

Davies Award Ambulatory Care Application

Cardiology of Tulsa Application

SECTION A: Identifiers

1. Michael Spain, MD, MBA, President/CEO
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7. Number of physicians: 18 (plus 8 mid-level providers)
8. Number of FTEs: 101
9. COT has partnered with NextGen Healthcare to develop the EMR's cardiology Knowledge Base Model and serves as a site visit host for NextGen Healthcare Information Systems.
10. Annual Number of Patient Encounters: 57,548 (2005)
11. Michael Spain, MD, MBA, President/CEO
Nancy Nelson, Chief Administrative Officer
Ida Walker, RN, MBA, Director of Systems Development
Roxanna Jacobs, BSN, Director of Quality
Scott Guthrie, Network Developer

Section B

The Organization

Cardiology of Tulsa (OK) is a full-service cardiology practice that offers comprehensive non-invasive diagnostic and therapeutic care ranging from disease prevention and testing to interventional cardiology and electrophysiology. Established in 1969, the practice has four offices in three cities, serving patients throughout northeastern Oklahoma. The practice also helped develop the St. Francis Heart Hospital in Tulsa, a 52-bed specialty facility jointly owned by COT physicians, other area cardiologists and surgeons, and St. Francis Hospital. The Heart Hospital is completely digital, with a fully integrated electronic clinical and administrative system that interfaces seamlessly with specialty software and outside systems. The Heart Hospital provides all levels of cardiovascular care, including open heart surgery. COT physicians attend patients in both St. Francis and the Heart Hospital.

COT has undergone complete work/process reengineering with full integration of an EMR, creating virtually a paperless environment. The practice hosts multiple national site visits annually to showcase clinical and operational processes.

Management

A) Business Objectives

1. **Access.** COT was committed to providing physicians full access to each patient's medical record at every location from which they provided care – whether they were at home, in one of the practice's offices or satellite locations, in the hospital, or on the road.
2. **Database Development.** Leadership at COT recognized the value of the wealth of information that was gathered during the course of each patient encounter. It desired to move from a "document management" to a "data management" model, which would allow it to mine the data available and use it to improve operational efficiency and clinical effectiveness.
3. **Improved Workflow.** Already efficient, the practice recognized that the only avenue available for future improvements was to fundamentally change operational process by implementing an EMR.
4. **Financial Health.** The practice sought a system that would allow it to decrease costs and optimize reimbursement, while improving the quality of care it delivered.

B) Project Organization

COT's search for an application to help it achieve its technology vision dates back to 1989, when it implemented a mainframe-based practice management system. That solution, however, proved ineffective. COT resumed its search for an electronic medical record in 1993, but discovered that none of the solutions then available could fully deliver on their promises of reduced costs and improved productivity. Leadership continued to assess systems over the next several years at professional conferences and through literature reviews. By 1996, it had developed relationships with four vendors and, after a lengthy evaluation, selected NextGen Healthcare Information Systems' Electronic Medical Record system (NextGen® EMR).

Following approval from its board of directors, COT identified a task force that would direct preparation for and implementation of the system. After a trial run revealed substantial hurdles during implementation, the project was tabled until the fall of 2000. At that point, a NextGen Implementation Executive Committee was created and members were assigned to one of four specific tasks:

- *Network development*, since the practice was going to build its own system from the ground up; Team Leader: Scott Guthrie.
- *Template design*, to ensure all tools reflected the manner in which the practice's providers worked; Team Leader: Ida Walker.
- *Training*, in recognition of the massive effort that would be required to bring all physicians, clinical staff and administrative personnel online with the new paperless system; Team Leader: Roxanna Jacobs.
- *Workflow redesign*, to evaluate current processes and recommend modifications to accommodate the EMR while respecting the work habits and preferences of eventual users; Team Leader: Nancy Nelson.

To optimize the success of the implementation, the team devised a plan to maximize physician adoption, with all related efforts championed by Dr. Spain. It was determined that physicians would be brought onto the system one at a time, following exhaustive training, and that implementation efforts would be evaluated after each individual became a user. This provided ongoing education and input, and allowed the practice to make adjustments along the way to benefit the overall organization's ease of transition. In the process, COT developed the capacity to be a "learning organization," incorporating and integrating new approaches as it recycled lessons learned earlier in the implementation stage. It continues to rely upon this strategy as it adopts new processes, systems and methodologies in all areas.

C) Clinical Objectives

1. *Improve Patient Safety.* COT recognized that having access to the patient's complete historical record and current care plan in all settings would enhance the physician's ability to make accurate diagnostic assessments and select the most appropriate and effective treatment options.
2. *Device Connectivity.* To minimize errors and make vital information immediately available to the physician, COT implemented systems that would allow data from diagnostic devices to be imported directly into the electronic patient record.
3. *Web Access to Healthcare Resources.* Leadership recognized that vast amounts of data were available outside the confines of its own system. It wanted to provide technology that would allow physicians to access these additional resources before, during and after patient encounters to optimize care.
4. *Contribute to National Body of Knowledge.* COT has a great deal of experience in clinical research, and has relationships with other institutions and practices with similar backgrounds. It was seeking a tool to allow it to share its findings, benefit from others' discoveries, and make the aggregate more available to practicing cardiologists across the county.
5. *Rapid Progress Towards Compliance With Emerging National Outcomes Standards.* EMR functionality would allow COT to adopt and respond to all types of performance measures, focusing clinical efforts on improved patient care and allowing it to take advantage of pay-for-performance initiatives as they become available.

D) Other Objectives

Although not expressly stated at the onset of the EMR implementation, COT recognized the benefits that increased efficiency would provide to staff members at all levels. Streamlined work processes, the elimination of paper charts, and easier access to information vital to successful completion of professional activities would decrease stress, improve the work environment, and virtually eliminate work backlogs and the need for overtime. Much of this was accomplished because multiple staff members were able to access charts simultaneously. In addition, Cardiology of Tulsa anticipated greater patient satisfaction because it would be able to provide better care and quicker responses to questions and concerns.

Implementation

E) EMR System.

The selection process was spearheaded by Nancy Nelson and Dr. Michael Spain, who reviewed qualified vendors, sought input from stakeholders throughout the practice, and made its final recommendation to COT's board of directors. Ultimately, to achieve its stated goals, COT selected NextGen EMR, which provides:

- Electronic Health Records
- Clinical Decision Support
- Document Generation
- Disease Management
- Health Maintenance
- Workflow and Image Management
- E & M Coding Optimization
- Referral Management
- Outcomes Analysis
- XML Data Sharing
- Patient Education

Through template-driven algorithms, the healthcare provider, utilizing point-and-click, voice-activated data capture, typing and/or scanning, can record:

- History and physical
- Visit notes
- Problem list
- Medications
- Radiology reports
- Reports and correspondence from outside the practice

Technical Components

Workstations are Windows XP Pro & Office 2003

Tablet PCs are Windows XP Tablet PC Edition

All critical server are Windows 2003 Server

NextGen 5.3.38

Windows 2003 Server

SQL Server 2000

.NET Framework 1.1

Visual Basic 6

Visual SourceSafe

Integration with

Word 2003

Outlook 2003

RightFax 9.0.1

WelchAllyn 1.4.3.386

Bidirection interface to PCIS

Impact.MD 3.0.2 document imaging

PCIS 2.2.1.7860

Windows 2003 Server

SQL Server 2000

- .NET Framework 1.1
- Microsoft XML 4.0
- Windows Mobile 4

- Windows 2003 Active Directory
- Windows 2000 Terminal Services/Citrix Presentation Server
- Exchange Server 2003
 - Symantec Antivirus 10.0
- Internet Information Services 6.0
- WhatsUp Professional monitoring & notifications

- Products currently in pre-implementation development & testing
 - SQL Server 2005
 - SharePoint services
 - Windows Mobile 5

In addition, COT staff collaborated with NextGen and Welch-Allyn Inc., the medical device manufacturer, to build and install interfaces that would seamlessly transfer discrete data elements captured through medical devices directly into the patient's central record within the NextGen database. Data output from a variety of medical devices—including the electronic Spot Vitals device and the PC-based stress and resting ECG machines—now flows directly into the EMR. This facilitates broader tracking and evaluation of patient data and saves staff from manually entering information into the EMR, eliminating lost readings, transcription errors and duplicate data entry. This integration allows physicians and staff to seamlessly capture, view, and record data, and enables COT to develop and maintain more complete and accurate medical records for all patients.

COT also created an interface with its billing system, so data could move bi-directionally between the applications. This saves both clinical and administrative staff from duplicating efforts (e.g., re-entering demographic and insurance information), provides greater access to important information (e.g., master files of referring physicians) and streamlines coding and billing (e.g., physicians can select appropriate diagnostic/procedure codes and forward the data electronically to the billing staff, who can release the claim to the payer before the patient has even left the office).

COT HIS staff has maintained primary responsibility for the EMR system – including training new staff, maintaining the current application, and working closely with NextGen to develop innovative tools for enhanced functionality.

F) System Implementation

Collaboration with NextGen. Cardiology of Tulsa worked with a NextGen consultant to plan and launch its implementation strategy. Although most of the efforts were accomplished by COT staff – including template design and workflow (menu) architecture – the NextGen consultant:

- Worked with the NextGen Implementation Executive Committee, attending meetings and serving in an advisory capacity during planning;
- Helped design the document scanning and abstracting projects;
- Assisted the COT template design and development team;
- Assisted in initial training of project leaders and super-users;
- Provided advice and support during various stages of the go-live process.

Scanning/Abstracting Paper Records. Among the first decisions COT made was to scan all historical patient records into the EMR. This decision was prompted by a previous attempt to implement an EMR – which failed in large part because physicians were unable to access information still stored on paper charts. As a result, they resisted using the system because they still had to pull and handle paper charts to have access to relevant historical information.

As part of the NextGen implementation in 2001, COT transitioned nine million documents to the EMR, eliminating more than 160,000 paper charts and gaining 1,100 square feet of revenue-generating space. As part of this task, critical patient information (like cath reports, echo reports, hospital summaries and medication treatments) was scanned from the patient’s paper chart and stored in the patient’s electronic medical record. The practice hired temporary employees as the scanning team and scheduled crews to provide coverage from 7 a.m. to midnight, five days a week. It took three years to complete the task, and it cost the practice \$200,000. The benefits greatly outweighed the costs, however, because physicians had complete access to electronic histories and records – which enhances patient care and drives greater physician adoption of the EMR.

In addition, COT abstracted data from patient charts to populate specific fields in the electronic record and make crucial information available at a glance. COT leadership had made a commitment to the physicians that, once they had begun using the EMR, they would never have to touch a paper chart again. To make good on that promise, COT was determined to have all relevant information on all patients available to each physician the first time they were seen after the doctor’s go-live date.

To accomplish this, COT ran a billing report to identify the number of times each patient in the system had been seen in the practice in the past three years. This allowed the staff to prioritize which charts should be abstracted first and provided a model by which to predict when patients would be next seen. COT used this model to determine which charts to abstract in which sequence – rather than simply using random approaches like alphabetical order. As a result, the practice was able to keep its word – no physician needed to refer to paper charts once on the EMR.

Phased Implementation of Physician Users. After selecting the NextGen application and launching the scanning and abstracting tasks, COT determined that the most effective implementation plan would bring physicians online one at a time. Leadership recognized that adoption would be challenging and wanted to ensure the transition did not overwhelm the practice as a whole. The phased implementation plan relied upon a calendar of “go-live” dates, with the first physician beginning to utilize the EMR on January 17, 2001. Implementation was rolled out among the various practice sites so that no single location had every physician going live in quick succession. The final physician began using the EMR on September 2, 2001.

COT initiated the process by installing high-speed Internet access in all physicians' homes so they would be able to review patient records after hours and when on-call. Each was then required to take four-hour classroom sessions with a trainer, who provided thorough hands-on exercises in all aspects of the EMR. At the end of classroom work, the physicians were given an open-book proficiency test with case studies. Only those who passed the exam proceeded to the next stage of training. They then spent a half-day with Dr. Spain, learning the flow of the EMR and observing how it affected the dynamics between physician and patient in the exam room setting. Immediately before the go-live date, Dr. Spain spent a half-day in each physician's office as well, to ensure they were comfortable with the technology before signing off on their go-live plan.

Training of Clinical and Support Staff. Other members of the clinical staff were trained in a similar manner, to prepare each office for its physicians' transition to the system. COT installed eight computers in the practice's boardroom for one month and scheduled all-day classes for staff members to attend. Training was customized for various departments. Subsequently, super-users were identified and given additional training. They then worked with clinical staff in a training room, where two-hour sessions were scheduled to review specific functions and to role-play anticipated clinical scenarios. They were also tested and had to demonstrate proficiency before their physician's go-live date.

The Saturday before the first go-live, clinical staff came into the office from 9 a.m. to noon to conduct a run-through and trouble-shoot potential problems. During the session, super-users simulated an abbreviated day's schedule, including patient check-in and checkout, exams, and related workflow processes.

Patients scheduled to be seen in the early days of each physician's adoption were called and alerted to the possibility of delays. The EMR was explained to each patient, and COT staff informed them of the benefits they would also receive – for instance, they would not need to repeat clinical history and insurance information each time they checked in.

Go-Live Strategy. Teams of clinical staff at each practice site were assigned two physicians to support during implementation. No team was allowed to bring its second physician on-line, however, until all teams throughout the practice had their first physician using the application comfortably. This allowed the practice as a whole to make the transition to EMR more gradually and to address stresses on the organization as they arose.

In addition, all affected personnel – from the receptionist to the business office – were debriefed at the end of each physician's adoption of the EMR to discover what worked well and what did not. This allowed COT to adjust its strategy as it went along, making subsequent implementations easier. In fact, it took the first physicians about a month to fully utilize the EMR's functionality, while the last users were brought online in less than one week.

Further, COT began working with some of the most challenging physicians first – those who were skeptical about the EMR. Besides being able to learn more about the flaws in its implementation approach early in the process, practice leadership believed that initial success with those most resistant to change would encourage subsequent adopters.

Key to the success of the training, scanning/abstracting, and implementation efforts were motivational strategies the practice implemented. For instance, "Go-live" t-shirts were distributed to staff members in each office as their physicians began using the EMR. "Project CHEARTBURN" - playing off the cardiology-related term "heartburn," and providing a not-so-subtle reference to the fact that the explorer Cortez burned his ships so crew could not mutiny and return to the Old World - kept the drudgery related to the elimination of paper records bearable. Scanning and abstracting staffers were given targets and prizes for reaching their goals within specified time frames - including after-hours "tropical" parties complete with margarita machines and the chance to throw water balloons at the administrator.

G) Current State

Since implementing the EMR, COT has become a paperless environment in both the clinical and office settings. To maximize functionality and value, COT continues to upgrade and expand the system. The practice recently added a computer programmer, Sean Kibble, for redesign of all templates so they better reflect the clinical habits of physicians. Kibble has lead efforts to develop the national cardiology database for NextGen, focusing on a point-and-click data entry system that allows maximum efficiency while populating data tables with phenotypic disease-expression data.

In addition, COT hired Amy Chong, MD, to head practice efforts to maximize data mining. Dr. Chong combines her medical background with computer programming expertise to allow the practice to use the database as effectively as possible to enhance care and improve outcomes. In addition, Dr. Chong will continue COT's efforts to facilitate data sharing among researchers, and to identify national standards for optimal disease management and health maintenance programs.

Its current relationship with NextGen has formally established COT as a national leader in cardiology database issues. All cardiology practices going live with NextGen use the knowledge base developed and used daily by COT, producing immense opportunities for standardizing national data collection. Dr. Spain has spearheaded, with NextGen assistance, a national effort to create a cardiology advisory group to develop a module for data warehousing and collaboration among cardiology practices across the country.

Value

H) Success in Meeting Objectives

- 1) Access. Because the platforms and applications used at COT and St. Francis Heart Hospital run in an SQL-based environment, physicians have immediate access to patient information from any location. If a physician is in the hospital, for instance, he or she can view diagnostic results from a patient's recent office visit. In addition, via a browser and Citrix, physicians can retrieve patient information remotely, thereby making optimal use of time whether they are in the office or at another location. Plus, by installing broadband access at each physician's home and making all electronic patient records available via the Internet, COT physicians enjoy nearly 100% access to all historical and current patient information 24/7.

When the plan for the EMR was initially presented to the board, members challenged project leadership about potential technology “downtime.” Even though they were assured it would be less than one percent, skeptics insisted even that would be unacceptably high. However, the EMR champions pointed out that, with paper charts, records were available only about 33% of the time – because physicians couldn’t access them from their home while on-call, in the hospital, or at satellite and remote locations. Currently, COT physicians have access to the EMR more than 99.5% of the time. Leadership has heard from physicians who have been able to provide services such as EKG interpretation and address patient questions and concerns from such remote locations as a medical conference in Florida, the airport in Atlanta, an Internet café in California, and a Wal-Mart in Mexico.

While the EMR supports easy access to patient records, it is also highly secure and HIPAA compliant. Records are password protected, and the application provides an audit trail of all who access the files. In fact, the EMR allows COT to achieve seemingly conflicting goals: it allows greater access to patient records by more staff, with greater assurance of privacy management.

- 2) COT successfully has developed the database it sought – and can use it to extract data about its own patient base and to expedite special or urgent projects (such as contacting patients during the Vioxx recall). For example, COT and the Heart Hospital use the database to determine which patients would benefit from the use of a defibrillator – by querying the system and cross-referencing the patient list with the most recent test results. They can also bring contextual data to physicians in real time, requiring them to complete specific data fields during encounters before allowing them to proceed to the next task. Additionally, when seeing post-myocardial infarction patients, for instance, physicians must review the condition of the heart muscle and comply with medication guidelines before advancing to subsequent screens in the EMR. This means quality guidelines are enforced at the point-of-care, not simply reported upon as a retrospective “report card” at a later time.
- 3) Improved Workflow. The practice realized significant benefits through process improvements – not necessarily because physicians worked faster, but because the installation of the system required that workflow throughout the organization be evaluated. This exercise allows practice leadership to overhaul and eliminate all areas of systemic inefficiency. Plus, EMR templates, menus, and processes were designed to support efficient clinical and administrative efforts – without sacrificing effectiveness or quality.

For instance, in the days of paper charting, physician often postponed their dictation until the end of the day (or later, if they were called away). This would delay claims submission and payment. With the EMR, charges are captured before the physician leaves the exam room and claims are submitted within moments.

The EMR system and Microsoft Exchange Server also automatically task activities to appropriate staff. For example, when a physician receives a

call from a patient at 3 a.m., he or she can route a follow-up task to his or her team. The next morning, a staff member selects the task and it falls off the others' lists. Physicians at COT route 725 tasks a day and can be assured they will be completed with no duplication.

One example of improved patient workflow is the better management of phone calls. Before COT implemented the EMR, the process to log the call and its purpose—pulling the chart (if the chart was on file), delivering it to clinical staff, retrieving the completed chart, logging it back in and returning it to the file—took staff 15 minutes. If the chart was not in the file, which was often the case with 1,500 charts in circulation on a daily basis, locating it prolonged this process significantly, sometimes up to an hour or more.

With the EMR, processes take five minutes or less, and the three employees who previously managed the manual process have been given other work assignments or their position has been completely eliminated. Clinical teams now manage the calls through the EMR by tasking the question to the physician, who reviews the patient contact and responds electronically. Better management of phone calls has not only saved the practice \$80,000 per year, but also allowed for re-allocation of clinical staff time.

- 4) Financial Health. During the first year of using the EMR, COT realized \$362,029 in administrative savings, plus numerous process improvements and clinical benefits.

Because it scanned all paper charts into the EMR, COT gained 1,100 square feet of revenue-generating space. Before the EMR system, it cost the practice \$4-5 to create charts for 10,000 new patients a year. COT has been able to eliminate these annual costs of \$48,341. The EMR also allows COT physicians to complete dictation at the point of service for faster turnaround and transcription savings of more than \$72,000 annually. The practice reduced its transcription staff by 62 percent while reducing transcription lag time from 2,000 minutes to only 30 minutes. The quality of transcription has improved as well, resulting in better documentation for better reimbursement.

Charges are automatically captured at the time of the visit, and the EMR facilitates less time per patient contact, particularly at the hospital. In addition, use of the EMR helps eliminate the potential for reimbursement fraud and abuse. The application checks coding, based on the documentation entered electronically, so the practice can be confident it is billing services at the appropriate level. Besides countering any tendencies to overcharge, it also reduces undercoding and underbilling, thereby ensuring COT ethically optimizes revenue.

COT also increased new patient and consultation volume by 13% with no additional support staff. Plus, remote electronic access allowed the practice to open an office in a new town within three days, eliminating a potentially devastating competitive challenge.

The competitive challenge faced was in a community more than fifty miles from Tulsa. Having had more than a 30 year relationship with the hospital and local referring physicians, COT had typically provided outreach clinics two to four days per month. At two different times the community had a cardiologist who chose to live there. Since neither stayed more than a couple of years COT would find they were gearing up to return to an outreach clinic situation. The downstream referrals represented significant revenue to the practice.

Upon deciding to grow the cardiology program, without COT's knowledge, the hospital contacted their competitors and essentially reached an agreement for the competitors to place a full time cardiologist in the community. Before the deal was finalized, COT's referring physicians requested the hospital give COT an opportunity to submit a proposal allowing the hospital to compare offerings. COT met with the hospital. On a Friday, seven days later they returned a proposal. COT was told they could have the contract but must bring a physician to the community during the day every week (Monday through Friday) until they and the hospital could jointly recruit someone to live in the community. However, COT would need to start providing services on the Monday following the Friday submission of their proposal. If COT was unable to make that level of commitment the arrangement would go to their competitors. They opened a fully functional office with electronic charts on all of the patients COT had ever seen in that community on the following Monday.

- 5) Improve Patient Safety. From a clinical perspective, the value of having complete access to patient data has made a tremendous difference. The EMR keeps such complete records—from telephone interactions and encounter notes to images and lab results—that the practice never has to worry about missing information. Physicians are also better prepared to make crucial care decisions because they have access to longitudinal data that establishes a timeline of care, an especially important feature in treating cardiology patients who require different treatments at different stages of their condition.

Being a paperless practice means:

- new patient workup has been cut from 20 to 7minutes;
- records for unscheduled patients are immediately available;
- information is communicated to referring physicians faster; and
- patient education in the exam room – via electronic diagrams, immediate access to test results, angiographic video images, etc. – is more comprehensive and effective.

The EMR allows COT to generate a broad array of health maintenance and disease management reports. For instance, COT identifies patients for specific services such as INR, lipid, and CHF clinics, and alerts providers to those who would benefit from therapies like SBE prophylaxis. The system allows the practice to implement an automatic "teleminder" service for patients with scheduled visits or follow-ups. It generates automatic forms such as living wills and informed consent documents. The system enhances patient education by generating goals and targets related to heart health.

The EMR also supports physicians when they cover for one another. Each medical record looks the same – the templates are identical, terminology is consistent, and physicians know precisely where to look for information critical to the current episode of care. Plus, physicians can communicate with one another electronically through the EMR, saving time and ensuring information is passed along accurately.

Caring for patients with chronic heart disease using a database model is a far superior tool to traditional paper records. Contextual data allows physicians to care for highly complex patients with fewer errors.

- 6) **Device Connectivity.** COT installed interfaces to seamlessly transfer discrete data elements captured through the medical devices (e.g., vital signs, ECG, and treadmill machines) directly into the patient's central record. This connectivity facilitates broader tracking and evaluation of patient data, and eliminates lost readings, transcription errors and duplicate data entry. COT saves \$33,215 each year through the connectivity between diagnostic devices and the EMR. The interfaces also allow the practice to reduce FTEs and decrease supply costs.
- 7) **Web Access to Healthcare Resources.** The EMR has facilitated access to web-enabled sites that offer physicians a wide-range of resources previously unavailable. For instance, from the application, they can immediately connect with various websites that may offer information vital to optimal care delivery – like an in-depth risk factor calculator offered through the American Heart Association website, implantable defibrillator registries, or even recent angiography studies that have been stored electronically at another hospital.
- 8) COT has also replicated its database efforts and exported its approach to other practices, becoming a model for similar health care organizations. In fact, with NextGen assistance, COT has been instrumental in developing a national cardiology database that serves as a repository for clinical data from multiple practices. As it moves forward, COT will standardize the database to match national benchmarks so that it can fully integrate emerging clinical outcomes and performance measurements.
- 9) **Other Objectives:** Patient satisfaction increased dramatically because of improvements in the flow of people and paper. Patients receive test results and answers to questions more quickly, and feel their providers have greater access to information that affected their care. This enhances the relationship between the practice and its patients, resulting in greater loyalty and increased numbers of patients referring friends to COT.

Similarly, physician satisfaction is enhanced because they have access to better clinical information, can write orders and chart notes more quickly, and are assured that other members of the care team have immediate access to vital information.

Referring physicians also express greater satisfaction, because they receive results and information more quickly, in a standard format that is easy to read and digest.

I Costs and Benefits Offsetting Costs

Perhaps the best illustration of the benefits COT has realized can be found in a comparison between charge volume and staffing levels. COT achieved a 24.1% increase in charge volume between the years 2001 and 2005 – which translates to a \$10 million increase in billing. At the same time, thanks in part to efficiencies realized through the EMR, the number of physicians remained steady at 18 and FTEs dropped slightly from 108.2 to 107.9. In other words, this significant level of growth was attained without increasing the work force by even a single position.

Costs to Implement EMR

Initial hardware/software investment:	\$412,468
Five-year maintenance agreement:	\$132,531
Costs to abstract charts (2001):	\$188,310
Chart/document scanning (2001):	\$ 87,770
Consultant fees (implementation):	\$ 35,325
Additional staff support:	\$ 10,325

TOTAL **\$866,729**

Savings Realized Through EMR

Ongoing/Annual:

First Year—

Management of phone calls:	\$ 80,772
Time spent on chart pulls:	\$ 71,518
Reduction in transcription staff:	\$160,898
New chart costs:	\$ 48,341
<u>TOTAL</u>	<u>\$362,029</u>

Second Year—

Management of phone calls:	\$ 80,772
Time spent on chart pulls:	\$ 71,518
Reduction in medical records staff:	\$ 96,428
New chart costs:	\$ 48,341
Transcription costs:	\$ 72,626
<u>TOTAL</u>	<u>\$369,685</u>

Third Year—

Management of phone calls:	\$ 80,772
Time spent on chart pulls:	\$ 71,518
Reduction in medical records staff:	\$ 96,428
New chart costs:	\$ 48,341
Transcription costs:	\$ 72,626
Device connectivity	\$ 33,215
Reduction in office space	\$ 33,000
<i>(due to elimination of paper records)</i>	
<u>TOTAL</u>	<u>\$435,900</u>

CUMULATIVE TOTAL **\$1,167,614**

(Savings Years 1-3)

(Note: Some savings – like management of phone calls – increase every year as the practice grows and call volume rises; however, there is no practical method to measure this savings)

Revenue enhancements:

Increased billing: \$145,541
(first year; due to accurate coding)

Lessons Learned

J) Critical Success Factors. Looking back, there were a number of components that contributed to COT's successful implementation of an EMR and would be equally necessary to implementation efforts at other practices:

1. Clear vision. All primary stakeholders must have a comprehensive understanding of what the practice wants to achieve. They must recognize that implementing an EMR is a strategic undertaking – not simply an operational endeavor. In addition to understanding this distinction, they must embrace the vision and be proactive in advancing it at all levels of the organization.
2. Detailed plan. Implementation of an EMR represents a complete reengineering of workflow – and of the way all individuals view their jobs, their responsibilities and the way they interact with their colleagues. Each step must be carefully planned, ramifications of the change must be carefully considered, and meticulous training must be executed.
3. Recycled learning. Because of the sweeping nature of the change, practices must build in “stops” along the way to evaluate what has been accomplished and how they can improve the process. This approach keeps problems manageable, allows staff to capitalize on successes, and communicates a sense of control in an environment of rapid change.
4. Physician strategy. It's important to employ a “pull” strategy – not a “push” strategy – with physicians. COT discovered that the physicians were less resistant to the change because leadership kept their needs in mind throughout the selection of the EMR, the design of the templates, and the deployment of the system. The EMR team worked closely with the physicians to explain the capabilities of the EMR and listened as the physicians explained how they wanted it to mirror their work habits. As a result, medical staff made the transition quite easily – and eagerly anticipates new functionality as it becomes available.
5. Ongoing nature of implementation. It is also vital that leadership understand that adopting an EMR is not a finite project. While various stages are undertaken and completed, the overarching process continues. The system will need upgrades...templates, menus and processes will need to be improved after they have been used for awhile...new applications will be discovered and new functionality will be requested when users learn the benefits they can enjoy.
6. Maintain enthusiasm. A change of this magnitude is stressful, no matter how well planned and executed. It is worth the time, money and effort to infuse the process with motivational and fun activities – parties to celebrate goals met, “casual” dress days during training, contests and prizes to keep spirits high.

Although the EMR has been in place for about 5½ years, COT continues to upgrade and improve. For instance, COT has rebuilt its network twice since implementing the EMR to accommodate the complex elements it has incorporated to the system (e.g., remote access with CITRIX). In addition, the practice has completely redesigned the templates it had created in 2001. It discovered a need to simplify the format – eliminating the need to key in data and relying upon check boxes and graphics instead, for instance. It has also hired two dedicated computer programmers to enable the practice to maximize its “data mining” capabilities and utilize the information stored in the EMR’s database more effectively.

COT has exported its experience to other practices implementing NextGen EMR. It was instrumental in developing the NextGen cardiology knowledge database, for instance, and serves as host for more than 25 site visits from prospective EMR adopters each year.

The vision of Cardiology of Tulsa is to improve care for patients on a case-by-case basis while changing the face of medical practice across the country. The scope of these combined goals has provided an enormous energy to the project and created unanticipated synergies within companies and practices across the U.S.