Document Imaging in Healthcare

DOCUMENT IMAGING IN HEALTHCARE

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The Rheinner Group

The Rheinner Group is a leading research, consulting and education firm in the document imaging, management and workflow industry. Its Certified Document Imaging Architech (CDIA) Education Program, which covers many of the same issues addressed by the Rheinner Guides, is the most popular training program in the imaging industry. For more information on The Rheinner Group, CDIA course schedules, or to obtain help designing and implementing document imaging and workflow systems, please call 781-741-8100 or visit our web site, at www.rheinner.com.

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INTRODUCTION

Today's healthcare providers face intense economic and competitive pressure as they strive to increase the quality of care they deliver to more customers at lower costs. To meet that challenge requires strong clinical, operational and informational infrastructures. Still dominated by host-based specialized information systems, healthcare organizations are beginning to look toward client/server information infrastructures that support the integrated, yet distributed, processing of these applications. But this transition will likely be a gradual one, constrained by financial, organizational and technical considerations.

In the interim, many healthcare organizations are gaining immediate competitive and financial benefits by implementing specific client/server solutions built around document imaging, workflow and COLD technologies for patient accounting, medical records and other healthcare applications. When properly designed and implemented, these systems deliver rapid payback and pave the way toward the fully-integrated client/server healthcare information network of tomorrow.

This Rheinner Group Technology Guide analyzes the use of document imaging and workflow technology within the healthcare environment, including a discussion of the benefits and most appropriate application areas for these technologies. This guide also addresses the technical, cultural and organizational issues you'll need to consider when implementing document imaging solutions.

THE CHANGING DYNAMICS OF THE HEALTHCARE INDUSTRY

The healthcare industry is currently in the midst of a fundamental transformation, one which has dramatic implications for the structure of the market and the manner in which healthcare is delivered. Among the competitive and economic forces causing this transformation: increased competition for patients and referral sources, pressure from third-party and government

healthcare payers to control rising healthcare costs, a move away from fee-for-service to managed care healthcare delivery, reimbursement based on capitated and diagnosis-based rates, and continued demand for quality improvement from all sides.

To thrive, or just to survive, healthcare organizations must determine how to deliver high-quality healthcare cost-effectively. To that end, there's an unprecedented degree of industry consolidation as suppliers attempt to broaden their coverage areas through mergers, networks and affiliations. The goal is to build integrated healthcare delivery networks so that one organization delivers a comprehensive continuum of healthcare services to a population, through a range of hospitals, clinics, nursing homes and other care delivery sites.

These integrated delivery systems are aimed at standardizing care around cost-efficient practices. At the heart of the matter is risk. As healthcare shifts away from fee-for-service to managed care, healthcare providers assume more of the risk associated with patient management and more of the responsibility for quality and costs.Ultimately, the success of these integrated delivery systems comes down to how well they manage the risk associated with managed care contracts that specify fixed payments for treating patient populations, regardless of the services rended. By standardizing care around cost-efficient practices, these systems strive to manage patient wellness, rather than caring for illnesses, thereby minimizing risk and increasing the return to the healthcare provider.

The Role of Information Technology

The changing market structure and delivery models are placing new demands on the healthcare information infrastructure. The redistribution of risk requires that healthcare institutions change their approach to infor-mation technology. Rather than supporting the business process, information technology must become an integral part of the business, enabling organizations to more efficiently gain new business, deliver quality services, manage the costs associated with that delivery, and monitor how well the organization performs each of these functions.

This strategic imperative requires the development of a new information infrastructure that links clinical, operational and financial information, and makes it available to the growing network of hospitals,

clinics and physician offices that are associated with the healthcare provider. Rather than individual systems optimized to perform a particular departmental function such as patient admitting or laboratory services, the emphasis is on distributed applications built around a common client/server platform. The common platform enables the integration and sharing of data among the various clinical, administrative and financial applications.

The Role of Document Imaging, Workflow and COLD Technologies

One significant piece of the information dilemma is the management of paper. Studies indicate that up to $.25 of every healthcare dollar is consumed by the generation, movement and tracking of paper. While on a departmental level, systems have been implemented to automate patient billing, administration, scheduling, etc., and while clinical information systems have automated the collection and reporting of certain types of clinical results and procedures, many critical healthcare documents and business processes remain paper-based.

Document imaging technology can address this paper management problem by electronically capturing, storing, managing and retrieving documents that have been converted from paper to digitized form. The management and processing of this digitized image information requires the integration of highly-specialized components with standard computing systems.

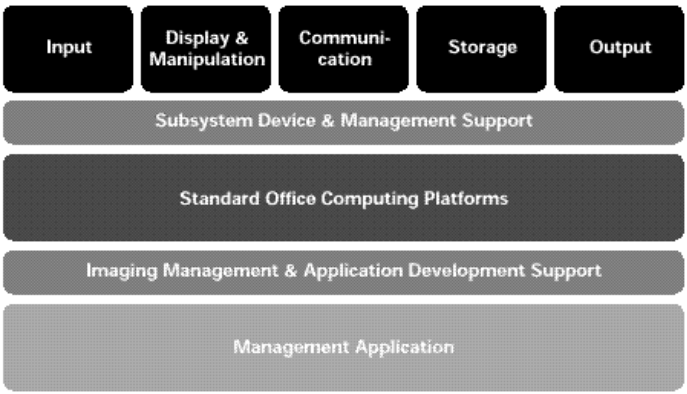
Every computing system consists of essentially five subsystems: input, display, communications, storage and output, each of which is integrated with the central processing unit (CPU) and especially configured to manage the type of data being processed. In the data processing environment, the keyboard is the input device and it is directly supported by both the computing device and the computer operating system. Each of the other subsystems is similarly optimized to manage character and graphic data, supported by the computing platform, the operating system or some other intervening layer, such as the network operating system.

But image data is very different from other computer data. Most importantly, images of documents are simply a collection of dots which form legible characters to the human eye, but are not “usable” by computer systems. This means that one cannot search for the occurrence

of a particular word or phrase in an image document; one cannot spell check it; one cannot edit the document— insert, delete or rearrange the elements. The second most significant difference is that image file sizes are much larger than other computer data files. For example, a word processing document that contains a letter might comprise a file size of two or three kilobytes; the scanned version of that letter might represent an entire megabyte.

Since the unique requirements of image data are not directly supported by the existing computing infrastructure, a comprehensive array of specialized hardware and software optimized to manage image, rather than character, data must be integrated with the computing system (see Figure 1).

Figure 1: Document Imaging Component Model



The imaging application, which can also be referred to as the management application, is the program the end-user actually sees. The management application relies on the imaging platform, an underlaying foundation, to process the document image and utilize the functionality provided by the various imaging subsystems. Some imaging platforms already are management applications; others require the integration of various tools and programs to create an end-user application, such as medical record chart completion or patient billing in the healthcare environment.

Workflow and COLD Technology

In addition to document imaging, there are two complementary technologies: workflow and COLD, which also offer substantial and immediate assistance to the paper processing problems of the healthcare industry.

Workflow is a technology tool that enables business process management and automation.While the terms workflow and business process reengineering (BPR) are frequently used interchangeably or together in the same sentence, they are not the same thing. BPR is concerned with solving organizational problems through a combination of human, technological and operational methods, one of which is using workflow to automate business processes.

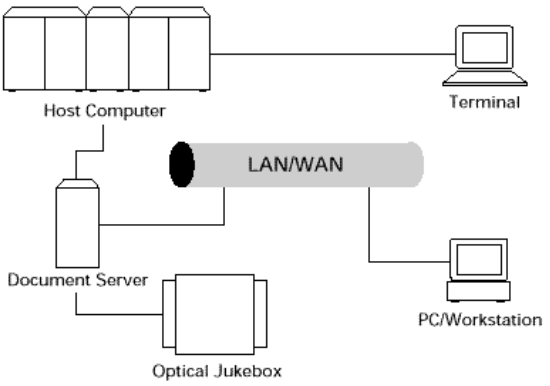
Using workflow technology, individual work items that comprise a business process can be assembled into a single "work package" that is distributed to the appropriate individuals so that they can perform work. The distribution of the work package can be based upon predefined conditions (a feature called rules-based routing), for example the amount of a bill for services. These conditions can be complex, with multiple options, variations and exceptions. A feature called parallel routing means that the workflow allows work items to be distributed simultaneously to different individuals so that they can perform separate tasks. Workflow can also facilitate the integration of different computer applications so that the user automatically has access to required information. Workflow can take this integration a step further, and automatically move data from one source to another, without any human intervention. Further, most workflow products include tracking and reporting capabilities that monitor the status of individual work items, as well as the overall performance of a specified workload.

Workflow software and imaging systems can exist independently from each other, but they are also quite frequently implemented together. Because many paper-driven processes are group-oriented, the fulfillment of that process can benefit from the routing, queue management and work tracking provided by workflow software. A good example within the healthcare environment is the use of workflow and document imaging technology for tracking and resolving deficiencies in patient charts. Workflow software can be used to track outstanding deficiencies by doctor, patient, or fee amount. After these deficiencies are electronically resolved, these items can be automatically forwarded to accounting for the billing process.

Computer Output to Laser Disk (COLD) technology deals with the voluminous amounts of mainframe computer data that is formatted, printed and stored on paper reports or microfiche. This formatted output consists of point-in-time daily, weekly and monthly reports, such as general ledger reports or patient billing statements. The subsequent retrieval of this data is typically tedious and time-consuming, requiring the user to scan through data page by page. COLD is an integrated set of hardware and software, that takes computer-generated, formatted reports and, rather than printing or filming them, processes, indexes and stores them on computer media. By taking data that would otherwise have to be stored off-line and storing it on-line, COLD enables users to electronically search, view, print and process the information contained on any report.

Most COLD systems operate in a similar way. Reports or statements are generated on a host mainframe or minicomputer. At certain predefined points in time, the reports are identified as ready for archiving and are transferred to the COLD system.The report is processed by building an index file based on predefined index values, compressing the report data, and then transferring the data to its long-term storage medium, which is most commonly optical disk but may also be CD-ROM or tape. With COLD, PC users can perform searches on the data and retrieve the pages or entire reports that they need.

Figure 2: Typical COLD Configuration



With improved information access and a compelling cost justification case when compared to fiche or paper alternatives, COLD is a sound technology choice for a healthcare provider's financial departments. These departments often generate as many as 40 or 50 mainframe billing and accounting reports on a daily,weekly and monthly basis.

Benefits of Document Imaging, Workflow and COLD

There are numerous benefits associated with implementing document imaging, workflow and COLD technologies within the healthcare environment, including:

- simultaneous access to information when and where needed;
- elimination of lost or misfiled documents and records;
- faster access to image-based documents and information;
- more efficient performance by various user departments since they can process work in parallel;
- elimination of couriers and other transfer costs associated with remote locations;
- reductions in staffing requirements;
- availability of filing storage space for revenue producing functions;
- elimination of microfilm/microfiche expenses;
- the potential ability to handle higher volumes without a corresponding increase in personnel costs;
- reduction of labor-intensive tasks like record retrieval, routing and refiling;
- cost reductions gained by eliminating redundant documentation and rework;
- the potential ability to provide better internal and external customer service.

LEADING APPLICATIONS

These technologies can be broadly applied throughout the healthcare environment: in administrative departments for patient registration, patient billing, remittance processing and contract management; in medical records for archive storage and retrieval, remote chart access and deficiency assignment; in clinical settings for chart review and physician chart completion; and in HMO or PPO organizations for enrollment processing, correspondence management and customer service.The most popular areas, to date, are medical records and patient accounting applications.

Medical Records

At the center of a healthcare provider's information and financial systems is the medical record, the principal document for patient treatment, service reimbursement, legal evidence, and quality care and outcome research. Because of its important and versatile nature, the medical record is the most-often requested and reviewed document within a healthcare environment, both during and after a patient encounter.The number of individuals and departments that require access to a medical record can easily approach three dozen, including doctors, nurses, and staff from medical records, patient accounting, risk management and quality assurance.

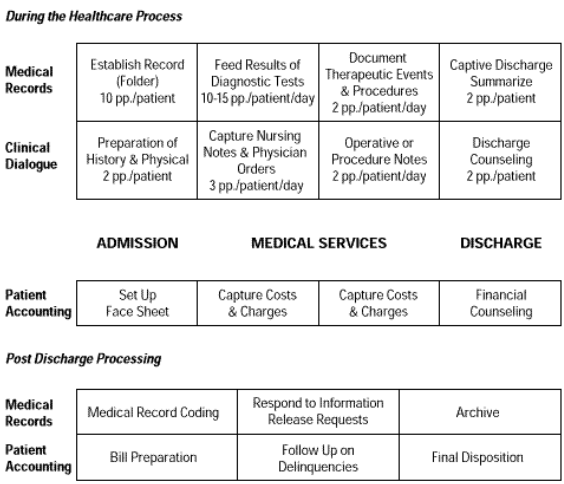
Despite its importance, the medical record and many of the business and clinical operations dependent on it remain paper-based. Over 40% of the documents within the medical record, including laboratory results or pharmaceutical records, are now generated on departmental information systems. However, in most organizations, these systems are not integrated. Thus, compiling the medical record typically consists of assembling various computer-generated reports, transcribed doctors notes, handwritten progress notes, along with a myriad of forms pertaining to patient care, insurance and billing.

By implementing a document imaging system, this record becomes available electronically so that multiple users can access the record immediately. In some cases, healthcare providers establish the electronic medical record folder after the patient encounter and billing are complete so that the record is immediately available for future patient

encounters, and the original paper-based record can either be destroyed or stored in inexpensive off-site storage. When the patient returns to the healthcare provider, his or her record can be retrieved electronically with no delay. In fact, if the patient is returning for a scheduled visit, the record can be retrieved and stored on a local on-line storage medium so it is already waiting to be accessed.This contrasts with the 45 minute average retrieval time for a paper-based medical record. And by providing remote access to the medical record imaging system, these records can be retrieved from an offsite workstation that can dial into the system, replacing the taxi cab or courier network that often characterizes the delivery of patient records to clinics or offices located in different physical sites.Timely record availability means improved medical care for the patient and improved service for the physician.

In addition, by electronically capturing and managing the patient record, healthcare providers save time associated with the labor-intensive tasks of creating, filing and maintaining paper-based medical record repositories. Some imaging applications can be configured to capture electronic healthcare documents directly from the system on which they are generated. For example, the imaging application can be set up to receive test result reports directly from a Cerner laboratory system. This reduces the total number of documents that need to be manually prepared and entered into the record.

Figure 3: The Healthcare Encounter



A much greater payback occurs when paper-based medical records are eliminated and the electronic patient record is established as early in the patient encounter process as possible (see Figure 3). This method enables all of the departments involved with the medical record access to the electronic medical record from the time the patient encounter begins until all post-encounter processing is complete. Rather than wait for the previous department to complete work on the record, activities like insurance verification, abstracting and coding, chart completion, patient billing and chart research can take place concurrently.

The electronic patient record is initiated by first creating a folder with identifying information about the particular patient, such as patient name, number, date of birth and date of encounter/admission. This information is referred to as "index values", which are the attributes used to retrieve a particular record, and to quickly access documents within that particular record.Index information also needs to be determined and entered for the sections of the folder, such as correspondence, discharge summaries and doctors' notes, and possibly to identify particular documents within each of these sections.

Selecting the optimal number and mix of indexing variables and determining how indexing will be accomplished are critical factors in the eventual performance of the system. If there are too few indexing parameters, searches can take a long time and return too many documents. Obviously, the more indexing values, the easier it is to retrieve the exact document required. However, indexing often requires manual data entry, which can be far too time-consuming and error-prone.The goal is to create an index that balances the need for fast and flexible access to information with a minimum of required data entry.

One solution is to build patient folders that rely on other healthcare information systems for as many index values as possible. For example, patient and visit information can be downloaded from the master patient index (MPI), while dates of discharge, encounter/admission and type of service can be obtained from most health information systems (HIS). Some software applications support batch index processing so that these values are downloaded for many patients during a particular time period (for example, the night before scheduled admissions).

Another indexing approach is the use of recognition technology to automatically extract index information from documents. Bar code is the most popular technique; although there are some specialized cases where machine print character recognition (OCR) and handwriting character

recognition (ICR) are also appropriate. Many organizations use bar codes on the bottom of standard hospital forms, such as admission forms or encounter face sheets, to automatically identify and index the type of document.

Whenever possible, documents and indexes should be captured and imported automatically and electronically into the imaging system. This will minimize the amount of labor required to manually scan and index the record, and the time before the record is electronically available. In many cases, the majority of the record can be built and obtained from other electronic sources, such as the MPI, HIS, patient registration, laboratory, pharmacy and transcription systems.

Adding Workflow to the Equation

In addition to providing immediate and simultaneous access to medical records, many healthcare processes that revolve around the medical record can be expedited by combining document imaging solutions with workflow technology. A good example is chart completion, a time-consuming process that while plagued by delays, is critical to cost reimbursement. Applications that combine document imaging and workflow technology facilitate the analysis, assignment and tracking of medical record deficiencies. With this software, deficiency analysts can easily identify a chart deficiency, assign it to the appropriate physician or allied health professional and indicate the required action. Physicians can then view outstanding deficiencies onscreen, quickly access and view the appropriate document within the patient folder(s) , and resolve the deficiencies, such as signing off on a particular document by using an electronic signature pad. The software can also support the analysis and tracking of completed, returned and outstanding deficiencies, according to a variety of criteria, such as the responsible physician, deficiency type, date of discharge, amount of billing, etc. The application of document imaging and workflow technology to this process can dramatically expedite the chart completion process, which results in the physicians' ability to see more patients, which in turn increases revenues for the doctors and for the healthcare provider.

Other post-discharge procedures, such as coding and abstracting, handling internal and external release of information (ROI) requests, utilization review and risk management can also benefit from utilizing the work tracking, routing and prioritization features of workflow

software, along with the ability to simultaneously and instantaneously retrieve and review the medical record. These automation efforts can result in dramatic labor and time savings, prompter payment for services rendered, and improved access to patient information, all of which can ultimately help a healthcare provider deliver higher quality care at lower costs.

Patient Accounting

There are a number of patient accounting functions for which document imaging technology can offer substantial near-term benefit including insurance verification, bill validation, insurance follow up, refund research and issuance, reimbursement analysis, remittance processing, collections and customer service.

Just as the electronic medical record can offer simultaneous and immediate access to the wide variety of document types within a patient's medical record, a patient information folder that includes data downloaded from mainframe financial information systems can be combined with document images, such as the patient's registration form, a copy of the patient's insurance card, benefit verification information, financial agreements and any incoming correspondence from either the insurance company or the patient. All information relevant to a patient's financial status is then available in one place.

Beyond that, imaging and workflow technology can be used to automate various accounting functions, like insurance billing. Upon being released from the mainframe, insurance claims can be directly imported to the imaging system where they are automatically entered into the patient's information folder. They can then be reviewed to determine if the payor has any custom requirements, for example the inclusion of the "face" sheet for all emergency room billing. These special cases can be routed to the appropriate employee for action, and then transmitted to the payor either through electronic data interchange (EDI), or by printing the image and sending it by mail. With less time spent sorting, collating and routing bills, accounting departments can reduce staffing requirements by as much as 50%. In addition, bills can be delivered to the payor faster, which brings about a reduction in the accounts receivable cycle. With the patient financial folder readily available for any necessary secondary billing or to follow up delinquent insurance payments, outstanding receivables and potential revenue can

be collected sooner. Many hospitals that have implemented imaging have decreased receivables from between five and ten days. A reduction of even one day in outstanding receivables can add up to millions of dollars in annual interest revenue for a healthcare provider.

Hospitals are also using document imaging and associated technologies for remittance processing. Incoming EDI and paper payment print outs are entered into the system, which uses OCR technology to recognize selected fields with text and dollar amount information. The system can then create a "day folder" for audit and legal purposes, place the individual explanation of benefits (EOB) form into the appropriate patient's folder, and generate an updated file for patient receivables that is posted to the hospital's financial information system.

When both patient accounting and medical record operations are automated with imaging and workflow, the combined advantages are even greater. If an insurance bill requires inclusion of a document from the medical record, the accounting clerk simply retrieves the document and includes it with the bill. Similarly, the patient accounting department can respond directly to insurers' information requests (ROI) by accessing the required documents from the medical record, and faxing, or printing and mailing, these along with another copy of the bill. Without imaging, this process requires the patient accounting employee to fill out a request for the medical records department to retrieve, copy and forward these reports to patient accounting for further processing. With imaging, this process is reduced to a matter of minutes, as contrasted with days or weeks for the paper-based process.

Other Application Areas

There are numerous other application areas in which document imaging and workflow technology can be useful. In patient registration, document imaging can be used to capture important documents like assignment of benefits or consent for treatment forms. Using electronic signature technology, the patient can complete, review and sign these forms electronically, eliminating the need to scan or copy these documents for the medical record.

Document imaging and workflow can automate and streamline the financial counseling and review processes as well. Insurance cards and other insurance information can be captured into the system and

insurance benefits can be automatically verified. Workflow software can be designed to identify and flag accounts classified as high risk, perhaps because of a large outstanding balance or based on previous payment problems. The workflow application can also be designed to use predefined rules to determine the appropriate path for payment resolution, such as indigent care, medicare charity, bank loan or long-term payment.

Other applications specific to the healthcare industry include patient scheduling, HMO enrollment processing, internal audit and managed care contract management. In addition, there are a large number of paper-intensive office operations, such as personnel management, accounts payable, budgeting and correspondence management, within the healthcare environment. As in other industries, like insurance, banking, manufacturing, transportation and government, healthcare organizations can realize significant productivity improvements by utilizing document imaging, workflow and COLD technologies.

Application Requirements

Document imaging doesn't come in a plug-and-play box; the successful implementation of this technology requires considerable system and application design expertise, complex systems integration experience, and client/server application development competence. While these are the same core requirements for successful system implementation within any industry, the healthcare environment places some unique demands on the system and application design process. You'll want to pay close attention to the following factors as you evaluate and implement document imaging solutions:

- Ease of Information Retrieval With a diverse user population, care must be given to providing a variety of flexible but efficient methods to retrieve the information contained in an image folder. For example, users obviously must be able to retrieve medical records based on patient names or a patient identification number. But the system will be more valuable to various user departments, like deficiency analysis, billing, risk management and infection control, if there are more retrieval criteria, for example the date of admission

and discharge, principal diagnosis, primary physician, patient's age or date of birth, type of medical activity or service, etc. As discussed earlier, to individually index each folder and document manually is a labor-intensive process. With even moderate patient volumes, manual indexing will bring the system cycle time to a standstill. Automated indexing is essential for medical records imaging because of the volume of records and the volume of paper associated with each record.As you consider the alternatives, be sure to balance the types of users and their usage patterns. Clearly, users who require frequent access to records should be able to retrieve records conveniently. Additionally, applications should be developed so that information is retrieved and presented to the user in the manner most appropriate for that user. When various types of users require access to the same information, consider software that can be customized to support multiple viewing formats. Take the example of deficiency tracking and resolution. There are typically three types of users involved in this application: physicians and/or other health professionals, deficiency analysts, and supervisors. Each user requires different information and performs different tasks to resolve an individual case. Physicians need to quickly identify all active chart deficiencies for which they are responsible. After being presented with this list, the doctor needs to access the individual charts, but more importantly access the specific section or page of the chart where the deficiency exists. Software should provide the doctor with a macro look at deficiencies, including the type of deficiency (the need for a physician's signature, the need for a dictated report, etc.), along with the patient name, account number, and the document type. Based on this information, physicians should be able to quickly retrieve the particular document within the patient record for deficiency resolution. Deficiency analysts, on the other hand, need to retrieve specific charts and be provided with an easy way to highlight and note deficiencies. For supervisors or senior deficiency analysts, the information retrieval should emphasize reviewing unresolved deficiencies or reporting tools that can be filtered to provide outstanding deficiencies by particular doctors or on a particular patient, or all active or returned deficiencies that need to be resolved or reassigned. The optimal deficiency tracking and chart completion application will support each type of user, with specialized viewing templates that guide the user through his or her interaction with the folder.

- Ease of Use A closely-related feature is the system's ease of use. Just as users should be presented with the information they need in a manner that facilitates their work on that folder, the system should be easy to use. The rule-of-thumb is that the system should be less time consuming and as accessible as the paper-based system. Within healthcare, ease of use generally is measured by how well the system is accepted by physicians. While hospital staff can be mandated to move to a new system, it is very difficult to force doctors who are often not employees of the hospital to use a system if they don't want to. It's also difficult to get doctors to participate in any formal system training programs. That said, don't underestimate the importance of other users. The system's eventual success depends on the acceptance of the system by all user constituencies. Clearly, you'll want a graphical user interface that supports customized screens so that relevant information is displayed first. For electronic medical records, the folder should look much like its paper-based predecessor, but exploit the computer's capabilities to provide access to information resident in the folder. For example, a tab structure that highlights various sections of the chart, as well as sections within sections, allows users to quickly and intuitively access the information required. A drill-down approach enables the user to move easily from one level of information to more detailed information. For example, the user might select a patient's name from a list of patients, then select the patient's lab work from a list of recent procedures and tests that were performed on that patient, then select a specific test result from a list of lab tests that were performed, all by simply pointing to a particular place on the computer screen and clicking the mouse. Another time-saving technique that can simplify information retrieval is prefetching records in anticipation of their need so that they are in the appropriate user queue ready for retrieval and processing.
- Workflow Requirements Many of the applications within the healthcare environment benefit from adding the information assembly, work routing, data and application integration, and work tracking capabilities of workflow to the fundamental filing, storage and retrieval capabilities of a document imaging solution. While these applications require more time to design and implement and generally require the highest level of system performance and reliability, they also tend to deliver the greatest return on

investment. Because, while storage and retrieval solutions automate the way records are stored and retrieved, workflow automates the business processes associated with these records. These processes are frequently major cost or revenue centers for the organization.

- Multiple Data Types Healthcare institutions are not just burdened with lots of paper, but with many incompatible information systems optimized for particular departments and services, such as radiology, laboratory, pharmacy, registration, transcription, etc. While these systems are well-suited to the particular function they perform, they generally are isolated systems that do not share information. As organizations redesign their information infrastructure, most are moving toward architectures that support the integration of these systems. To be truly effective, the imaging system must be capable of managing data generated from all these systems, including lab reports, electronic transcription reports, billing information, or medical record document images. Access to this information should be seamless: the information should be automatically moved to the electronic patient folder; or when used as a reference source, should be seamlessly integrated so that the user can work with the image information and the other information source at the same time.
- Annotation Requirements The ability to annotate an image, without changing the underlying image, is a key feature for healthcare imaging applications. Annotation tools such as highlighting, colored lines, boxes or text, and sticky notes can help the user navigate through the image folder and alert another user about required attention.
- Specialized Display Requirements For many users, a 17-inch S-VGA display will be adequate for viewing electronic documents and document images on the imaging system. But for applications in which the user must view mainframe data along with document images, for example to reconcile or review information, the user will require a larger-screen display that supports the side-by-side display of two windows. In addition, depending on the original source of the documents as well as the intended application, higher resolution displays may be required.

Architectural Issues: Integration, Reliability and Security

Most of the information systems found within healthcare organizations today are specialized mainframe or minicomputer systems dedicated to a particular function. Some organizations are aggressively moving off all of these systems, replacing them with an integrated, distributed client/server-based architecture that shares common databases and user interfaces. But many organizations are opting for a less-expensive strategy of gradually moving toward the client/server model by adding client/server systems that enable or enhance their existing information infrastructure. In either case, this represents the first foray into client/server computing for most organizations. Success requires close attention to key technical, cultural and project management issues.

HL7 Since the biggest payback of document imaging and workflow is delivered through integrated applications, it's essential that these applications can be integrated with other healthcare information systems. Over half of the medical record is comprised of data that can be captured directly from other applications. To scan those documents is redundant, substantially increases storage volume requirements since these are now larger image files, and negatively impacts network performance. To facilitate this integration, the industry has collaborated to develop the Health Level Seven (HL7) standard which defines a uniform format for data so that it can be exchanged among various healthcare information systems. The most common implementation within the document imaging industry is an HL7 interface between the system that manages patient admission, discharge and transfers (ADT) with the imaging application(s). Unfortunately, while HL7 is a standard, there are different interpretations and various versions. And in some cases, HL7 doesn't define everything that's needed for the level of integration required between two applications. In some cases, particularly when HL7 is not supported by either system supplier, specialized interfaces must be written to allow the two systems to talk to each other. Organizations must determine the order of priorities for integrating applications, and interfaces must be successfully implemented one system at a time. Standard interfaces are starting points; the interfaces must be tested using real data and real volumes to determine the effectiveness of the interface.

Not Just Mission Critical, Mission Essential Across all industries, document imaging tends to be implemented in mission-critical

situations, where the system is used to automate and streamline a business process that is crucial to the ongoing operations of an organization, such as loan processing in the banking industry or claims processing in the insurance industry. The healthcare environment's use of document imaging for medical and patient accounting records is even more essential to business operations, since it affects not only the organization's ability to collect revenues but also the delivery of services. Within healthcare, accurate and complete records are critical to high-quality diagnosis and treatment of patients; similarly accurate billing and streamlined accounting processes are key to full and prompt reimbursement from third party payers and government agencies. Prompt access to accurate records has substantial medical, financial and legal ramifications for the healthcare industry. That means that a document imaging application has to be up and running all the time. A system failure is not just an inconvenience—it's a disaster that can have profound implications on care delivery and the financial health of an organization. Document imaging systems need to be selected on their reliability—their ability to deliver constant and consistent performance regardless of changing business conditions, such as peak patient volumes or peak processing periods. When designing the system, healthcare organizations need to be sure to plan for the peak and worst-case processing scenarios. This reliability is demanded from each of the system components: scanners, storage devices, networks, servers, PCs, as well as from the integrated application software that coordinates these components and the business process. Servers should support symmetric multiprocessing, and offer fault management features such as the ability to predict and avoid failures and the ability to continue running in the event of component failures. Data backup for these applications is essential and must be a key part of the system design. Multiple WORM (Write Once Read Many) jukeboxes can ensure a level of redundancy, as well as deliver improved performance. Some suppliers rely on Redundant Array of Independent Disks (RAID) devices to provide constant backup so that data is simultaneously written for active use as well as backup purposes. Finally, in conjunction with the supplier, the healthcare organization should prepare a disaster recovery plan. In the rare event that the system does go down, this plan documents specifically how and within what time frame the system will be brought back up.

Security Confidentiality of medical information must be assured and cannot be compromised. Notably, a document imaging system that is

properly designed and implemented can provide greater security than paper-based records. Security should be provided on multiple parameters within the imaging environment: depending on the user, the patient, and the document. Security should be provided at the folder and individual document level; in some cases it should even be applied within documents. In addition to system-provided security, various ad hoc features can be used for security purposes. Some software includes a redaction feature that enables the user to white out or black out a portion of a document so that it cannot be read. For long-term document security and legal reasons, records should be stored on WORM optical media.

Planning for the Enterprise While most document imaging installations initially focus on a particular department or business process, such as patient billing or chart completion, it is the widespread deployment of the patient information folder that will enable the healthcare provider to deliver the highest quality care in the most cost-effective manner. By providing the multitude of departments simultaneous access to the same body of information, albeit customized to facilitate the particular tasks and functions that each department must perform on the work, enterprise systems will enable the organization to leverage patient information to maximize both clinical and financial benefits. To that end, users should evaluate document imaging solutions in terms of the current and emerging enterprise, including consideration of support for hundreds of users, support for remote access to and entry of information into the system, and the ability to manage current and new data types. From a technical perspective, this translates into first evaluating the “scalability” of the system: As patient volumes, user volumes or applications grow, are you able to add components and distribute processing loads across multiple components so that you achieve the same level of system performance? Scalability will require a true distributed client/server system that relies on the same basic operating system, the same imaging software and the same tools and utilities for integration. In addition, you may want to gradually integrate the imaging application with other healthcare information systems--a product that can support growth and expansion by adding modules will reduce the amount of custom application coding required. In addition, stay away from proprietary solutions as much as possible. That means adhering to as many “standards” as practically possible to reduce the chances of system obsolescence. On the desktop that means Microsoft

Windows as the basis for the user interface; the server operating system should probably be some flavor of UNIX or Windows NT. The imaging database should be a SQL database. These standards should be considered in terms of the existing and planned information infrastructure so that as much standardization around databases, networking protocols and development environments as possible is achieved.

Successfully Implementing Document Imaging and Workflow Technology

While there is no single blueprint for successfully implementing document imaging and workflow technology, there are some general guidelines to follow when defining the application and designing and implementing the system.

- Application Definition and System Rollout Regardless of the eventual size and scale of the system, it's essential to identify an appropriate application starting point. Depending on your knowledge of or experience with document imaging, it may make sense to start with COLD for patient billing reports. The system can then be expanded to include other patient accounting functions, such as insurance billing or remittance processing. Similarly, if the objective is to start implementing electronic medical records, it is best to start in a single area, such as emergency room records or outpatient services. Users in this "pilot site" allow you to fully test the system and address issues and problems prior to rolling out the system. After success is achieved with one application or with one group of users, you can roll out the system to include more users and/or more applications. The initial user population can serve as advocates as you proceed with the system deployment, helping to make the eventual rollout more successful.

- Supplier Selection As mentioned earlier, because of their potential financial, clinical and legal ramifications, document imaging and workflow implementations within the healthcare industry tend to be even more mission-critical than in other industries. Just as you'll want to select a system that offers an exceptionally high level of

performance and reliability, you'll want to select a supplier that understands and is capable of providing round-the-clock service twenty-four hours a day, seven days a week. Another factor to consider when evaluating system suppliers is their understanding of and focus on the healthcare industry. Generic document imaging systems may be inadequate for handling the complexities of healthcare environments. While a wide range of imaging platforms may be suitable for horizontal applications, such as remittance processing or contract management, specialized healthcare applications like chart completion or patient registration are likely to require substantial customization. By choosing a supplier that focuses on the healthcare industry, you'll gain the benefit of that experience.

- Solid Project Management All information system implementations require the involvement of a number of individuals from a number of disciplines.That is as true of an imaging and workflow installation as any other system.You'll probably want to involve representatives from the medical staff, administration, information systems, as well as representatives from the end user departments where the application will be implemented. Close coordination between the supplier, the internal IS staff and any project staff from the department will be key to getting the system in on time. A detailed project plan that identifies all the steps, participants, objectives and goals associated with the system implementation is essential. This plan should be the blueprint for the application definition and system implementation effort. Regular review meeting will ensure that the project is on schedule and on target.

- Cultural Issues While document imaging and workflow are deployed for strategic reasons, remember that users are the most important customers and that their acceptance of a system is the number one determinant of a system's success or failure. This factor is further complicated in the healthcare environment where a system's success is dependent on its use by a diverse group of individuals, ranging from clerks in the accounting or medical records department to skilled deficiency analysts to physicians and other healthcare professionals. A system is only as good as the willingness of all relevant users to use the system to its full potential. It's essential that the system design consider each set of users in terms of their usage

patterns and in terms of their familiarity with the set of technologies being implemented. For clerical employees, this may be their first encounter with a PC, the Windows environment or a mouse. Through adequate phased training that first addresses the computing environment before the imaging environment, and ongoing support, these users can gradually be acclimated to the system. For physicians, on the other hand, the emphasis should be on an intuitive, easy to use environment. If the system does not save the physician time or provide more information than previous paper-based systems, medical professionals will not use the system. Application design and ongoing user support must focus on these objectives. Finally, ensure that there's a system champion, a well-respected member of the senior management team, who can help build enthusiasm and support for the changes brought on by the system implementation.

Measuring Success

To track the success of the implementation and continue to justify the phased rollout of applications across the enterprise, it's important to measure how well the system is meeting pre-established financial and productivity goals. Among the metrics you'll want to track are costs, including activity-based processing costs, full-time equivalents (FTEs), profitability, revenue increases, processing times and volumes, and staffing requirements. Qualitative measurements such as the level of user satisfaction with the system, the ability to make better decisions based on accurate and available information, and enhanced customer satisfaction should also be considered as part of this review.

AUTHOR BIOGRAPHY

The Rheinner Group is a leading research, consulting and education firm in the document imaging, management and workflow industry. Its Certified Document Imaging Architech (CDIA) Education Program, which covers many of the same issues addressed by the Rheinner Guides, is the most popular training program in the imaging industry. For more information on The Rheinner Group, CDIA course schedules, or to obtain help designing and implementing document imaging and workflow systems, please call 781-741-8100 or visit our web site, at www.rheinner.com.

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