# WHITE PAPER

## Caring for patient information

### Using a new approach to simplify medical image management, reduce storage costs and accommodate growth

Patient information is growing exponentially due in large part to new picture archiving and communication systems (PACS) and the requirements of the Health Insurance Portability and Accountability Act. While PACS can provide a positive financial payback for hospitals, successful implementation requires developing a cost-efficient storage strategy. An effective strategy is based on determining retrieval requirements for patient information at the different stages of patient treatment and recovery, matching the retrieval requirements with the most appropriate storage method and adjusting the storage infrastructure to handle future growth and user requirements.

APRIL 2004

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## 1 Executive summary

- Healthcare organizations need new strategies for managing patient information, especially film media, such as MRI and X-ray images.
- Analyzing retrieval patterns for medical images provides valuable insight into the who, where and how often of accessing the data.
- A data storage strategy based on retrieval frequency and patient-driven performance requirements can result in cost-efficient storage of data throughout its lifecycle.
- Adjusting the storage infrastructure can simplify management, accommodate future data growth and maximize the efficiency gained from the new storage strategy.

## 2 The challenge

### 2.1 Bracing for the PACS data explosion

Recent advancements in medical technology are enabling today's healthcare professionals to provide a level of patient care that is vastly superior to what it was even a decade ago. However, this evolving technology brings the challenge of managing and storing an ever-growing repository of patient information. Advanced picture archiving and communications systems (PACS) are a significant contributor to this data volume. Today's healthcare IT managers are likely to face a compounded annual data growth rate of up to 50 percent, mostly from PACS implementations.

Compounding this data management challenge, the federally-mandated Health Insurance Portability and Accountability Act (HIPAA) requires healthcare providers and insurers to protect patient information, as well as patient privacy, and to ensure the availability of this information in the event of a disaster. This is a massive undertaking for even the most forward-looking, technologically sophisticated healthcare establishments. Federal and state regulations specify the extent of long-term retention of patient data, which places additional strain on healthcare IT infrastructures and budgets. The pressure is on for healthcare IT managers to adopt advanced data storage management solutions and policies that will assure first-class patient care while allowing the healthcare organization to operate within a limited budget.

Whether you have already deployed a PACS or are evaluating the adoption of this technology, there are several issues and strategies to consider when planning for the data deluge.

## 3 Optimizing storage for medical data

### 3.1 Information lifecycle management

The first step in planning for the management of accelerated data growth is to consider the cost of storing and managing information in light of its changing value over time. This concept is the core of information lifecycle management (ILM), a new strategy aimed at providing a practical framework for aligning storage costs with operational priorities.

Implementing an information lifecycle management strategy begins with applying the right mix of hardware, software and services to information at each stage of its lifecycle. To start, healthcare organizations must assess how they use, protect and retain their data while treating their patients. A key goal of ILM is to effectively match data retrieval patterns with the cost of the supporting storage technology.

### 3.2 Levels of retrieval

When it comes to storing data-intensive PACS information and enabling timely accessibility, there are four levels of storage/retrieval needs.

#### Instant retrieval

Instant retrieval of patient information is required for patients who receive frequent treatment over short time intervals. Accommodating instant retrieval is the most expensive component of PACS storage, as this information needs to be stored on high-throughput spinning disks for extremely rapid data accessibility.

#### Immediate retrieval

Immediate retrieval of patient information is required for patients seeking treatment at longer, but regular, intervals — for example, a radiation oncology patient requiring weekly visits for one to six weeks. This information should be stored on high-speed disk or new, low-cost, high-capacity Serial Advanced Technology Architecture (SATA)-based disk storage systems.

#### Archival

Some patient information is archived and then viewed for pathology comparisons when the patient returns for follow-up care or to assist

with new diagnosis. Tape-based systems are the most cost-effective media for such archival storage. Tape storage is still the least expensive option for long-term mass storage and today's advanced tape solutions can handle massive capacity and deliver rapid data accessibility.

#### Disaster recovery

To comply with HIPAA requirements and achieve operational continuity, healthcare providers are required to build disaster recovery mechanisms into their information management infrastructures. Disk-based mirroring and offsite replication technologies are an emerging option for disaster recovery applications. These relatively young technologies offer good hardware protection from disasters, but are susceptible to viral infections and malicious mischief, such as from hackers and disgruntled employees. Additionally, using disk for backup/disaster recovery of an entire enterprise is widely considered to be cost-prohibitive for protecting the massive data set that the healthcare community creates.

Using disk as an interim repository for recovery — whether for small archived data groups or newer data that has been compromised — enhances an overall hierarchical recovery plan. However, the best storage option for disaster recovery today is tape-based storage via high-capacity tape libraries. Storing information on discrete tape media allows the media/information to be readily removed and vaulted offsite.

Figure 1 summarizes the level of data retrieval supplied by different storage options.

By planning storage technology needs across this tiered hierarchy of retrieval requirements for PACS information, healthcare IT managers can more effectively balance care quality and cost efficiency. In this way, health care professionals are provided timely access to the patient information they need, when they need it, via the most appropriate media.

### 3.3 Planning ahead

With these retrieval requirements in mind, there are many ways that today's healthcare IT managers can plan for — and most effectively manage — the storage and protection of their PACS data.

#### Identify data growth projections

With so much data being accumulated so quickly, IT managers need an accurate forecast of PACS data growth to ensure that they can scale their storage resources appropriately. Storage capacity should always exceed storage needs, with enough headroom to accommodate increases in PACS data creation caused by expansions to your electronic medical record and PACS infrastructure, and by increasing patient caseloads.

#### Consolidate and centralize the storage infrastructure

By consolidating distributed departmental storage resources, IT can help provide tighter PACS/storage integration, centralize management resources and simplify the overall infrastructure to reduce management complexity and risk.

#### Minimize manual data retrieval

Leveraging the retrieval guidelines mentioned above, IT can help keep an appropriate volume of PACS information online for more immediate retrieval needs. If the volume of the immediate-need PACS data is outstripping available disk capacity and forcing more offline storage, IT can lose valuable staff hours (and money) spent manually retrieving offline PACS information. Not only is this an inefficient use of staff resources, it can also cause lengthy delays in providing this information to the physician, directly impacting patient care.

| Storage level | Purpose | Technology |
|---|---|---|
| ·· Instant retrieval | ·· Recurring access during ongoing treatment | ·· High-performance disk |
| ·· Immediate retrieval | ·· Regular, intermittent access | ·· High-performance disk or SATA disk systems |
| ·· Archival | ·· Prior treatment comparison | ·· High capacity tape libraries |
| ·· Disaster recovery | ·· Recovery from data loss | ·· High capacity tape libraries |

**Figure 1.**

### Evolve your storage infrastructure

IT managers should plan to evolve the storage infrastructure over time via a phased growth/purchasing strategy. Rather than spend the allocated storage budget on 10 years worth of disk capacity at the outset, managers should plan carefully but purchase conservatively. With storage technology evolving at such a rapid pace, buying 10 years worth of disk capacity (at a premium price) may not look as attractive when cheaper, higher performance technologies subsequently come to market.

### Partner for success

Partner with trusted storage technology leaders and healthcare solution providers to help customize an end-to-end storage solution that meets the organization's unique needs and best complements the PACS infrastructure. By tapping the expertise of recognized industry experts, IT will be well-positioned to get the funding for a PACS/storage initiative and achieve a successful implementation.

## 4 The opportunity

As medical technology advances and healthcare providers evolve from a film-based infrastructure to PACS, new challenges and new opportunities with the supporting information technology are emerging.

Some healthcare organizations are reaping tremendous financial benefits from PACS. The largest payback comes from eliminating film-processing costs and manual film handling, eliminating real-estate costs for film archive offices and eliminating manually-produced reports.

In addition, some hospitals are using HIPAA compliance deadlines as the impetus to revise their IT storage strategy, with across-the-board improvements to patient care and to the efficiency of caregivers and supporting staff.

The key challenges of storing PACS information and providing timely access to a patient's medical information can be overcome with a sound storage management strategy and a supporting storage infrastructure. With an information lifecycle management strategy in place and a methodology for identifying and meeting data accessibility requirements and government regulations, today's healthcare IT managers can profoundly impact the ultimate effectiveness of care at the physician/patient level.

With streamlined access to critical patient information, today's physicians are better able to make more informed care decisions, expedite patient treatment and shorten hospital stays for patients. In this way, patient care is enhanced while the healthcare provider's overall costs are reduced.

## 5 Recommended actions

- Begin any adjustment to your storage strategy with a data assessment to fully understand your patient information and its usage patterns.
- Map data retrieval patterns to current storage assets and consider options to change the storage mix to better match data requirements and usage.
- Clearly define the requirements and processes for migrating PACS data in the adjusted infrastructure.
- Forecast PACS data growth for the expected life of your infrastructure and design to accommodate.
- Plan for incremental additions to the infrastructure to leverage price/performance advances in storage technology.
- Measure success against a target cost per managed gigabyte of PACS data.

## 6 Planning considerations

- Does your PACS vendor have the expertise to advise you on a storage strategy as an integral part of the PACS implementation?
- Does your PACS and storage solution vendor have an established process for applying the principles of information lifecycle management to PACS data retrieval and storage?
- Do you have a process for integrating the PACS data with existing hospital information systems and billing processes to ensure timely billing for all radiology services?


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MC 1044 A 04/04