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BUSINESS AND ADVOCACY

Business Aspects of Cardiovascular Computed Tomography: Tackling the Challenges

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The purpose of this article is to provide a comprehensive understanding of the business issues surrounding provision of dedicated cardiovascular computed tomographic imaging. Some of the challenges include high up-front costs, current low utilization relative to scanner capability, and inadequate payments. Cardiovascular computed tomographic imaging is a valuable clinical modality that should be offered by cardiovascular centers-of-excellence. With careful consideration of the business aspects, moderate-to-large size cardiology programs should be able to implement an economically viable cardiovascular computed tomographic service.

Recent developments in noninvasive imaging portend significant changes in how coronary artery disease (CAD) will be evaluated. Single-photon emission computed tomography (SPECT) (1), myocardial perfusion positron emission tomography (PET) (2–7), and cardiac magnetic resonance (8,9) are all moving toward the objectives of higher accuracy, greater patient convenience, and more rapid through-put. However, most interest is focused on multidetector computed tomographic angiography (CTA) for coronary imaging. Its emergence has generated controversy about anatomy versus physiology (10), radiology versus cardiology (11), hospital-based versus office-based imaging, needed evidence-base before payment is approved (12), payment rates, appropriate patients for testing (13), impact on alternative imaging strategies (14), training requisites (15,16), provider certification, and imaging laboratory accreditation (17). Peer-reviewed literature is now extensive, a medical society focused exclusively on cardiovascular CT has formed, the Centers for Medicare & Medicaid Services has commissioned a technology assessment (18) and held an advisory panel meeting (19), physicians are signing up for expensive courses and hands-on experiences, and a group of professional societies has developed appropriateness criteria for its use (13). Despite all these developments, and perhaps to some extent because of them, many cardiology practices have not instituted a coronary CTA service. The purpose of this business perspective is to outline the challenges associated with implementing a high-quality and financially successful cardiovascular CT program in the current economic climate and offer some possible solutions.

The Status Quo

Most noninvasive imaging of patients with suspected or known CAD is with stress echocardiography or stress SPECT. There has been impressive growth in both primarily because of extensive literature demonstrating cost-effective diagnostic and prognostic uses (20,21) but also facilitated by relatively low barriers to entry, high relevancy to subsequent decisions, and an aging population prone to a high prevalence of CAD. Similar trends have occurred in other

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Table 1. Financial Realities Confronting Cardiovascular Computed Tomography

Equipment and space renovation is expensive
Historically there has been rapid depreciation in equipment value
Rapid technologic changes, often leaving prior generation scanners without purpose
Currently limited referral population
Low volume of repeat imaging
Problems getting paid
Current CMS rates low relative to costs and work
Can negatively impact other imaging programs

CMS = Centers for Medicare & Medicaid Services.

imaging tests: Between 1999 and 2004, the number of imaging services per Medicare beneficiary increased by 62%, which was double the rate of increase for Medicare physician services overall (22). Because of budget neutrality provisions and concern that imaging would continue to grow exponentially if unchecked, a consortium of forces congealed around the intent to reign in spending on imaging services. Initiatives to reduce payment, limit utilization, eliminate the potential for referral abuses, insist on provider credentialing and imaging laboratory accreditation, and discredit evidence-based guidelines as being too general in their scope converged on the field beginning in 2005. It was into this milieu that the exciting but expensive new technology of 64-slice CT scanning entered.

Financial Realities

Cardiovascular CT clearly has its niche and greatly benefits a defined patient population. As such, it is worthwhile to attempt to understand whether cardiovascular CT can be implemented in a given practice environment within current economic constraints while maintaining rational fiscal integrity. There are several realities of cardiovascular CT that might make it a greater financial risk for a cardiology practice or for a hospital than the traditional cardiac imaging modalities echocardiography, SPECT, and PET (Table 1).

CT technology for cardiac imaging is rapidly evolving. The standard today is 64-slice at approximately 350-ms rotations. Typically, purchasers anticipate spreading lease or debt payments over the course of 60 months to keep equipment expenses in reasonable relationship to revenues. The early adopters who invested in cardiac CT with 4-slice and later 16-slice scanners experienced rapid depreciation in equipment value as next-generation devices were introduced. Although 64-slice scanners may be useable for the next 5 years, it is less clear that they will remain state-of-the-art. Two new concepts in cardiac CT scanning have already been introduced: 1) a greater number of detector rows to cover the entire heart, reducing breath hold time, minimizing chances of motion artifacts, and reducing radiation exposure (23) and 2) dual-source scanning to effectively double temporal resolution (24). A recently published multicenter study concluded that "MDCT coronary angiography performed with 16-row scanners is limited by a high number of non-evaluable cases and a high false-positive rate. Thus, its routine implementation in clinical practice is not justified" (25). In response, some payers have set 64-slice scanners as today's "entry-level" threshold for coronary CT applications. Although the positive predictive value appears to be improved by the use of 64-slice devices, a multicenter study has not been reported but could be influential in determining even newer payment thresholds. Increasing concern about radiation exposure (26), especially for women, and industry's interest in competing publicly on lowest-exposure innovations will likely force providers in competitive environments to purchase new software and in some cases new hardware.

CT scanners and associated space renovations are expensive. There are additional expenses besides the 7-figure cost of a 64-slice scanner. Rooms are typically at least 200 square feet and require X-ray shielding. A separate partition for staff during scanning needs to be constructed. An injector for contrast infusion is needed. Storage needs for cardiac CT scans may necessitate the obtaining of new hardware. Many interpreters currently invest in third-party solutions to facilitate image interpretation. Taken together, these expenses may add up to $500,000 or even more of "get-started" money to the price of the scanner. Service contracts typically are 10% to 15% of the cost of the scanner beginning in year 2. In many cities, cardiac CT technologists are in short supply and command higher salaries. Table 2 shows the annual expenses of our practice's 64-slice CT scanner.

The potential referral population. This population for cardiac CT in an office-only setting is currently not large. For example, the Appropriateness Criteria identify 13 appropriate indications (13), compared with 27 for SPECT (27); furthermore, 4 of these criteria will be uncommon uses (i.e., assessment of complex congenital heart disease, evaluation of cardiac masses, evaluation of pericardial conditions, evaluation of suspected coronary anomalies) for most practices, and 3 others are predominantly relevant to hospital practices (i.e., suspected aortic dissection, to rule out pulmonary embolus, and acute chest pain with normal electrocardiogram [ECG] results and negative enzymes). Within an outpatient cardiology practice, the predominant referrals, on the basis of the aforementioned Appropriateness Criteria, will be patients with chest pain and uninterpretable or equivocal stress tests, patients with chest pain and uninterpretable ECGs or unable to exercise, and patients with new-onset heart failure to determine etiology. Additional but quantitatively smaller numbers of referrals will be for assessment of patients before electrophysiologic procedures.

Repeat imaging. Repeat imaging using cardiovascular CT is less likely than with SPECT or echocardiography, where perhaps 40% of current imaging volume is for patients who, over the course of several years, need repeat

Table 2. CT Expense Proforma

Assumptions	
Staffing consists of CT technologist, nurse, clinical technologist, scheduler	
Benefits/payroll taxes = 25% of salaries	
Cost of CT scanner = $1.5 million, financed over the course of 5 yrs (lease with ownership end of lease)	
Space rent of 800 sq ft @ $30/sq ft	
Maintenance contract = $140,000/yr for years 2 to 5	
Property taxes estimated @ $15,000/yr in years 2 to 5	
Leasehold improvements @ $300,000 depreciated over the course of 10 yrs	
Expense Proforma (5-Year Average)	
Direct operating expenses	
Salaries	$163,000
Benefits/payroll taxes	40,750
Supplies/meds/contrast	36,000
Office and administrative expense	10,000
Professional fees	5,000
Lease	364,980
Rent	24,000
Maintenance	112,000
Insurance	3,000
Marketing/advertising	20,000
Property taxes	12,000
Depreciation/amortization	30,000
Total	$820,730

CT = computed tomography.

Table 3. Potential Sources of Patients: Individual Practices and Programs Can Build a Business Proforma Based on Estimates

- Coronary calcium screening
- Coronary computed tomography angiography studies
  - Equivocal or nondiagnostic stress tests
  - Clinical situation at odds with results of stress tests
  - Chest pain patients, intermediate likelihood for coronary artery disease, cannot exercise
  - Acute chest pain patients, normal electrocardiogram and enzymes
  - New-onset cardiomyopathy
  - Rule out anomalous coronary origins
- Peripheral artery disease studies
  - Carotids
  - Thoracic and abdominal aorta
  - Renal arteries
  - Mesenteric arteries
  - Run-off studies
- Pre- and post-electrophysiology procedures
  - Atrial fibrillation ablation
  - Postablation
  - Biventricular pacing
- Specialized indications
  - Bypass graft patency
  - Stent patency
  - Before repeat open-heart surgery (course of grafts relative to sternum)

imaging for adequate disease tracking and evaluation of new symptoms.

Interpretation times. So long as CT tests are used for ruling out CAD in lower-likelihood patients, interpretation times are reasonably related to professional payments. When there is progressive movement to using it in patients with known CAD, for example, those with significant coronary calcification, stents, and bypasses, interpretation times quickly become excessive relative to current professional payments.

Problems getting paid. In many locales, a majority of a practice's payers either decline to pay for cardiac CT exams even when these exams are appropriate by published criteria or pay at rates much lower than seems reasonable for the costs of the equipment and the space, the supplies, the contrast, and the personnel. When the cost falls to patients themselves, many of these patients will decline on this basis alone, limiting potential usage.

The impact of cardiac CT on alternative essential cardiac imaging services needs to be taken into account. Most practices and cardiology departments currently perform stress echo, stress nuclear, and coronary angiography as part of their core services. None of these can be entirely replaced by cardiac CT, and it will be necessary to keep them available. Dependent on utilization rates, the addition of a competitive modality could lead to the less-efficient use of all modalities and their assigned personnel.

Meeting the Challenges

In developing a business plan for cardiovascular CT imaging, it is important to assess likely patient referral volumes (Table 3), necessary structural and organizational changes within the practice or department, personnel issues unique to this service, physician training and certification, work involved in study interpretation, laboratory accreditation, and local payment expectations. An economic proforma can then be developed; by including some assumptions about trade-offs between loss of revenues (and hopefully some offsetting reductions in expenditures) from competitive clinical services such as stress imaging and diagnostic angiography, a reasonably accurate predictive model should be able to be developed.

Referral Patients (in Approximate Order of Percent of Volume)

Coronary artery calcium (CAC) screening. Calcium screening is an important component of a cardiovascular CT financial model. Academic debate over its clinical value seems to be reaching a consensus, as expressed in a recent American Heart Association (AHA) scientific statement (28) and an American College of Cardiology Foundation/AHA clinical expert consensus document (29), that CAC screening is reasonable for asymptomatic people with an intermediate (10% to 20%) 10-year risk for events and for lower-risk patients with highly atypical symptoms. Many people found to have CAC will desire education and follow-up in a preventative cardiology program (30). Those with high scores will likely undergo stress imaging tests. Therefore, the proforma needs to consider both operational and downstream revenue. The CAC screening is an uncovered service that is price-elastic; the lower the charge the higher the volume. In our practice, a price of $199 seems to deter few.

Peripheral CTA. Computed tomographic angiography is useful for imaging carotid, renal, mesenteric, and pelvic and leg arteries, and the thoracic and abdominal aorta, often supplementing information from duplex exams and either avoiding necessity for an invasive exam or providing sufficient information to plan an interventional procedure (31). Because these services are widely covered, they are essential components of most CTA business models. The ideal practice setting will be one in which there is a focus on diagnosing and treating peripheral arterial disease (PAD). Training requisites for performance and interpretation of PAD studies using CT were published in 2007 (16).

Coronary CTA. The major contribution to date of coronary CTA is its high negative predictive value, approaching 99% in most studies (7,32). It would be reasonable to extrapolate that an optimal population for coronary CTA would be that with a low or low-intermediate CAD likelihood, where a normal scan might be anticipated and where this finding could terminate further coronary-related investigations. For the most part, however, published coronary CTA studies have been performed in higher-likelihood patients, such as those for whom coronary angiography has already been decided. A recent study that included a low pretest probability population confirmed a very high negative predictive value, but an approximate 25% false-positive rate (33). A well-defined and sizeable evidence-based population for coronary CTA still awaits identification. A conservative proforma for an outpatient practice would include patients with equivocal or nondiagnostic stress imaging tests, patients with clinical diagnoses at odds with results of stress imaging tests, those without chest pain but a fairly high suspicion of CAD, such as newly diagnosed cardiomyopathy, patients with chest pain who are unable to exercise, and a small number of cases of syncope such as during athletic events when earlier assessments suggest that anomalous coronaries should be ruled out (13).

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Bypass grafts and stents. Vein grafts have relatively large diameters, are less mobile, and have less calcium than the coronary arteries. Accordingly, the accuracy of CT angiography for identifying occlusions or high-grade obstructions in vein grafts or in suspended arterial grafts approaches 100% (34,35). Internal mammary arteries are usually smaller and have numerous metallic clips, so that definitive interpretation can be more challenging. Furthermore, full assessment of most postbypass patients is complicated by their native CAD that often includes extensive calcification and disease in side-branches and in distal vessels; the sensitivity and specificity for detection of stenoses in the native coronaries is suboptimal even with the use of 64-slice scanners (35). Computed tomography angiography also can be quite accurate for determining patency of larger stents ≥3.5 mm (36,37). However, a number of factors, including study quality, the size of stents, and the amount of metal within them limits the usefulness of CT angiography for routine assessment of stents. In summary, referrals of postrevascularization patients will not likely be substantive, and most likely will relate to a question about a specific bypass graft or stent.

Electrophysiology (EP) applications. Pulmonary vein anatomy assessment (38, 39) before atrial fibrillation ablation procedures is now commonly requested and can significantly aid in both planning of and reducing operator time during these procedures. Many electrophysiologists also want a follow-up study to identify procedure-related pulmonary vein stenosis (40), although with time and increasing proficiency, follow-up imaging may become less used unless symptoms suggest this complication. Computed tomography angiography also may be used before biventricular lead placement in cardiomyopathies, both to define venous anatomy and confirm myocardial viability at the planned (and accessible) site for the lead tip.

Organizational Changes Within the Office or Department

The introduction of cardiovascular CT into a practice poses a number of logistic questions: scanner placement; which existent section (if any) should be responsible for the program; a critical mass of personnel to provide a consistent and high-quality service; physician training, certification, and continuing medical education; and lab accreditation.

Scanner placement. Patient flows for cardiovascular CT are different than for echo, nuclear, or patient visits. Most patients will be in the scanner room for only a few moments. If patients arrive properly prepped (lab results already available, heart rates reasonably slow, and so on), the entire visit should be <30 min. Therefore, most likely the scanner will need to be supported by a larger waiting room; a separate room for placing intravenous lines, ECG electrodes, and administering medications if needed for slowing heart rates; and a postprocedure monitoring space for those few patients who may have a contrast reaction and need to be watched for a while. A consultation room may be necessary if CAC results are to be discussed with the patient immediately after the scan.

Program accountability. Accountability will vary according to numerous considerations. Some practices or departments will prefer an independent CT program, whereas others will favor avoidance of further in-house "competitive" imaging programs with an aim to consolidate resources and develop cooperative utilization pathways. Incorporating the service into the nuclear group is rational because hybrid scanners are becoming common and this department already needs to make the necessary personnel and expertise changes. Also, SPECT and PET are moving toward rapid through-put models that are more compatible with CT, so that scheduling; patient pretest instructions; waiting rooms; intravenous lines and electrode prep rooms and needed personnel; and the nurses and physicians who already need to be present for stress testing can all be used efficiently. Although many proceduralists will need to review studies as part of preinterventional planning (such as electrophysiologists, PAD specialists, coronary interventionists), comprehensive study interpretation would best be left to physicians that are well-trained in and have daily dedicated time to cardiovascular CT.

Practice–hospital cooperation. Because of the expense and complexity of setting up and running a cardiovascular CT program, it would be desirable for hospitals and practices to work cooperatively rather than competitively. Without such an arrangement, it may prove fiscally impossible for either entity to keep on the cutting-edge of this quickly evolving field. Because permissible arrangements are currently in a state of evolution, knowledgeable attorney advice is a necessity. The question arises as to the most advantageous setting for cutting-edge cardiovascular CT. An office-base has many advantages: the uses are mostly for elective outpatient assessment (ruling out significant CAD; peripheral vascular imaging; coronary calcium screening; preparing for elective EP procedures); patient convenience; easy access for the caregiver (cardiologist) to images; lower administrative and technical costs; and greater control over referral indications vis-à-vis appropriateness criteria than might be possible in the hospital. An argument in favor of a hospital base is potential application for ruling out an acute coronary syndrome in patients coming to the emergency room with chest pain (41,42); however, more research will be needed before determining that this strategy will be a cost-effective one.

Personnel. Computed tomography scanners need to be operated by appropriately trained and credentialed technologists. Just as with SPECT and PET cameras, there are quality control requisites, radiation safety concerns, camera and processing computer issues, and secure scan storage requirements. Most laboratories will need to budget for 2 technologists because there is a relative scarcity of trained and experienced cardiovascular CT technologists dedicated to cardiovascular studies limiting ability for cross-coverage from part-time pools. Contrast-enhanced CTA requires the direct supervision of a physician, meaning that the physician must be in the office and immediately available for assistance. In laboratories that image CAC, specially trained clinical personnel for discussing results and making follow-up recommendations will be much appreciated by most people and is a good business strategy. A scheduler who is well-versed in payment policies can be helpful, because policies are currently highly variable. For example, some payers cover coronary CTA but do not if the CAC exceeds a defined threshold; these cases need to be flagged appropriately to avoid expending resources payments for which will be denied after the procedure.

Physician training and certification. The American College of Cardiology Foundation/AHA clinical competence statement details expectations for trainees, for those already practicing cardiac CT, and for those who are in practice and wish to attain proficiency in practicing cardiac CT (15). To encourage additional opportunities for the development of physician competence in the performance and interpretation of cardiovascular CT, the date to qualify based on previous experience was recently extended to July 1, 2010 (15). After that, a physician wishing to interpret and bill for a cardiac CT examination will need to complete a 2- to 4-month fellowship in CT. There is a separate statement specific for vascular imaging (16). A certification process for cardiovascular CT is currently under development. It is anticipated that payers will not reimburse without documentation that physicians have met these educational criteria.

Laboratory accreditation. Ten sponsoring organizations have developed a formal process for laboratory accreditation through the Intersocietal Commission for the Accreditation of Computed Tomography Laboratories. Similar to echocardiography, nuclear cardiology, nuclear medicine, and magnetic resonance imaging, the application process emphasizes a series of quality indices, including personnel, lab organization, equipment quality control, imaging protocols, patient safety, image quality, and accuracy of interpretations.

Scan Interpretation

The major business-related issue surrounding interpretation relates to noncardiovascular findings. A significant percentage of the target population for

Table 4. Category III CPT Codes for Cardiac CT, 2008

CPT Code	Long Description
0145T	Cardiac structure and morphology
0146T	CT angiography of coronary arteries (including native and anomalous coronary arteries, coronary bypass grafts), without quantitative evaluation of coronary calcium
0147T	CT angiography of coronary arteries (including native and anomalous coronary arteries, coronary bypass grafts), with quantitative evaluation of coronary calcium
0148T	Cardiac structure and morphology and CT angiography of coronary arteries (including native and anomalous coronary arteries, coronary bypass grafts), without quantitative evaluation of coronary calcium
0149T	Cardiac structure and morphology and CT angiography of coronary arteries (including native and anomalous coronary arteries, coronary bypass grafts), with quantitative evaluation of coronary calcium
0150T	Cardiac structure and morphology in congenital heart disease
0151T	Function evaluation (left and right ventricular function, ejection-fraction and segmental wall motion) (List separately in addition to code for primary procedure)

Note that coronary calcium screening is not included. The long descriptors for all listed codes include "computed tomography, heart, with contrast material(s), including noncontrast images, if performed, cardiac gating and 3-dimensional image postprocessing." Each code then adds "…"
CPT = current procedural terminology; CT = computed tomography.

Table 5. Global Reimbursement Approximations in 2007 (Note That These Are for Rough Approximations Only, They Will Differ Across Locales, and They May Change Significantly When CMS Releases 2008 Rates)

Service	Reimbursement
CACS	$199.00*
0145T	$350.00*
0146T	$350.00*
0147T	$350.00*
0148T	$450.00*
75635 (run-off)	$406.00
70498 (carotid)	$374.00
74175 (abdominal aorta)	$381.00
72191+74175 (abdomen and pelvis)	$850.00
Q9950 (contrast)	$68.10

*These codes may be charged at a market rate if not covered by a patient's insurance company.
CMS = Centers for Medicare & Medicaid Services.

cardiovascular CT studies have other-organ pathology (43–46), much of which will be previously known or unimportant but some findings need follow-up. For carotid, thoracic, abdomen and pelvis, and run-off studies, with and without contrast, work descriptors of Current Procedural Terminology (CPT) codes exist and mandate full study interpretation. The cardiac codes are still in Category III, and work descriptors have not been defined. Despite this, most physicians recognize the importance of inspecting the imaged area for other pathology than for which the test was requested. There are basically 3 "solutions" to scan interpretation from the cardiologist perspective: the cardiologist becomes proficient at interpreting positive and negative cardiovascular and other organ findings; the cardiologist becomes trained to recognize "pertinent" abnormalities deserving of radiology over-reads; and all scans are interpreted by both a cardiologist and a radiologist. Consistency of approach is important. It is best to adopt an approach, formally document it, and have all interpreters follow the policy. A legally untested but concerning potential arises when a local radiology group "over-reads" the scans for a smaller professional fee than it would typically bill, raising the question of illegally securing referrals through this means. Any arrangements between cardiologists and radiologists for interpreting scans that involve splitting fees or submitting additional charges under modifiers should be reviewed by a knowledgeable health-care attorney. For cardiac CT scans, opportunities for cardiologists to train in recognizing pertinent abnormalities are available and encouraged.

A second financially relevant concern is professional time to interpret scans in relation to current reimbursements. Most important to maximizing productivity is study quality, i.e., scans acquired with constant heart rates, heart rates <70 beats/min, with good vessel opacification (optimally >300 HU), and free of patient motion or breathing artifacts. Normal scans usually can be interpreted in a similar time frame to that for a normal stress echo or SPECT study. Patients who have received stents or bypasses and those with extensive CAD and/or significant calcifications can take much longer.

Type of Scanner

An important consideration for many mid- and large size practices and programs is whether to purchase a dedicated CT scanner or a hybrid PET/CT device. Although PET provides improved quality and higher accuracy than SPECT (2), most practices and programs do not incorporate it because of its high associated expenses. A dedicated PET scanner may cost in the range of $650,000, room design may add another $250,000, and a year's contract for delivery of 13 rubidium-82 generators is approximately $400,000. Many programs do not have the volumes to justify this, just as they lack the volumes for a dedicated CT scanner. However, combining relatively low PET and CT volumes through the use of a single hybrid scanner can result in a program that consolidates space and personnel and keeps an expensive scanner busy. PET reimbursements are more at-

With informed planning most moderate-to-large size practices and programs should be able to implement a clinically successful and fiscally viable cardiovascular CT program.

tractive than those for SPECT, and can help to offset revenue shortfalls from CT.

Coding and Billing

The cardiac CT procedures will remain as Category III codes for 2008. For 2007, they were included within the Ambulatory Payment Classification (APC) for nuclear cardiology, but for 2008 they have been moved into new clinical APCs 0282 (for CPT 0144—coronary calcium screening and 0151—left and right ventricular function CTA add-on code) and 0383 (all of the remaining CPT codes). Of note, the APC payment rates are for technical fees only, and in 2008 are proposed by the Centers for Medicare & Medicaid Services to bundle the costs of the contrast agent; in other words, the same payment regardless of whether or not contrast is used. Table 4 provides the long description of each of the CPT codes. The year 2008 payment rates for the APCs and the individual CPT codes will be announced in late 2007. In 2007, the APC rate prevailed, under rules of the Deficit Reduction Act, if lower than the rate the Medicare carrier was willing to pay for an office-based procedure. It is not clear how this will be applied to office-based providers in 2008 if contrast agents are bundled for hospital out-patient procedures.

For purposes of roughly calculating volumes necessary for a practice to "break-even" on a 64-slice scanner, Table 2 provides estimates of costs, and Table 5 provides estimates of payments for various cardiovascular procedures if performed and interpreted in an office practice in 2007. Expenses and reimbursements can vary widely in different locales—the table is only for a rough guide to assist practices and hospitals to develop their own proformas. It should also be noted that rates may differ significantly in 2008.

Conclusions

Cardiovascular CT is a relatively new and rapidly evolving subspecialty interest for cardiologists. It clearly has identifiable and important uses for the optimal care of patients. Best clinical practice mandates access to latest-generation equipment and protocols, which is challenging in the current era, but with careful informed planning most moderate-to-large size practices and programs should be able to implement a clinically successful and fiscally reasonable cardiovascular CT program.

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