

"I was sold the first time I tried it," says Chief of Pediatric Urology David Joseph, MD, at Children's Hospital of Alabama in Birmingham of viewing PACS images in the OR during surgery as well as in the urology clinic. Eight of the hospital's 12 ORs are fitted with dual wall-mounted displays like these.



Inside the Transition to Next-Generation Image Management

CHILDREN'S HEALTH SYSTEM

Birmingham, Ala.

Outpatient visits629,909

Inpatient discharges..... 13,777

Annual imaging procedures140,000

Annual ER patient visits50,795

RIS/PACS user since2003

Stat ... Only children's hospital in Alabama

Radiology operates in a constantly and rapidly changing environment. Consequently, digital image management is an ongoing project. The common denominators at hospitals across the country include investment in new data-intensive imaging modalities, PACS infusion throughout the enterprise, bursting archives and overburdened radiologists and technologists.

Effective solutions to these standard—and widespread—challenges require planning, partnership and vision. Take for example Children’s Health System and its flagship 275-bed Children’s Hospital of Alabama of Birmingham, Ala. Children’s Health System is comprised of Children’s Hospital, an outpatient surgery and diagnostic center called Children’s South, an off-site pediatric specialists practice and 14 primary-care pediatrics practices across the state. The health systems’ partners—RIS/PACS from Siemens and information infrastructure from EMC Corporation—have collaborated to develop a proactive approach to the challenges of 21st century digital image management and workflow.

Early in 2008, Children’s became one of the first sites to transition from Siemens Magic technology to *syngo* Suite, an integrated web-enabled RIS/PACS platform, including *syngo* Workflow RIS and *syngo* Imaging PACS. In doing so, it established a solid foundation for efficient workflow, improved communication and reporting, robust cost savings, scaleable storage and disaster recovery.

The magic of *syngo* Suite, however, transcends workflow mastery. The RIS/PACS upgrade moved Children’s to the next level of digital image management by delivering a more sophisticated, richer user experience, allowing the imaging department to provide high value services to improve patient care across the enterprise. “*syngo* Suite is so customizable and flexible. We’re confident that we can use the software to answer any business requirement including specific documentation or tracking needs,” explains Chief of Radiology Stuart Royal, MD.

A solid foundation

Children’s began the transition to digital imaging and digital image management in 2003, deploying Siemens SIENET PACS, and NOVIUS Radiology RIS and implementing an integrated RIS/PACS model. At that time, the hospital started the conversion to digital imaging equipment, installing CR and DR in the diagnostic, outpatient radiology and emergency departments and equipping operating rooms with digital C-arms. Other digital modalities added later include 16 and 64-slice CT scanners, digital R&F, ultrasound and two 1.5T MRIs. In addition, Magic-Web web-based image and report distribution provided a means to infuse digital image processes across the enterprise. The health system deployed PACS in the emergency department, operating rooms, hospital clinics and all nursing floors to deliver additional efficiencies and cost savings.

The results of the initial project are impressive. Siemens RIS-driven workflow and integrated RIS/PACS model reinvented the radiology department to provide a robust framework for high-quality pediatric care. The Children’s Hospital of Alabama radiology department is 99 percent digital, and its eight radiologists read about 140,000 imaging studies annually.

Senior Vice President, Director of Operations Pete Van Pelt is part of the team leading the charge to plan Children’s Hospital of Alabama’s brand-new facility slated to open in 2012, just down the street from the current facility. Upgrading Children’s Health Systems’ RIS/PACS to Siemens *syngo* Suite is one step in that plan to assure solid image and information infrastructure for future growth.



Digital image volume represents only a fraction of the picture. Children’s has gained a number of benefits with the implementation of Siemens digital image management solutions. The hospital has accelerated and improved patient care, slashed costs and shortened report turnaround time from an average of 24 hours to less than four hours. Royal credits the integrated RIS/PACS model with a 40 percent increase in efficiency among radiologists. Plus, the health system has cut film costs by \$250,000 annually.

Opting for the upgrade

Despite its impressive implementation of enterprise digital image management and RIS-driven workflow, Children’s continues to actively search for ways to improve pediatric patient care. “We plan to open a new facility in 2012, so we’re focused on infrastructure to support future needs,” shares Senior Vice President of Operations Pete Van Pelt. The plan includes hiring new specialists in neurosurgery and orthopedic surgery; investing in PET/CT, interoperative MRI and an interventional radiology suite and, equally important, perfecting current processes and systems. “We’d like the new facility to be paperless,” shares IT Divisional Director Pam Atkins.

As Children’s pondered its future, the health system also faced a number of intense developments in radiology such as the nearly absolute penetration of 64-slice CT scanners. The ubiquitous 64-slice brings new challenges. The hefty datasets generated by 64-slice CT often tax conventional tape-based archives. At the same time, new storage alternatives, EMC CLARiiON CX series systems and EMC Centera active archiving storage solutions offer lightening fast, reliable storage to current and historical medical and radiological information and the scalability to accommodate terabytes of image data being generated every year at Children’s. Similarly, PACS infrastructure has improved. Siemens next-generation *syngo* Suite technology offers a next step for burgeoning radiology departments by blending image acquisition, RIS, PACS, post-processing and report distribution in a unified environment.

Last year, Children’s decided to transition from SIENET Magic to *syngo* Imaging. Multiple factors drove the decision, says Lynne Hamer, divisional director of pediatric imaging. The pri-



Divisional Director of IT Pam Atkins stands in the Children's Health System data center that now includes two EMC Centera content-addressed storage systems that have helped to speed image recall rates for clinicians throughout the system as well as creating a strong data disaster recovery strategy.

mary rationale, says Hamer, was the need for speed. *syngo* Imaging provides a more direct—and faster—server environment. Unlike MagicStore, which is based on a distributed workflow that sends data from modality acquisition devices to servers to the archive, *syngo* Imaging is based on a central server model with a direct connection between modalities and the archive. The direct connection virtually eliminates wait time for even the most data-heavy studies. The direct connection between modality devices and the archive represent one means of increasing speed. *syngo* Imaging also boosts the speed of the central server model by enabling a state-of-the-art storage solution.

At Children's Health, MagicStore was tied to the tape archive, which does not provide optimal image retrieval, particularly with large datasets. "Radiologists felt the tape archive slowed image review," explains PACS Administrator Lynn Odom. "At times, it took six to eight minutes to load a 64-slice CT exam with priors. Ultimately, this effects dictation, report turnaround and even length of stay." The *syngo* Imaging/EMC Centera combination offers a new model. The EMC Centera active

ADVANCED STORAGE DELIVERS

Radiology is a high-tech business. The amount of technology in any radiology department is impressive. And although advanced technology, like 64-slice CT, is a boon to radiology, it also is a burden because new modalities produce exponentially larger datasets. Storing those large datasets is a hefty undertaking.

Conventional storage solutions like tape libraries no longer fit the bill for many radiology departments. The problems with tape-based archives and radiology are multiple and entrenched. Tape is slow, prone to glitches and not easily scaled.

Advanced information infrastructure solutions, consisting of EMC CLARiiON CX series storage for current studies and EMC Centera active archiving storage solutions for records retention offer a new (and significantly improved) model. In contrast to tape archives, EMC

Centera is lightning fast, reliable and scaleable.

Children's Health System and its flagship Children's Hospital of Alabama, replaced their nearly full tape library with a pair of EMC Centera active archiving storage systems early in 2008 during a transition to Siemens *syngo* Suite integrated RIS/PACS solution.

"EMC Centera is an ideal storage solution for the hospital," says PACS Administrator Lynn Odom. One inherent, seemingly unsolvable problem with the previous system, a tape library, was historical image review. In the pediatric imaging environment, it is not uncommon for physicians to require historical images on a moment's notice. In these cases, technologists have no time to pre-fetch data, so the radiologist often takes on the task. As Children's tape archive filled, it took



The exponentially large data sets from newly deployed 64-slice CT scanners were the tipping point for the decision to deploy a new information infrastructure plan at Children's Health System, says PACS Administrator Lynn Odom.

more time to recall prior images. "It might take six minutes or longer to recall prior images," says Odom.

EMC Centera significantly improves the image recall rate. A simple



Divisional Director of Pediatric Imaging Lynne Hamer says that choosing to upgrade its Siemens *syngo* Suite RIS/PACS has brought true economic benefits namely a 40 percent jump in radiologist efficiency, \$250,000 in film cost savings and vastly improved report turn-around times to 4 to 5 hours or less from 24 hours.

archive delivers images of any size within a few seconds, and progressive loading allows radiologists to begin image review as soon as they call up a case.

Rapid image review is a key consideration for all radiology departments. Another driver is data security. The health system deployed a pair of EMC Centera storage solutions and writes studies to both servers located at the nearby data center, providing a foundation for the next step of the project: a true disaster recovery plan.

syngo Suite: In action

Since transitioning to *syngo* Suite in January 2008, Children's has realized a number of tangible benefits ranging from rapid image retrieval to improved report turn-around to reduced costs. What's more, *syngo* Suite facilitates value-added imaging; the software helps radiologists to provide higher level service to specialists, clinicians and patients.

Efficiency is often the first-line concern in radiology. As the tape library neared capacity in 2007, radiologists experienced

lags in image retrieval time, which, in turn, impacted critical department and hospital functions including reporting and clinical decision-making. The primary factor behind the archive slowdown is 64-slice CT. Sixty-four slice CT is a double-edged sword. On one

hand, it delivers tremendous improvements in diagnostic capabilities. On the other, it can burden the image archive, particularly for sites like Children's that were using a first-generation tape library. It took up to six to eight minutes to retrieve large datasets prior to the deployment of *syngo* Suite and Centera.



One of two EMC Centera content-addressed storage systems installed in the Children's data center.

right-click delivers any imaging data within a few seconds, says Odom.

Another tape challenge stems from its frailty. Tape drives are prone to mechanical issues. If the tape mal-

functions, it can take longer or may be impossible, for a time, to recall archived studies. Neither option represents an ideal business model.

EMC Centera, on the other hand, is robust. Children's installed two separate systems and image data are simultaneously written to each archive. "If there's a problem with one system, it switches to the second, so radiologists never encounter a delay in image retrieval," explains Odom. The outcome is ideal; the department's eight radiologists are able to maintain a steady pace.

Despite the apparent advantages of EMC CLARiiON CX series systems and EMC Centera active archiving storage solution, the health system has not yet realized all of the benefits of its advanced storage solution. That's because some benefits will be realized in the future as the archive grows and Children's develops its

disaster recovery program. With EMC Centera, increasing information infrastructure capacity entails the simple addition of a new disk. In contrast, expanding the tape library required changing systems. Finally, EMC Centera provides a solid foundation for business continuity and disaster recovery. Children's owns two separately housed systems. "Eventually we plan to move one archive to a hot site as a more robust disaster recovery plan," explains Odom.

The decision to deploy EMC Centera active archiving storage solution in conjunction with *syngo* Suite not only continues to pay dividends on a daily basis by enabling rapid image retrieval, but also represents a sound foundation for the future. EMC CLARiiON and EMC Centera can be easily scaled to meet growing needs and provides a framework for disaster recovery.

“That time adds up over the course of a day,” explains Hamer. Consider an ordinary caseload of 20 CTs daily; a six-minute delay translates into two hours of wait time for the radiologist. There are other issues as well. “Tape drives are mechanical and fragile, susceptible to break downs,” she says.

Fast forward to the *syngo* Suite/EMC Centera era. Radiologists

can retrieve any image from the near-line spinning disk in a matter of seconds. “This translates into quicker turn-around times,” reports Hamer. Prior to the *syngo* Suite transition, report turn-around hovered in the 24-hour range. Since deploying *syngo* Suite and EMC Centera, the Children’s radiology department boasts report turn-around in the four-to five-hour range.

FUNCTIONALITY TO THE MAXIMUM THE PACS ADMINISTRATOR’S PERSPECTIVE

“I am constantly building and improving processes with Siemens Medical Solutions *syngo* Suite,” shares Lynn Odom, PACS administrator at Children’s Hospital of Alabama in Birmingham. The hospital and the affiliated Children’s Health System transitioned to Siemens *syngo* Suite integrated RIS/PACS early in 2008 and the new system

Josh Pavlovec, PACS Administrator at Children’s Hospital of Alabama tweaks images on a wall-mounted display in the orthopedic clinic.



has produced dramatic improvements in the hospital’s integrated RIS-driven workflow. For example:

- › *syngo* Workflow automates and streamlines peer review. Prior to the transition, peer review was a manual process that required technologists to physically pull studies from the file room. *syngo* Suite places relevant studies on the worklist; radiologists simply select a prior result and review the findings to determine if they agree or disagree. “With *syngo* Suite, our compliance has improved, with each radiologist completing five peer reviews weekly,” says Odom.
- › *syngo* Workflow facilitates critical results reporting. Radiologists can flag critical results to close the reporting loop and eliminate the need to pulling of critical results. Similarly, Odom used *syngo* Workflow to create a trauma worklist to improve turn-around and service for trauma studies. Prior to creating the trauma worklist, radiologists weren’t immediately aware of trauma images to interpret until they appeared on the routine worklist. Now, when the tech tracks a procedure to the trauma location, a trauma worklist appears on the radiologist worklist(s) immediately.
- › Children’s uses *syngo* Workflow’s Interactive Documents function to automate ED discrepancy tracking. If a radiologist determines that an initial ED read missed a finding such as a hairline fracture, an Interactive Document is created and automatically printed in the ER follow-up nurse’s office.
- › The conference worklist function streamlines the conference process. A radiologist or clinician can load an entire patient file, specific studies or parts of exams into a conference folder. The digital folder is immediately available enterprise-wide for conferencing. Similarly, ER physicians use the function to store challenging ER cases to review with radiologists during monthly meetings.
- › *syngo* Suite includes tabs to link to other systems. For example, a radiologist can launch the EMR to access lab results or patient history without leaving the integrated RIS/PACS environment.

“*syngo* Suite will continue to grow with the hospital. We realize the possibilities are tremendous. By continuing to optimize *syngo* Suite, Children’s Hospital can provide the highest quality pediatric patient care and develop efficient workflows for all care providers,” sums Odom.

There is, however, a second factor contributing to the hospital's dramatic improvement in turn-around time. *syngo* Suite features embedded voice recognition software. *syngo* Voice software fueled the transition from conventional dictation and transcription to voice recognition with self-editing. The time-consuming cycle of dictating, sending dictation to an offsite transcription service and reviewing reports has been replaced with a single streamlined process at Children's. Radiologists create and self-edit their own reports, eliminating time and several steps. "*syngo* Voice is convenient, easy and efficient. We've seen the usual improvements in [report] turn-around time and gained additional efficiencies through the use of voice commands for common tasks like signing reports or changing the organization of a report," explains Royal. Equally impressive, voice recognition cuts costs. "The software has paid for itself in three months," shares Hamer. Looking ahead, the department anticipates a \$175,000 reduction in radiology transcription costs in 2008.

Improving efficiency and demonstrating cost-savings are critical in healthcare. Improving patient care and clinical service are equally important. The health system regularly taps into *syngo* Suite's customizable features to offer higher quality service. "Physicians know the radiology department is open. We can use *syngo* Suite to pull radiology data and assist with difficult questions," states Royal. For example, radiologists can locate and track all tumors with neuroblastomas, if needed. In addition, *syngo* Suite integrates with radiology residents' MData PDAs. Residents have immediate access to results via the PDA, so the department no longer contends with time-consuming calls about normal chest x-rays. "We can focus on the difficult questions and higher-level needs," sums Royal.

Integration pays dividends across the enterprise

Radiology is an all-inclusive undertaking. To be truly successful RIS/PACS must meet enterprise needs. Siemens *syngo* Suite fits the bill. Chief of Pediatric Urology David Joseph, MD, is an ardent admirer. "I was sold the first time I tried it."

The technology has reinvented workflow and patient care in the hospital's pediatric urology clinic, which is a solid consumer of radiology services. (Sixty percent of patients arrive with imaging studies in hand, either film or CD.) Consider a fairly representative case of a child with an ureteropelvic junction (UPJ), who presents to the clinic with 18 months of prior studies. Prior to *syngo* Suite, recalling prior images seemed to be a circuitous process. "That had a tremendous impact on the clinic. The family waited longer, which is less than ideal patient



Chief of Pediatric Neurosurgery Jerry Oakes, MD, stands in front of a 58-inch plasma HDTV in the Neurosurgery Conference room at Children's that is regularly used for surgical conferences.

service. Plus, each waiting patient tied up a room. The impact added up over the course of the day."

syngo Suite provides a much-improved contrast to prior operations. "All images, even those that aren't online, present in under a minute," says Joseph. The new software also includes a number of functions that can improve clinicians' user experience, he says. The urologist—who often views images on side-by-side PACS displays in the OR during surgery—uses flexible layout panels to sync CT images and simultaneously roll through a pair of studies side by side. The function helps physicians pinpoint kidney stones or ureter defects. The SmartSelect tool optimizes functions for a single viewer's needs. For example, if one user frequently uses magnification or measurement tools, *syngo* Suite can be set to display commonly used tools as appropriate.

Ultimately, the transition reinvented clinical image management across the enterprise. Chief of Pediatric Neurosurgery Jerry Oakes, MD, sums, "The benefits of *syngo* Suite run the gamut from improved patient care to expedited workflow and efficiency. Previous studies are readily available and can be pulled from the archive within seconds."

The transition under the microscope

Lightening-fast image retrieval, shorter report turn-around time, six-figure cost savings and a higher level clinical service are not overnight achievements. Generally, they accrue as part of a

carefully planned strategy and in close collaboration with strong vendor partners. In the case of the Children's Health System *syngo* Suite project, planning began in 2005.

The hospital invited a Siemens team to the hospital to complete a Volume Analysis Report. The plan focused on optimizing the RIS/PACS and RIS-driven workflow. "During the three-day site visit, the Siemens team reviewed all aspects of the digital image management process: volume, throughput and the archive and data center. Next, the team provided specific feedback on what was needed to optimize the system," says Odom.

"The report showed us that we were doing many things well, but it also pinpointed some areas for improvement," continues Odom. Specifically, Siemens indicated that the one-person PACS team was understaffed and recommended the hospital hire an additional PACS support administrator, which they did—bringing PACS Administrator Josh Pavlovec on board to help Odom. The Volume Analysis Report unveiled a second major, but not unsurprising, finding. The hospital had not anticipated the impact of 64-slice CT when it deployed PACS. Consequently, the tape archive was nearing capacity. The report recommended additional improvements, including investing in EMC Centera content-addressed storage infrastructure and beefing up the network backbone. The upgrade includes:

- Dual Core switches connecting to the DataCenter housing the

server farm to provide redundancy in case of a hardware failure or fiber loss.

- Three Gig connections in each user closet for increased bandwidth to each user closet. The fiber paths travel in different directions to provide fiber path redundancy.
- The backplane (maximum throughput for a switch or stacked switches) for the user-based switches increased from 2.5Gbps with the Nortel to 32Gbps with the Cisco. The backplane for the core switches went from 128Gbps to 720Gbps.
- Eight Gig connections to provide 16 Gig throughput between the four core switches.
- Limited Gig to the desktop.
- Power Over Ethernet (POE) to wireless devices.

"The network project was a win-win proposition; it serves as the foundation for *syngo* Suite and will facilitate other planned IT projects," notes Atkins.

Ultimately, Siemens Volume Analysis Report served two purposes: a springboard and framework for planning the next-generation PACS. Odom describes the *syngo* Suite project as both a migration and a transition. "Children's migrated imaging data from the tape library to EMC Centera active archiving storage solution. At the same time, the hospital transitioned its workflow, using its solid RIS-driven workflow as a base for a next-generation integrated workflow model that includes voice recogni-

LOOKING AHEAD

Siemens *syngo* Suite is a future-oriented platform. Children's Health System invested in the new system as part of an overall strategic vision for its radiology department and healthcare system. "This is a long-term process of progressive improvements," explains Chief of Radiology Stuart Royal, MD. In the next year, Children's hopes to tap into a pair of upgrades (*syngo* TrueD and *syngo* Portal Radiologist) to realize further clinical and workflow benefits. *syngo* Suite also serves as a model for long-term projects, including a paperless electronic health record (EHR).

Children's looks to streamlining communication and workflow



Chief of Radiology Stuart Royal, MD, reads CT images in the central reading room at Children's Hospital of Alabama in Birmingham.



syngo Voice software on the *syngo* Suite RIS/PACS at Children's has transitioned radiologists such as Yoginder Vaid, MD, from conventional dictation and transcription to voice recognition and self-editing and is expected to save the system \$175,000 in transcription costs in 2008.

tion and a more user-friendly, customizable user experience.”

Unlike the typical PACS replacement process, the transition from MagicStore to *syngo* Suite entailed a nearly painfree data migration. For starters, Siemens *syngo* Workflow (RIS) had handled Children's data. In addition, Siemens professional services team handled the major aspects of the migration, establishing auto migration processes to take the sting out of the massive data move.

Like all health systems in the midst of a data migration, Children's did encounter a few minor roadblocks as it moved data from MagicStore to *syngo* Suite. “The initial processes did not establish a mechanism to handle duplicate or overlapping data,” explains Odom. The fix was relatively simple. Odom worked with the Siemens team to develop a way to automate the migration of overlapping and duplicate data such as studies with delayed imaging.

A second migration hurdle proved to be fortuitous. A few weeks prior to the initially scheduled go-live date in November, Odom realized that the migration had not consistently covered the most recent data. That is, although 25 percent of the data had been migrated to *syngo* Suite, not all recent studies had been covered in the migration. Odom decided to delay the go-live date by six weeks. “It set us up for a successful migration. By the new go-live date of January 20, 75 percent of the data had been

migrated.” That is, postponing the go-live date to January facilitated a smoother transition because most historical data had been moved to EMC Centera, thus minimizing delays.

Making work flow

Workflow remains a critical issue for radiology departments; the best will tackle workflow and implement a next-generation radiology department with radiologists as clinical partners and information providers. That transition requires a highly customizable digital image management platform like Siemens *syngo* Suite. The Suite delivers the rapid image access essential to image-centric patient care; plus provides a platform for ongoing improvements in workflow, clinical care and beyond. It also requires a solid image and data management strategy. It's just what the doctor ordered. **H&IT**

via a planned upgrade to *syngo* Portal Radiologist later this year. The hospital decided to postpone *syngo* Portal Radiologist as Siemens perfects a number of features for inclusion in the next version of the software. These include:

- › **Tech Comments**, designed to make it easier for technologists to share important patient information in the exam notes.
- › **Tech Critique**, an in-process QA function, allows radiologist to electronically communicate feedback about exam quality to techs.
- › **ER Discrepancy Tracking** mimics the *syngo* Workflow process and automatically shares discordant re-

sults with an ER follow-up nurse.

- › **Critical Values** offers radiologists a mechanism to communicate emergent critical findings with clinicians and meet evolving Joint Commission requirements.

The in-progress features join others like Shortcuts, which allows radiologists to complete voice shortcuts. That is, if a given exam seems like a representative template for a specific diagnosis, radiologists can use the voice function to save the study as a template. “We plan to add *syngo* Portal Radiologist as soon as these features are available. It will be a wonderful communications tool,” Royal says.

In the longer term, Children's plans to open a new hospital in 2012. The goal is a paperless enterprise. “The *syngo* Suite project is helping to lay the groundwork for the EHR. Because the imaging department moved forward so quickly and successfully with *syngo* Suite, we know they can lead the charge and serve as a model for the rest of the enterprise,” explains IT Divisional Director Pam Atkins.

Siemens' commitment to ongoing development of *syngo* Suite makes it the ideal solution for future-oriented radiology departments. It provides a means to improve current processes and a platform to deliver future clinical and workflow improvements.