the reach of subspecialty cardiovascular care** to include telecardiology consults with patients with our premier team of Level 2 and Level 3 cardiac imaging experts, many of whom are recognized leaders in the field, IHS is expanding patient access to advanced cardiovascular diagnostics that prevent heart attacks, lower healthcare costs, and decompress busy emergency departments. IHS engineers support this mission with an IT platform for seamless cloud-based collaboration, image interpretation and reporting, and innovative post-processing tools to improve diagnostic accuracy and efficiency. We partner with hospitals, practices, and emergency departments in all 50 states to support

their growth and adoption of cardiac imaging, working collaboratively with local physicians to ensure long-term relationships. Our goal is to provide collaborative, cost-effective, precision care equitably throughout the U.S., from small community hospitals to large quaternary referral centers. Scaling guidelines-backed cardiac diagnostics throughout our partner sites results in fewer heart attacks and deaths, faster ED discharge times, and improved patient and provider satisfaction.

A multidisciplinary team of over 50 cardiologists and radiologists providing around-the-clock cardiac imaging support to hospitals, practices, imaging centers and emergency departments throughout North America.

Our proprietary cloud-based clinical portal, Vivien, facilitates collaboration between physicians, technologists, and support staff, seamlessly integrating into local workflows with structured reporting, advanced data analytics, and quality assurance. All IHS physicians have access to cloud-based 4D workstations with AI-enabled features to increase efficiency and accuracy, allowing us to provide comprehensive cardiac risk stratification, including coronary plaque characterization, FFR-CT, and emerging techniques for visualizing and quantifying inflammation around the heart. Our platform also enables IHS to provide Point-of-Care **Telecardiology Videoconsults**: videoconference sessions between our physicians and patients (or between our physicians and ordering providers) to review the images and results of their diagnostic exams, including treatment recommendations.



A national team of expert cardiologists and radiologists collaborating in the cloud. IHS connects hospitals and practices with accredited cardiac imagers around-the-clock to support uninterrupted service lines, including cardiac CT and MRI.

Our services include:

- **Around-the-Clock Cardiac CT**: Our team is available for 24/7/365 coverage, including imaging interpretation, management recommendations, and consultation with results review. *Our service is collaborative with and complementary to local imagers, and the scope of our support can range depending on local needs.* While we are available to operate a full daytime CT service, we can also provide more limited support on evenings, weekends, and holidays, or "as needed" support during volume surges and vacation coverage. With extended hours of Cardiac CT, IHS can help your healthcare system lower costs, reduce preventable heart attacks, expedite ED discharge, and increase patient and provider satisfaction.

- **Cardiac MRI**: IHS physicians are accredited Level 3 experts in Cardiac MRI and can provide critical imaging services for maintaining high-quality cardiovascular service lines, including cardiothoracic surgery, structural heart disease, electrophysiology, and congenital heart disease.

- **ECG, Echo, and Telecardiology Videoconsults**: Depending upon local needs, IHS cardiologists can assist with 12-lead ECG and echocardiography interpretations. Our team also offers videoconsults face-to-face to expand patient access to general and preventive cardiology services.

- **Radiology Overreads**: Our radiologists offer overreads for Cardiac CT, PET/CT, and MRI to support local programs in their mission to deliver comprehensive radiologic interpretations for optimal health outcomes.

- **Education and Training**: IHS operates one of the highest-rated CT training courses for residents, fellows, and attendings who are seeking accreditation in cardiac CT. Directed by Dr. Mohit

Bhasin, the Intensive Level II Training Course offers a week-long mentored review of 250 cases with invasive angiographic correlation and an introduction to FFR-CT and peripheral CT angiography. All courses are now 100% virtual and CME-accredited.

- **Mentorship and Quality Assurance**: For recently accredited physicians, IHS offers quality assurance case review and mentorship to build diagnostic confidence and ensure reporting accuracy.

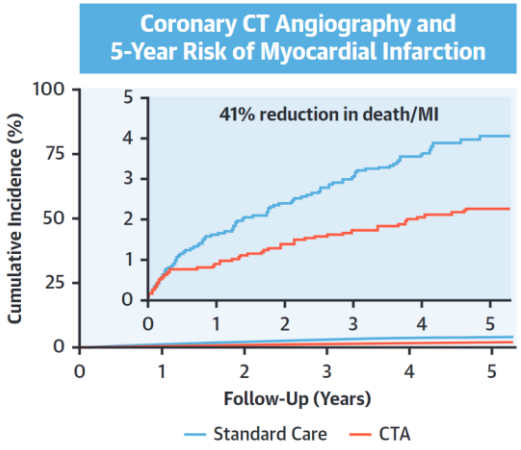
Unlocking Value and Efficiency with "CT First"

There is an enormous body of evidence supporting a "CT First" approach for chest pain triage, both in the emergency department setting and for clinic patients presenting with stable chest pain. This has led to numerous international professional societal endorsements, including most recently the ACC/AHA 2021 Chest Pain Guidelines,[1] which issued cardiac CT a "Class I" recommendation, supported by "Level A" quality of evidence. Similar strong endorsements for cardiac CT are echoed by the European Society of Cardiology 2020 Guidelines for the Management of ACS in Patients Without ST-segment elevation,[10] and the 2016 National Institute for Health and Clinical Excellence (NICE) chest pain guidelines.[11]

Partnering with a cardiac imaging team to run "CT First" around-the-clock offers a strategic market advantage for hospital systems, imaging centers, independent practices, and freestanding emergency departments who are looking to improve health outcomes, increase efficiency, and contain costs.[12-16]

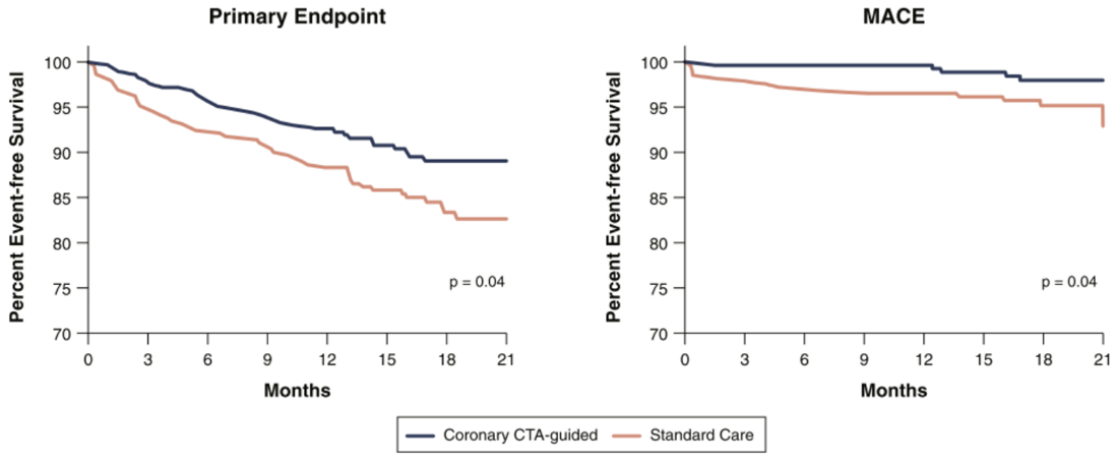
Advantages of "CT First" include:

- **Fewer heart attacks.** Above all, patients who are triaged early with cardiac CT are less likely to suffer from future heart attacks. Data from the SCOT-HEART trial 5-year outcomes study[7] demonstrated a 41% reduction in myocardial infarction and death among patients with stable chest pain who underwent early triage with cardiac CT compared to standard care (p=0.004). Similar data from a Danish nationwide registry of over 86,000 patients with stable chest pain demonstrated an almost 30% reduction in myocardial infarction with cardiac CT compared to functional testing.[17]



From Newby DE et al. New England Journal of Medicine. 2018.[7]

For patients presenting to the emergency department with acute chest pain, the randomized controlled CATCH trial[18] demonstrated a favorable long-term clinical impact of a "CT first" strategy, with a 64% lower incidence of major adverse cardiovascular events, including cardiac death, myocardial infarction, hospitalization for unstable angina, and late symptom-driven revascularization (p=0.04).



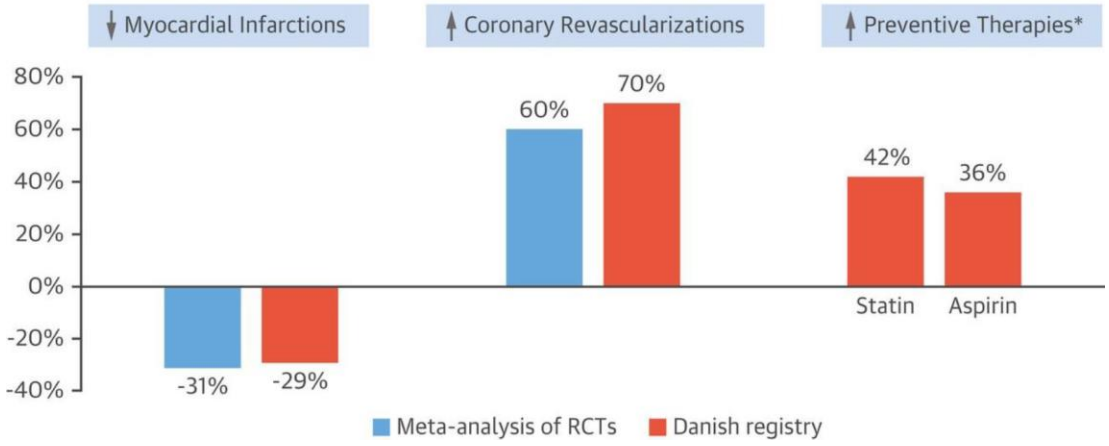
From Linde JJ et al. JACC Cardiovascular Imaging. 2015.[18]

These improvements in health outcomes are likely driven by a 40% higher rate of preventive therapy initiation or intensification after patients undergo CT, including treatment with statins and aspirin, as CT is uniquely equipped to detect coronary atherosclerosis at early stages and prompt more aggressive preventive care.[7]

- **Cost savings.** Facilities of all sizes can benefit from modernized cardiac diagnostic pathways with around-the-clock access to a team of expert cardiac imagers, at a cost lower than hiring an in-house full-time equivalent imager, and without the difficulty of physician recruitment. Partnering with a cardiac imaging team allows for more efficient use of local cardiology and radiology infrastructure, while improving patient access to potentially life-saving diagnostic pathways. Data from multiple clinical trials also demonstrates significantly lower costs incurred when a "CT first" approach is utilized, by improving diagnostic accuracy and operational efficiency.[13-15] In the BEACON trial,[13] patients with acute chest pain who underwent early triage with cardiac CT had 62% fewer downstream tests ($p < .01$) and 34% lower costs ($p < .01$) compared to patients in the standard-of-care arm. CT also provides long-term confidence with a "warranty period" of 8-10 years for patients with normal scans, unlike any other diagnostic test.[19]

- **Increased *appropriate* revascularizations.** Compared to stress myocardial perfusion imaging, cardiac CT demonstrates higher per-patient sensitivity and specificity for detecting significant coronary stenosis.[20] As such, more patients with obstructive coronary artery disease are detected with cardiac CT, resulting in appropriate increases in PCI and CABG. In the Danish nationwide registry, patients who underwent cardiac CT were 70% more likely to undergo

coronary revascularization compared to functional imaging, and similar trends were observed in the PROMISE and SCOT-HEART randomized controlled trials.[17, 21, 22] Cardiac CT also improves cath lab efficiency and is associated with a significantly lower rate of invasive angiography showing no obstructive CAD, particularly when paired with CT-based fractional flow reserve (FFR-CT).[23] Thus, patients referred to the cath lab with positive CT findings are more likely to undergo appropriate revascularization, and invasive angiography can be safely deferred in patients with negative scans or nonobstructive disease.

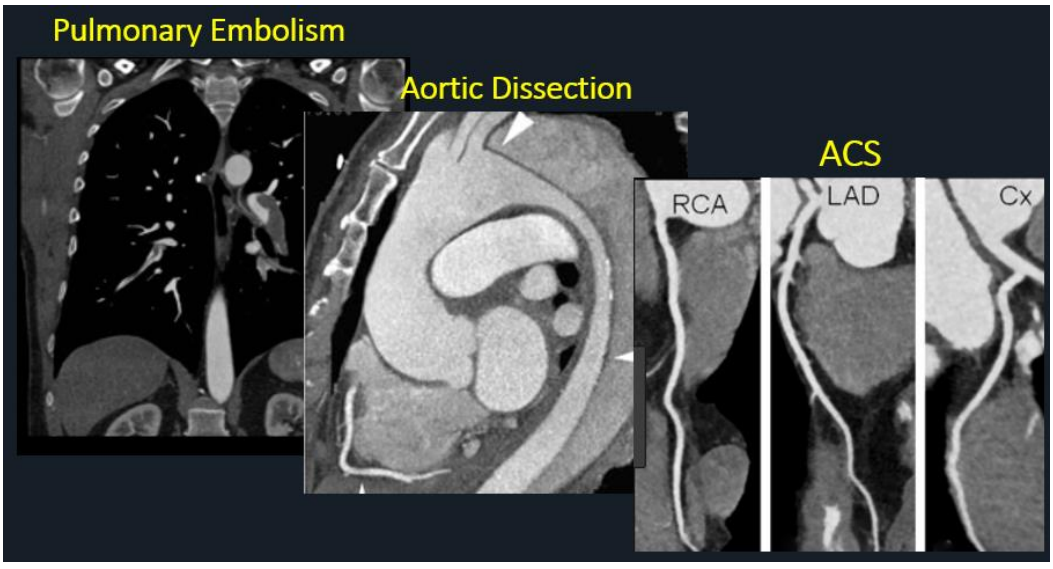


- **ED and hospital bed decompression:** Data from multiple randomized controlled trials highlights a substantial reduction in time-to-diagnosis and time-to-discharge when cardiac CT is utilized in the emergency department for chest pain triage.[12-16, 18, 24, 25] Cardiac CT safely allows for decompression of emergency department and inpatient telemetry beds, while ensuring high risk patients are appropriately triaged to cardiac catheterization.[26-28] Data from the ROMICAT II trial[16] showed a 40% reduction in unnecessary hospital admissions when cardiac CT was utilized in the ED compared to usual care, and a 25% reduction in ED length-of-stay. A similar trend was observed in the ACRIN-PA trial[12] of 1370 patients who were randomized to either cardiac CT vs standard care, with 27% shorter length-of-stay and 35% fewer hospital admissions among patients triaged early with a "CT first" strategy.

  Cardiac CT is also complementary to high sensitivity troponin assays in the ED by improving specificity for acute coronary syndrome and identifying patients with vulnerable anatomy. Detecting early myocardial injury with high sensitivity troponins has become widespread over the past decade.[29] However, false positive and borderline results are very common, as many cardiac and non-cardiac etiologies can account for elevated high sensitivity troponins besides coronary artery disease, including myocarditis, arrhythmia, cardiotoxicity, chronic kidney disease, heart failure, sepsis, COPD, and pulmonary embolism, among others.[29] Pairing a triage strategy of high sensitivity troponins with cardiac CT in the emergency department results in improved risk stratification and diagnostic accuracy for acute coronary syndrome, and is associated with less outpatient testing and lower medical costs.[13, 30]

IHS physicians obtain immediate access to medical images over the internet via secure portals, resulting in much faster access to highly specialized imaging reports and a median turn-around time of 38 minutes.

- **Rapidly exclude other life-threatening causes of chest pain:** Often when patients present to the emergency department with acute chest pain, there may be more than one life-threatening clinical suspicion. For example, some patients with coronary risk factors also have positive D-dimer tests and symptoms suggestive of pulmonary embolism. Cardiac CT permits increasing the field-of-view to include the entire thorax, using techniques to simultaneously evaluate the coronary arteries, aorta, and the pulmonary arteries. This so-called "triple rule-out" protocol is highly sensitive for excluding three life-threatening etiologies for acute chest pain (acute coronary syndrome, aortic dissection, pulmonary embolism) and can be accomplished on modern scanners with only mild radiation and contrast dose penalties. Data from prior studies suggest significant noncoronary diagnoses are identified in 8-14% of patients who undergo triple rule-out CT, often which explain the patients' chest pain.[31, 32] In addition to aortic dissection and pulmonary embolism, CT can also identify pneumonia, pleural effusion, pericardial effusion, and pneumothorax. The 2015 Multi-Society Appropriate Use Criteria for Cardiac Imaging in the ED endorsed triple rule-out CT as "appropriate" in patients for whom a leading diagnosis is problematic or not possible, and the overall likelihood of acute coronary syndrome, pulmonary embolism or acute aortic syndrome is not low.[33]

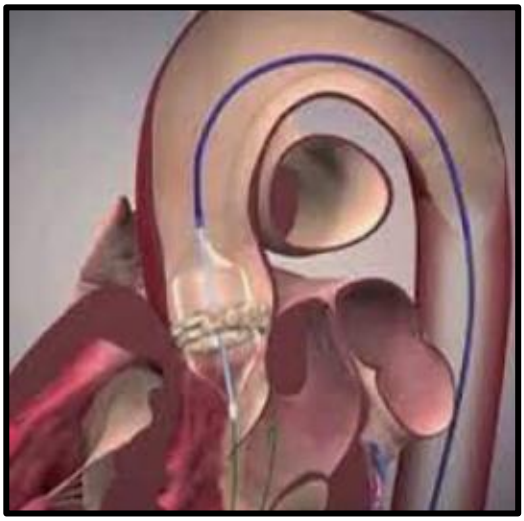


Triple rule-out CT for rapid exclusion of three life-threatening etiologies for acute chest pain in a single exam: pulmonary embolism, aortic dissection, and acute coronary syndrome

A Digital Structural Imaging Team

IHS supports many healthcare systems in their mission to expand structural heart programs. Most hospitals that developed structural heart programs over the past decade with hybrid operating rooms have seen an increase in referrals, as patients seek-out catheter-based heart valve interventions over surgical valve replacements, finding a return on investment from an increase in procedural volume. Transcatheter aortic valve replacement (TAVR) now makes up more than 70% of procedures for aortic valve replacement, and the global TAVR market is projected to grow from $3 billion in 2022 to $7 billion in 2027 due to expanded indication and FDA-approval to include lower-risk surgical patients.[34, 35] Many hospitals are now expanding to transcatheter repair and replacement of all four valves in the heart, as well as other types of structural heart disease.[36]

As an accredited structural imaging team, IHS can support structural heart programs with high-precision pre-procedural evaluation and interventional planning. Our physicians collaborate closely with local interventional cardiologists and cardiac surgeons and share decision-making for the best possible patient outcomes. Cardiac CT has emerged as the standard of care for pre-procedural TAVR planning due to its high reproducibility and its ability to simultaneously evaluate the coronary and peripheral arteries.[37, 38] The IHS Structural Imaging Team provides comprehensive CT segmentation of the aortic root, ensuring appropriate patient selection, accurate prosthesis sizing, and optimal route of valve delivery through evaluation of the peripheral arteries. We also provide detailed pre-procedural evaluations for left atrial appendage closure, tricuspid and pulmonic valve interventions, as well as interrogation of LVAD malfunction.



TAVR is recognized as the key structural heart procedure for minimally invasive aortic valve replacement, greatly reducing recovery time compared to surgical replacement. Cardiac CT has emerged as the standard-of-care for preprocedural TAVR planning.

Quality is Our Mission

IHS defines quality, first and foremost, as improving patient outcomes. Our practice prioritizes patient safety at all stages of the diagnostic imaging pathway, including smart alerts in the electronic medical record to ensure appropriate patient selection, quarterly radiation dose optimization, and annual chart reviews to evaluate for downstream adverse cardiovascular events. All IHS physicians are accredited cardiac imagers with advanced certifications in cardiac CT and MRI. We hold ourselves accountable for practicing at the highest level, with all imagers participating in a multidisciplinary peer review program that includes quarterly cath correlation, and a weekly CME-accredited videoconference series where challenging cases are discussed, and best practices are reviewed with the entire team.

We also recognize the need to rapidly exclude life-threatening disease, so we ensure all imaging studies are reported in a timely manner with direct physician-to-physician communication. **Our median turn-around time for cardiac CT in the emergency department is 34 minutes, with verbal consultations doctor-to-doctor as needed.** Standardized workflows for exam protocoling, patient preparation, and structured reporting facilitate efficiency and enable faster patient throughput. IHS also conducts regular site visits to review procedures and protocols, and we collaborate with local providers and administrators to ensure our workflows are frictionless.

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