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White Paper:

Better Information, Better Care, Better Health

Abstract

This paper examines how healthcare providers can leverage their information to achieve better care, improve care outcomes, lower operational costs, and secure higher service reimbursements. Business and governmental regulation changes have catalyzed a literal healthcare information explosion. Managing information has become both healthcare providers' curse and their opportunity. Healthcare providers must manage this information glut to meet governmental compliance, as well as to control spiraling operational costs that result from increased documentation and reporting requirements. However to benefit from this opportunity, providers must also capitalize on the business intelligence that can be gleaned from this information

Key Findings

- Providers recognize that operational efficiency is the panacea to confront rising operational complexity.
- Providers are wedged between climbing care costs and fixed reimbursement for their services. The only solution is to provide care more effectively, efficiently, and at a lower cost.
- Regulatory requirements increasingly necessitate that providers analyze their care data to distill metrics on care facility performance.
- As healthcare becomes more transparent and consumers become more informed about their care, quality scorecards prove to be directly linked to providers' business goals.
- While storage needs are growing, historical storage strategies are not keeping up with the complexity and retention policies that providers must employ today. A hierarchy of storage mediums, matched to information relevancy and required speed of access to the information, and accompanying rules-based migration software are now required.
- Data reliability, integrity and continuity are inextricably linked to patient safety.
- As providers increasingly achieve interoperability and data integration across their organizations, they will ultimately have real-time access to critical business metrics and patient status.
- Integrating data from clinical and business operations can be mined to identify benefits and detractors, pinpoint process bottlenecks, and expose duplication of effort.

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Contents

| | |
|---|-----------|
| Introduction..... | 1 |
| Feeding the Healthcare Information Explosion | 1 |
| Motivations for Harnessing Information..... | 3 |
| Poor Information Management Leads to Inefficiency..... | 6 |
| Improving Business Innovation | 7 |
| The New Era: Information Lifecycle Management | 9 |
| The HP Healthcare Difference..... | 12 |
| Conclusion..... | 15 |
| About Gantry Group | 16 |

White Paper: Better Information, Better Care, Better Health

Introduction

Healthcare is comprised of two components: medical technology and business technology. The focus is now on the patient and how to best deliver care.

Diane Beattie, CIO
London Health Sciences Centre

This paper examines how healthcare providers (i.e., providers, clinics, physician groups and imaging centers) can leverage their information to achieve better care, improve care outcomes, lower operational costs, and reap higher service reimbursement. Business and governmental regulation changes have catalyzed a literal healthcare information explosion. Managing information has become both healthcare providers' curse and their opportunity. Healthcare providers must manage this growing information glut to meet governmental compliance and control spiraling operational costs that result from

increased documentation and reporting requirements. However to benefit from this opportunity, providers must also capitalize on the business intelligence that can be gleaned from this information.

Healthcare technology is comprised of two components: medical technology and business technology. While fantastic advances have occurred in medical technology to improve patient diagnoses, application of technology to improve the business and operational-side of healthcare has lagged. Tremendous information growth and slow advances in healthcare back-office technology have caused providers to step back, refocus and address their back-office needs. Chronic clinician shortages have created further impetus for providers to change the way they work to achieve higher efficiency. Throughout this paper the value and strategic nature of information will be highlighted as key to optimizing business efficiency and healthcare outcomes.

Feeding the Healthcare Information Explosion

"Historically, storage has been dominated by clinical images. However, in the near future, patient data and business data will soon exceed image storage needs."

Jerry Kevorkian, CTO
Sentara Healthcare

Providers' storage requirements and costs are skyrocketing. More often than not, this information explosion is cited in institutional business plans and strategies with IT being included in discussions around the investments necessary to support the increasing demands of information management. Fueled by recent governmental healthcare regulation changes, ever-growing EMRs, and more sophisticated imaging systems, providers' legacy storage systems are strained by tremendous clinical and business information growth. An EMR, recording each patient's entire health history, grows rapidly as clinical images (e.g., CT, MRI, Digital Mammography and Colonoscopy), test results and documented interventions are incrementally appended.

Loss of access to accurate patient medical records could have serious repercussions. Many providers needlessly maintain patient records on Tier 1 storage much longer than is necessary — particularly for patient information which contains "normal" results or when the patient is

discharged with no near-term follow up. Instead of implementing a staged backup and D/R strategy to assure data availability and integrity, some providers back-up patient records using processes which result in multiple copies being made each week (or more frequently) and stored on the most expensive storage medium in multiple locations. As a result, information storage typically grows by a multiple that is beyond the relevant cost/budget or necessary data integrity thresholds. With approximately 20% of U.S. providers reporting to have advanced data storage architectures¹ deployed today, a top priority for most healthcare IT executives is to define new storage strategies that contain the spiraling costs attributed to information storage.

Increased Regulatory Oversight

Rapidly evolving federal regulations have incrementally strengthened the federal government's oversight of providers' delivery of care and management of patient information security. HIPAA stipulates a new rulebook for the handling, security and retention of healthcare information. Government agencies (e.g., JCAHO, CMS, IHI and Leapfrog) require detailed reporting on care quality, patient safety and organizational performance indicators. Providers have a heightened business need to capture, retain and access large stores of historical patient data to demonstrate compliance. Moreover, pending Pay-for-Performance legislation will soon make service reimbursements dependent on providers' ability to accurately document care protocols, care plans and care interventions. As compliance increasingly governs the bottom line, providers' urgency to automatically capture and aggregate, mine and analyze healthcare data will continue to escalate.

In response to the need to prove their performance through statistical analysis of healthcare data, providers have invested in Quality and Performance Improvement groups that are dedicated to the preparation of regulatory reports and onsite inspections, as well as pinpointing efficiency and quality improvement opportunities for the organization. Easy access to healthcare information is required to support analysis and reporting on over 2,000 quality indicators, on average, to state and federal agencies which track practices and statistics against reimbursement requests. To minimize QI labor costs, providers must streamline access to information to support automated chart audits and electronic extraction of patient data to feed reports. Providers rely on electronic retrieval of integrated patient data as the strategy to confront this daunting and costly compliance reporting task.

Strengthened Healthcare Information Retention Requirements

"Our storage needs have escalated. Diagnostic imaging and medical information is growing exponentially. Information access and retrieval must be instantaneous, and data MUST always be there. Data reliability, integrity and continuity are critically important."

Diane Beattie, CIO
London Health Sciences Centre

Regulatory requirements stipulate providers' storage and retention of healthcare information to demonstrate adherence to best practices and compliance. The goal of having this data fully viewable by anyone with proper authentication constitutes the definition of an EMR. Having this as a goal, however, is not achieved merely by buying and standardizing on an enterprise-wide clinical information system from one of the major application software companies. In fact, making that decision is just the first step in changing the business from best-of-breed to integrated delivery. Implicit in an organizational decision to fully implement EMRs is the long-term commitment to own, manage, protect and

¹ "Much healthcare data at risk", Healthcare IT News, 1/1/06, John Andrews

support access to this healthcare data across all accessible media for decades.

Further, in order to protect the information which has now been captured and stored electronically, and to make it 'always' available, the requirements and goals of the organization should be reexamined. No longer can information from patient care systems that transact business in ASCII format be considered separate from data generated from monitors, imaging modalities, dictated voice, and documents scanned-in from outside referrals. Instead, not only must the organization have a strategy and business policy for indexing, storing and displaying this data in a composite view, but techniques must be employed to assure the data is 'always' available and never lost. Reliability and recoverability must be built into the technology infrastructure. This change in data management philosophy inherently dictates investment in Disaster Recover Centers, implementation of long-term storage, and aging algorithms that guide the migrated data to the appropriate storage media. This investment is rewarded with two important benefits:

- Increased information value through integration and improved accessibility;
- And cost-effective data retention by matching the most appropriate storage to information based on age, access speeds, and clinical/business importance.

Technology Advances

"The big piece of the puzzle is having convenient access to data – mobile as well as fixed. This is the next big challenge for us."

Rick Allen, Service Line Director
Gwinnett Health System

Technology advances in clinical imaging, patient monitoring, and rules-based indexing schemes around medical information are driving unprecedented growth in electronic multi-modality data. More clinical imaging studies are conducted annually with each study containing more information. CT technology that formerly captured 4 slices, now takes 64 slices, growing storage requirements in some cases from 200 MB to 2 GB per study. Since clinicians need all relevant images to track change and support accurate diagnoses, clinical images such as CT scans and digital mammograms have to be archived and accessible for many years.

Having access to patient information at the point-of-care ultimately improves providers' care outcomes. Many providers establish data access points closer to the point-of-care by installing PCs, tablets, or laptops in examination rooms, nursing stations, and at the patient's bedside. Improved PDA technology and wireless data encryption breakthroughs bring the mobility to make data access possible anywhere within the care facility. By making it easier for clinicians to access and enter care data, more care interventions are documented and information stores increase.

Motivations for Harnessing Information

Providers' top strategic goals are to:

- provide the highest quality of care;
- keep people safely out of the hospital;
- diagnose, treat and discharge patients safely and more quickly;
- optimize provider profitability;
- and maintain regulatory compliance.

Providers recognize sharing and mining of patient information to be important means to accomplish these goals. By transforming care processes and decision-support through the elimination of paper-bound information, providers leverage information to achieve better business and care performance. Anytime, anywhere accessibility to information is enabling providers to deliver improved care quality more profitably and efficiently.

Improved Operating Efficiency through Shared Information

Despite advances in medical technology, providers struggle against rising operational costs. Paper-based processes prove cumbersome when trying to find and extract information. Lack of data integration leads to process inefficiency and data redundancy. Because paper-based processes typically have a narrow 'view' within the organization, such processes are prone to inconsistent and double execution. Information aggregated from silo-ed sources often yields disparate and inaccurate spreadsheets, reports and databases. Providers are searching for ways to achieve a simple, integrated view of their overall performance.

Symptoms of these problems are evidenced when patients are subjected to re-registering and providing demographic and health history every time a new 'portal of healthcare' is entered. In such cases, patient name and registration data is commonly restated in several different systems running on different platforms at the provider's site.

Recognizing that paper-based processes and silo-ed information stores are barriers to conquering care process inefficiencies, providers are quickly moving to digitize and integrate all patient data. Paperless processes enable enterprise-wide data integration and promote sharing of information across care units. By automating capture and dissemination of timely, accurate, digitized information within an integrated, enterprise-wide storage infrastructure clinicians gain rapid access to complete patient care profiles.

Improved Business Intelligence

Regulatory reporting, reimbursement demands, P&L pressures, and consumerism necessitate that providers manage their care facilities using a comprehensive set of performance indicators that reveal care quality and organizational efficiency. Provider executives use a compendium of financial, clinical quality, staffing, and patient satisfaction metrics to assure that core measures and quality scorecard metrics are high. High quality scores direct service reimbursements and qualification for managed care contracts from commercial and public payers.

Already committed to regulatory quality indicator reporting, providers have seized the opportunity to drive their analyses to the next step: business intelligence. Providers are mining their burgeoning information stores to reveal additional business and care performance metrics that guide improvements to care and business processes. Stratifying patient population and examining care outcomes reveal care patterns that can isolate best care practices. These care protocols can be optimized to achieve the best outcomes. Workflow simulations identify and eliminate process bottlenecks and work tasks that do not contribute a positive impact on the patient's outcome. Dynamic executive dashboards expose and leverage valuable key indicators to guide business and administrative decisions. Indeed, information is providers' strongest tool to achieve top strategic goals: patient safety, clinical excellence, patient satisfaction, physician satisfaction, employee engagement, and financial profitability.

Improved Patient Safety

Providers strive to reduce care errors to achieve high patient safety and high quality scores. JCAHO reports that breakdown in clinician communication is the most frequent factor leading to adverse events at providers. Poor clinician communication is proven to lead to medication, medical care and patient identification errors.

Providers may find that better electronic documentation systems and the online availability of patient data can help dampen the care risks often associated with shift to shift transitions. Through enterprise-wide integration of patient information, each clinician can have access to a complete, interdisciplinary view of the patient's care plan, care interventions and status. Improved communication between clinicians can lead to significant patient safety improvement.

Increasing Market Share through Improved Quality

As healthcare becomes more transparent and consumers become more informed about their care, quality scorecards prove to be directly linked to providers' bottom lines. Many providers now advertise the quality of their services by publishing quality scorecards on their websites and in newspapers. Some U.S. states are posting quality scores for all their in-state providers to apprise their constituents. Once a measurement only for provider accreditation, quality scorecards are now used as a competitive differentiator to retain current patients and attract new ones. As consumers increasingly 'shop' for healthcare, quality scorecards will factor increasingly into their provider selection process.

These measures — in conjunction with mortality statistics, cost by procedure postings, and patient satisfaction survey results — are already having a direct effect on physician referrals, physician and nurse loyalty, and the ability to retain and attract new patients. Providers that conquer information management prove to have the advantage in regulatory compliance, more consistent care, and faster reporting. A provider that has performance information at its fingertips can review patient quality in real-time, enabling the organization to initiate timely changes to care plans and processes. The result is improved quality scorecards that can in turn be used to publicly promote competitive advantage.

Value of Patient Information

The best decisions are made when clinicians have the most complete picture of the patient. This means having access to a single view of the patient record that contains the entire care history, including up-to-date and validated demographics, diagnoses, orders, treatments, prescriptions, and all clinical results. Achieving an evermore integrated and accessible view of patient information is emerging as one of the most significant value propositions to impact every facet of the business. An integrated patient record brings:

- real-time access to complete patient information;
- increased care quality;
- and more responsiveness and preparedness for audits and accreditation compliance.

Moreover, as clinicians, patients, patient families, and staff realize the power of reviewing, improving and analyzing care plans, workflow improvements and turnaround time on treatment changes can be accelerated.

The reality of providers having access to integrated patient data is only beginning to be understood. For years, commercial business and financial institutions have relied upon integrated supply chain, business intelligence software, as well as second-by-second indicators

of change, progress and opportunity. The access to a growing spectrum of accurate, available, searchable information enables providers to:

- manage and forecast better;
- choose better options for service and where such services are to be performed;
- justify higher spend on IT systems.

Poor Information Management Leads to Inefficiency

Better access to better information is the key to operational efficiency. Many providers are challenged by an IT architecture geared to departmental autonomy. Still prevalent are disparate and interfaced systems interwoven with paper-based processes for patient admission, care plan development, patient documentation and nurse shift hand-off. These individually automated systems and processes require information hand-offs which create islands of care within the facility. Lacking enterprise-wide integration of patient information, leads to:

- redundant data stores;
- inconsistent care processes;
- double (i.e., redundant) care orders;
- delays in delivering care for the patient;
- delivery of incorrect care to the patient;
- absence of data at the point of encounter-when decisions on treatment or interventions are being made;
- and miscommunication of patient care between care units.

Through the implementation of enterprise-wide information architectures, providers can improve consistent delivery of the right care to the right patient at the right time. Indeed, harnessing information is critical to the provider success equation for assuring care outcomes, high quality scores, and maximum service reimbursements.

Paper-based Processes

Paper-based information still remains a major obstacle to efficiency for providers today. Paper is well known for its penchant to get lost, contain unintelligible data, or become misplaced/misfiled. Regulatory reporting is arduous when pertinent patient data must be found, manually extracted, organized, entered into some form of report for every quality indicator, and finally included into custom-generated regulatory reports.

Moreover, paper-based care processes and patient documentation create a barrier to establishing standardized interdisciplinary processes. Often each care unit designs its own custom paper-based form, diminishing visibility into what other care activities have been administered to the patient. In such an operating environment, coordinating, documenting and sharing of interdisciplinary patient care rely upon frequent verbal exchanges between clinicians and clinicians' recall. This situation fosters miscommunication and sometimes even medical errors. Many providers report that the complete view of the patient's care documentation comes together for the first time in the medical records department when all the available documentation is collected in preparation for patient discharge. This process then becomes a highly labor intensive 'find & fetch' exercise for locating missing information to complete the

patient's chart. The various departmental and clinician participants have only had access to portions of the complete record throughout the process of the patient's care.

Decentralization

Merger and acquisition activity over the last several years has resulted in fewer standalone providers and hundreds of 'health systems.' Several models of IT support for these 'health systems' have emerged, running the gamut from centralizing all IT services to operating individual providers in a decentralized/local governance operation. For those who choose the decentralized approach, the question of duplication of personnel with unique skill sets conflicts with what appears to be the advantages of standardization, optimization of IT operations and business practices, and much tighter system and patient integration. However, one advantage of the decentralized approach, often overlooked, is found in organizations that service metropolitan areas and more rural areas as part of their business. While each 'health system' must find its optimum business and IT fit, the challenges of decentralizing systems and support, as well as retaining different information systems are best overcome through supportive infrastructures designed to accommodate and integrate patient information within the system.

Disparate Legacy Systems

When a provider chooses to retain legacy infrastructures and departmental clinical applications, each care unit often continues to operate as its own entity with its own policies and somewhat isolated personnel. Organizations that still follow this model lose the key advantage of an enterprise-wide clinical system: cross-communication and interdisciplinary visibility into a patient's care. Although care units are highly motivated and 'trust' one another explicitly to communicate and share best practices among staff, shifts, and clinicians, enterprise value is only achieved when a provider's business and information processes are fully integrated at each keystroke and within the patient's record. The evolution that began for the more affluent health systems to expand and/or replace disparate legacy systems has accelerated to the point where few organizations are now without some plan to participate in this move to cross-enterprise integration.

Improving Business Innovation

Care delivery was historically built on the premise of observation and measurement, resulting in diagnosis and treatment. This constituted the product of medicine which relied on data from history and physical review, facts from test results, comparisons from experience/memory or training to similar cases. It is no longer possible for a clinician to stay current with the massive amounts of new information, treatment protocols, and newly available WW abstracts which demonstrate breakthroughs without a new paradigm of integrating access to aggregated data as part of the day-to-day patient process. The emphasis to improve patient care, integrate data at the point-of-care, and work through the trade-offs of acquiring one technology versus another has kept the focus on clinical care and less on business operations.

Today, providers seek a more balanced approach whereby innovation on the business side is emerging as an equally valuable contributor to improve care quality and adherence to best practice fundamentals. Underpinning this drive to invest in enterprise-wide integration is the assumption that providers will achieve improved care outcomes by:

- giving staff and clinicians full insight into all patient care processes;
- tying staff communications and documentation to workflow efficiency;

- automatically managing data feeds to quality scorecards that report on quality measures and compliance to best practices;
- adhering to best practices which include automated order sets;
- cross comparing decision-support options at the point-of-care;
- and analyzing patient treatment and response.

Highlighting the improvements that can be achieved through integration across the ‘business of care’ encourages innovation in process workflows and fosters staff enthusiasm for integration.

EMRs → EHR → RHIO

“The goal is to achieve a completely automated workflow: the right info in the hands of the right clinicians at the right time.”

Steve Hess, CIO & VP IT
Christiana Care

Recognizing that there needs to be a ‘single source of truth’ for each patient, health systems are rapidly evolving to connect to or participate in the entire community which constitutes the continuum of care. As a first step, many providers are forming cooperative networks with other ancillary organizations (e.g., pharmacies, laboratories, clinics, providers) to share a common patient Electronic Health Record (EHR). Some providers are taking this cooperative network a step further by extending their reach to participate in a Regional Health Information Organization (RHIO) that will allow a virtual EHR to be shared by healthcare organizations throughout a local community, state, or region.

EMRs, EHRs and RHIOs improve patient care by streamlining information sharing between healthcare providers inside and outside a healthcare network. This is accomplished by:

- eliminating administrative costs associated with paper-based patient records;
- sharing pertinent data about, updating, and providing access to patient care plans;
- eliminating the need to redundantly collect patient information such as demographics, diagnosis, medications, allergies, and medical history;
- enabling rapid access to automated test results;
- presenting a consolidated view of a patient’s history;
- and minimizing ‘data collisions’ by automating the PCPs.

The final step will connect the provider to the greater community and the individual (i.e., the patient). The EHR will ultimately be the standardized communication vehicle for patient data by which providers and payers will transact with one another.

Increase Data Integrity & Patient Safety

Data reliability, integrity, and continuity are inextricably linked to patient safety. Clinicians must have instantaneous access and retrieval to patient information to make informed, time-critical care decisions. Today, patient safety is measured by accurate patient identification, correct medication provisioning, as well as low patient fall, infection, and skin ulceration rates. By getting the right information into the hands of the right clinicians at the right time, patient safety can be substantially improved on all fronts.

Evidence-based Medicine

Perhaps providers' biggest challenge today – and top priority – is removing variability in care practices. Evidence-Based Medicine (EBM) is a portfolio of care protocols that are proven through historic patient care experiences to deliver the best care outcomes for each disease and care procedure. The healthcare industry believes that EBM is the method by which care practices can be standardized. By integrating the appropriate EBM care protocols into each patient's care plan, providers can achieve uniformity in care practices to improve care quality, and reduce error and risk. Each clinician, regardless of experience level or discipline, is guided by a step-by-step care pathway to ensure that every patient receives the best care for their specific diagnosis.

Care Practice Insight

Providers have entered the era of care transformation. Many healthcare organizations query their centralized data marts of patient data to reveal care patterns, trends and business insights. Most providers are just beginning to leverage such data to probe pivotal questions such as:

- How should we manage the organization differently to achieve desired quality, safety, and efficiency?
- What care practices and care workflows lead to the best care outcomes?
- What care tasks can we eliminate that do not contribute to the care outcome?
- What redundant care orders can we eliminate to reduce the average cost per case?
- How should the care practice change?
- How does the patient see care differently?

As the patient knowledge base grows, this integrated data store of clinical and business information can be mined to identify benefits and detractors, and expose process bottlenecks and duplication of effort. Dynamic executive dashboards further leverage this patient knowledge base by delivering real-time views of organizational performance to support business and clinical decisions.

Many providers are establishing Clinical Business Intelligence groups that use patient data repositories to support predictive modeling of selected diseases to determine the best healthcare practices that produce the best clinical outcomes. By analyzing how other patients have been treated and their care outcomes, providers can make better care decisions for new patients with similar health conditions. Managing and mining patient data to improve healthcare outcomes is the future healthcare. By harnessing information, such as evidence-based medicine, providers can create and drive insight for their organizations. Indeed, today every healthcare worker is a knowledge worker.

The New Era: Information Lifecycle Management

"We have entered the age of advanced information life cycle management. How, when, and where the data is stored is changing."

Steve Hess, CIO & VP IT
Christiana Care

The pressures to securely retain, access, and analyze growing stores of information have accelerated providers' evolution to paperless processes and new strategies for data retention. Recent catastrophes, such as Katrina, highlight the need for providers to move away from fragmented paper files stored in basements and/or offsite facilities to a secure, disaster-proof electronic approach.

Healthcare, by its very mission, is life critical. Centralization of data is the prerequisite to achieve a single, accurate view of the patient's care history to support immediate care decisions. Recognizing that care information can be leveraged to improve the quality of care, providers are directing their technology investments to more intelligent, robust information management systems that bring analytics and business insight into every healthcare workers' daily routine.

While storage needs are growing, how, when, and where the data item is stored is changing. A hierarchy of storage mediums is needed to cost-effectively match the information's relevancy and accessibility to the appropriate storage medium storage and retrieval characteristics. Information Lifecycle Management (ILM) has arrived in healthcare.

"We believe investing in information management will improve the quality of care."

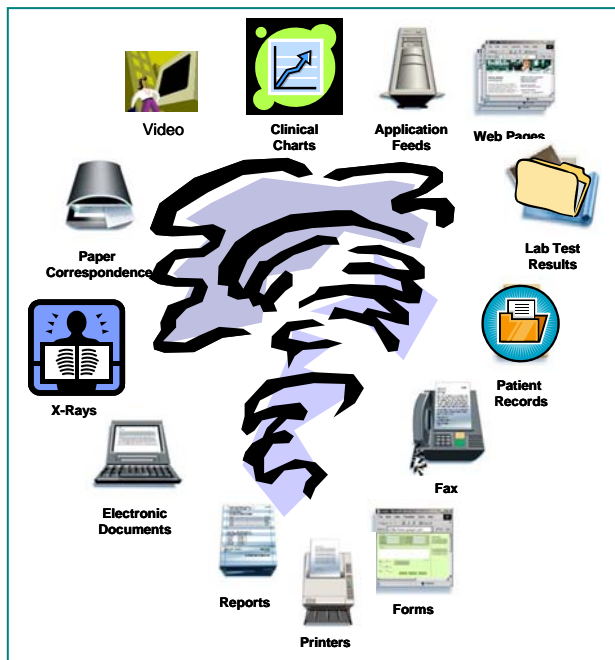
Rick Allen, Service Line Director
Gwinnett Health System

Perhaps storage management software is the most important component that distinguishes ILM. Policy-based software can automate a provider's rule set used to move information to different storage tiers at specific times based on pre-determined thresholds or compliance requirements. Storage management applications automatically replicate medical records for disaster recovery, placing the records in separate physical locations to avoid catastrophes. Built-in security (e.g., WORM, digital signatures) helps providers meet HIPPA compliance.

Through the evaluation of new strategies for data accessibility and performance, providers can optimally meet the competing demands for:

- increasingly complex regulatory reporting;
- patient safety, privacy, and convenience;
- protection against litigation;
- IT budget realities;
- data integrity;
- and data availability.

Diversification of Healthcare Information



Healthcare information continues to diversify as new technology emerges. Healthcare information can be business data, a clinician's orders or notes, clinical imaging, lab test data, TV broadband from a remote videocast care session, or even a form created from a paging system. Today, providers' storage strategies recognize patient records and business communication as being an integrated mix of multimedia information.

Managing Care & Business in Real-Time

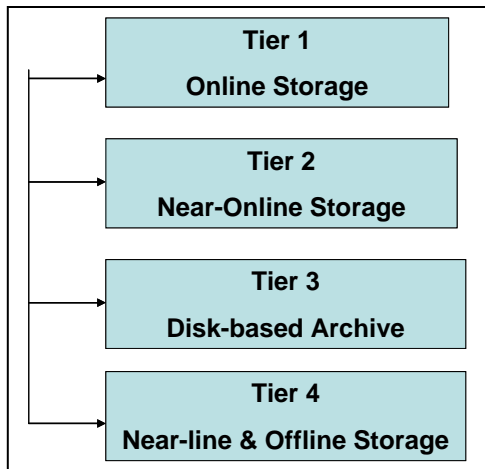
Interoperability and data integration yield real-time access to critical business metrics and patient status. By integrating all ISV applications and hardware to ensure high levels of compatibility and performance, as well as digitizing and integrating all care data

throughout the organization, providers gain access to operational data at any time instead of being limited to monthly, quarterly, and annually reported snapshots. Delays that result from manual chart reviews, manual data extraction, and cumbersome custom report generation are alleviated.

Care data integration enables clinicians to have a complete, interdisciplinary view of patients' care histories and care plans at any point of care delivery. Clinicians know exactly where patients are within the care facility and their precise care status. Care units are always ready with objective patient status at nurse shift change, mitigating the need for subjective verbal communications and taped end-of-shift reports.

Rapid Change in Data Storage Needs

Today's storage systems need to comply with stiff requirements for quick data access, reliability, integrity, verification, and validation through redundancy and mirroring. Retaining multiple copies of a fast growing data archive further accelerates information growth and providers' storage needs.



While storage needs are growing, what data items are being stored and how the data is being stored is also changing. Storage is no longer dominated by clinical information in ASCII format or scanned documents. Patient data generated from medical modalities, monitoring output, anatomical path images and business data is already eclipsing historical storage projections. New storage management systems, based upon a hierarchy of tiered storage mediums, can align information relevancy to the required data access speed and storage media price.

One of the main drivers behind the storage explosion is the highly sophisticated modalities being employed by many clinical departments. Picture Archive and

Communication Systems (PACS) enable providers to efficiently manage and exchange high resolution medical images rapidly over their networks. Using PACS, it typically takes less than 15 minutes to get a patient scan into the hands of the physician for diagnosis.

PACS images are frequently used heavily for a brief period of time, but then remain largely unused for extended periods. Because of clinician and regulatory requirements, these images must remain accessible for long periods. ILM and Tiered Storage offer providers the ability to meet both accessibility and cost objectives. Furthermore, ILM rules can also be applied to other applications (e.g., EMR, HIS) to better match usage requirements to budget realities.

Storage Area Networks (SANs) are high-speed networks within data centers and extended remote sites. These dedicated networks provide shared access to an array of storage devices such as RAID arrays, optical disks, and tape backups. SANs remove dedicated storage from servers, freeing up server resources to handle data processing and analysis.

In conjunction with SANs, policy-based software offers providers a way to categorize their data by usage patterns. By understanding regulatory retention requirements and when patient information is most (or less) frequently accessed, it is now possible to implement rules-based migration of data to different tiers of storage. This approach ensures that there is a balance between data availability requirements and the relative costs of delivering that data. Rules

based ILM systems help automate tedious, manual processes to free up valuable management resources.

The HP Healthcare Difference

“HP knows healthcare is different. HP has put in the time into understanding healthcare. HP’s listening skills have helped us think very differently and innovatively about our new technology configuration.”

Diane Beattie, CIO
London Health Sciences Centre

HP has demonstrated a long-term commitment to serving the healthcare industry with leadership products and services. HP stands out as a healthcare solution provider that integrates technology components in innovative ways to best serve the healthcare industry. Through long standing partnerships with the top application innovators, HP is able to deliver complete solutions that are tested to exceed the high standards demanded by the healthcare industry. HP has stepped back to refocus and tackle providers’ back-office needs, assuring both upward and downward technology infrastructure compatibility. Offering the healthcare sector an end-to-end solution — from handheld devices, tablet PCs, and multi-function printers to data warehouses and business intelligence systems — HP

helps providers collect and extract maximum value from their data to achieve business objectives.

HP works collaboratively with different members of the healthcare ecosystem to design and implement technology infrastructures that achieve real-time data capture and reliable storage management of business and clinical information. Working as a strategic partner, HP thinks through tough problems to recommend innovative, custom solutions that achieve integration and interoperability throughout the organization. For example, HP’s technology investment with the leading PACS vendors ensures that these applications will work flawlessly with HP products (i.e., workstations, servers, storage). HP’s strong technology partnerships with application developers offer providers the confidence that their software investments will be leveraged through a wide range of HP platforms. HP applies this implementation approach to all of the major functional application categories.

Intelligent Information Lifecycle Management

HP has developed new tools for the healthcare industry to accommodate the significant growth and retention of healthcare records, documents, and data. HP storage solutions adopt an ILM approach to automate and optimize information storage retrieval to assure that it is in the right place, on the right media, and accessible within the right amount of time. Information storage assignment is based upon the value that the provider assigns to the data — rather than merely relying on a time and date stamp. This approach aligns the cost of storage with the value of information to the healthcare organization. ILM automatically organizes providers’ data through search patterns, indexing, categorization, and policy creation to direct the information to the proper location based on its changing importance.

HP embraces the following design tenets for its healthcare storage and archival solutions:

- *Innovation* — out-of-the box thinking to bring information management solutions which recognize that multi-tier storage architectures, managed by a rules engine, provide increased value.
- *Unification* — unify storage resources located across different locations into a single storage pool, allowing multiple applications to access it simultaneously and store any type of fixed-content data.

- *Integration* — connect different PACS and EMR systems across departments, facilities and regions to facilitate greater access to information. Eliminate storage silos and duplicate management costs.
- *Standardization* — use industry-standard interfaces, platforms, and software to provide an open, cost-effective storage solution that supports providers' long-term archival requirements and their application investments.
- *Simplification* — reduce complexity and improve efficiency of providers' information systems to lower the Total Cost of Ownership (TCO) of systems and storage.
- *Modularization* — employ grid-based architecture to enable easy geographic expansion with new nodes to balance usage patterns and create a high availability environment.

| Storage Tier | HP Solution | Solution Description |
|--|---|--|
| Tier 1: Online Storage | HP StorageWorks XP Disk Array Family | Provides enterprise-class, online storage that delivers reliability and always-on availability for critical patient information. |
| | StorageWorks Enterprise Virtual Array (EVA) Family | EVA systems provide high performance, high capacity, and high availability virtual storage that conserve space and reduce costs compared to traditionally architected approaches. |
| Tier 2: Near-Online Storage | StorageWorks Modular Storage Array (MSA) | Easily integrated with both the XP and EVA systems, MSA arrays support both SCSI disk and low-cost SATA disks, making them an economical, high-capacity solution which does not require the highest performance. |
| | EVA with FATA | Lower cost disk for providers who have already purchased this array. Good for less demanding requirements. |
| | HP ProLiant Storage Server Family | Affordable, easy-to-use Network Attached Storage (NAS) solutions that simplify storage management without compromise. They allow providers to change without chaos and grow without limits. |
| Tier 3: Disk-Based Archive | Medical Archive Solution | Grid-based solution for efficient archive and rapid retrieval of PACS images, clinical data and patient health records, designed to span multiple sites and applications. |
| | Reference Information Storage Solution | Active-archive for email including Microsoft Office/Lotus Notes documents and other attachments. |
| | StorageWorks Reference Information Manager for Databases | An ILM solution that improves database application manageability. Excellent solution for ERP and CRM applications. |
| Tier 4: Near-line & Offline Storage | Automated Virtual Tape & Physical Tape Solutions | Automated tape libraries from HP provide improved backup and restore reliability. Simplified backup is enabled through automated management of the entire library. Virtual Library System offers fast disk to disk backup. |

HP StorageWorks Medical Archiving Solution

“HP is always innovating and on that next technology wave. The products they develop not only work, they work well.”

Steve Hess, CIO & VP IT
Christiana Care

HP StorageWorks Medical Archiving Solution (MAS), a complete healthcare archival solution, is specifically designed to safeguard providers' long-term digital assets. The solution incorporates industry-leading technology based on HP StorageWorks arrays, ProLiant servers, and medical imaging archival software. HP supports this offering with a comprehensive set of services to assure that MAS meets providers' needs during all phases of deployment. The solution fully addresses the scalability and economic challenges of long-term archiving, as well as rapid access to medical imaging information. HP MAS is proven as a secure and reliable solution for the storage and retrieval of medical and

document images. By storing two copies of all data with ongoing comparison of the duplicate copies, HP MAS optimizes both retrieval and data integrity of healthcare information. HP MAS scales to hundreds of terabytes and is deployed within a distributed grid architecture to ensure high availability and fast access. HP MAS costs less to deploy, manage, and operate compared to other solutions, bringing providers a minimized Total Cost of Ownership (TCO) for their imaging storage technology. HP has qualified MAS with the top PACS and document imaging applications so providers will enjoy a fast production start up.

HP StorageWorks SAN Solutions

HP Healthcare's comprehensive portfolio of SAN and Tiered-Storage products are designed to meet a range of storage networking needs from small and midsized providers to the largest IDNs. HP ILM and HP MAS help providers achieve affordable healthcare through the use of an intelligent archival architecture. HP's Storage Essentials software gives IT management the ability to monitor, manage, and provision all storage resources for the provider.

HP Storage Essentials Enterprise Software Suite

Many providers' storage infrastructures are a mix of multi-vendor storage mediums (e.g., DAS, SAN, NAS), making storage management and provisioning complex. HP Storage Essentials simplifies storage management and provisioning for heterogeneous storage networks to lower storage management costs through the following capabilities:

- Through visualization, the storage network (e.g., DAS, SAN, and NAS) and backup topology are automatically discovered and mapped.
- Through monitoring, graphically trending, and forecasting availability/utilization at host, switch and arrays, IT can proactively monitor consumption levels and perform file system management tasks (i.e., file-level scanning, analysis, reporting, and policy-based management).
- Through integration with HP System Insight Manager, administrative efficiency is improved via shared services like single sign-on, security administration, asset management, reporting, discovery, licensing administration, and event management.
- Through integration with HP OpenView software, provisioning, operations, reporting, and charge back is facilitated.
- By performance monitoring, application objects down to storage subsystems and file identification are automatically discovered and mapped — enabling quick detections of performance 'bottlenecks.'

- Through impact analysis of configuration changes and file sharing activities for HP ProLiant Storage Servers, HP Storage Essentials extends the full range of discovery, visualization, reporting, event notification, dependency and path, capacity planning, and real-time performance to NAS.
- By monitoring and providing a single view to all backup activities, detection of backup failures, unprotected applications, servers and files is facilitated.

Data Mining & Business Intelligence Services

"We view HP as a partner, not just a vendor. We truly share common goals for the health of the community. Today, providers must have this type of relationship to succeed."

Jerry Kevorkian, CTO
Sentara Healthcare

HP partners with providers as a trusted advisor, and expert implementer for end-to-end business intelligence solutions designed to mine data that can improve business performance, provide smarter and more informed decision-making, and optimize IT efficiencies.

HP's acquisition of Knightsbridge Solutions, the largest IT professional services firm devoted to business intelligence, brings focused expertise for a wide range of areas to providers, including:

- measuring and defining clinical best practices;
- improving capacity management;
- supply costs per discharge;
- productivity measurements;
- and designing data marts and warehouses.

A specialist in problems rooted in massive data volumes and/or complex data and information challenges, HP-Knightsbridge delivers information solutions that are flexible, operational, reliable, and affordable. Through HP's combined suite of tiered storage, analytically smart servers, and data warehousing services, HP builds customized, end-to-end solutions that transform providers' healthcare data into accessible business intelligence.

Conclusion

"In 1996, \$.35 of every Ontario, Canada tax dollar went to healthcare; by 2004 \$.44 of every tax dollar went to healthcare – an increase of 26% in 8 years. These economics are not sustainable. We have found a different way to do things: Better information, better care, better health."*

Diane Beattie, CIO
London Health Sciences Centre

* Source: "Preliminary Provincial and Territorial Government Health Expenditure Estimates, 1974-1975 to 2005-2006", Canadian Institute of Health Information, November 2005.

In short, harnessing healthcare information is providers' lynchpin to:

- improve care quality by having ready access to a single, integrated, accurate view of each patient's care history to support immediate care decisions.
- gain real-time business intelligence to identify opportunities to lower care costs through the elimination of redundant/unnecessary care tasks and process bottlenecks;
- pinpoint best practice care patterns that are proven to improve healthcare outcomes;
- improve clinician conformance to established evidence-based care standards and processes to reduce care variability;

- contain the cost of compliance reporting and audits by enabling automated access to digitized patient charts and data;
- improve staff efficiency through highly accessible, accurate patient data;
- improve patient safety through improved communication between clinicians;
- improve patient satisfaction through an efficient, patient/provider communication interface for all care portals;
- reduce medical errors and liabilities through improved staff visibility to care execution across all involved disciplines;
- improve quality scorecards through improved care outcomes and adherence to best practices;
- and improve revenue and competitive advantage through higher quality scores that earns more payer contracts for more products, improved reimbursement, and stronger market share.



About Gantry Group

The Gantry Group is a research and consulting firm specializing in technology ROI. With over 300 technology clients, 4,000 business process interviews and profiles in our knowledgebase, and more than 1,000 ROI business processes and value drivers modeled, we offer our clients the greatest depth and breadth of ROI experience and invaluable objectivity.

The Gantry Group uses analysis drawn from practiced operational experience, supported by custom primary research, to help IT vendors and enterprises forecast accurate ROI and TCO. Gantry Group translates the business process enhancements that result from IT solutions into enterprise bottom line impact. This analysis helps vendors to sell their solutions more persuasively and enterprises to make more informed buying decisions. Through a rigorous interview approach, Gantry Group profiles real enterprises with solution deployments to isolate and capture actual business performance metrics before and after implementation. Gantry Group develops predictive ROI tools that measure and quantify the effect of the technology on business performance prior to investment. Using these results, technology vendors can substantiate their solutions' real ROI and expected payback horizons to increase revenue. Enterprises can realistically evaluate and forecast the likelihood of net financial benefit derived from a technology solution.

For more information about Gantry Group, visit www.gantrygroup.com or call 978-371-7557.