Maximize Clinical Performance ↔ Minimize Risk
…Constant Access to Patient Care Applications and Information in a Digital World

A Frost & Sullivan White Paper
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CALL TO ACTION

Becoming ill is not a planned event. In a world of digitized patient information, healthcare providers require on-demand access to digitized patient information to deliver optimal care. In hospital settings, downtime is not an acceptable option. A virtual infrastructure that enables always-on availability and access to electronic medical records (EMRs), electronic health records (EHRs), and other patient care applications is essential.

Private, non-profit and public organizations have invested billions of dollars in health information technologies (HIT) to digitize patient data and realize operational efficiencies.\(^1\) To achieve the promise of improved health outcomes, it is imperative that provider organizations, particularly hospitals and hospital systems, create and maintain a virtual environment that supports the leveraging of these investments. Hospital CIOs and their staff are not only challenged by persistent silo data streaming from fixed, portable and mobile devices, but must accommodate increasing physician demand for mobile access to their patient’s EMRs.

As an example, a consumer may seek care at a hospital emergency room, have radiologic and laboratory test services, and then be admitted for cardiac surgery, pending OR suite and surgical team availability. Under this scenario, he or she may be seen by a number of providers who are constantly on the move and require patient information when they need it, as they need it. Diagnostic radiology and laboratory services may have been ordered stat, with viewing of images limited to a dedicated room, while lab test results are transmitted to physician mobile devices. Any disruption in the flow of patient information forces providers to work under less than optimal conditions and can place patient safety at risk.

In today’s world of collaborative medicine and mobility, access to clinical applications, regardless of location or device, is a “must have” not a “nice to have.” Healthcare providers recognize and expect single sign on (SSO) and access to patient information, anytime, anywhere. Availability and access to patient data and patient care applications are mission-critical demands. Hospital executives expect their HIT investments to yield operational efficiencies and facilitate the delivery of services to achieve better patient outcomes. All healthcare stakeholders expect a HIT environment that supports 21st century health objectives and drives quality healthcare.

The challenge: To maximize physician, nurse and ancillary service provider performance, hospitals must create a fluid HIT virtual environment that provides on-demand access to patient data and patient care applications. This requirement for access, not tied to any specific device, also requires that there not be downtime or delays in information delivery. Mobility adds value but can create a larger security risk if the access device containing patient information is lost or stolen. Creating an infrastructure that supports provider access without being tied to a specific location, provides robust information flow without downtime, and does not expose patient information to risk of loss requires a virtual desktop environment, supported by a redundant path to clinical applications.

This white paper will explore best practices and the underlying value of hospital desktop virtualization.
EMRs and EHRs are not synonymous, but are often reported interchangeably.

On a global level, the majority of primary care doctors have adopted some form of a basic EMR.

MIGRATION INTO THE VIRTUAL UNIVERSE OF HEALTHCARE

With catalytic innovations in information and communication technologies and medical devices, healthcare providers and consumers have leaped into a virtual universe of eHealth, telehealth, mHealth and cloud computing. EMRs and EHRs are at the core of this migration. Frost & Sullivan describes eHealth as an ecosystem supporting the electronic exchange of patient data across a coordinated, collaborative continuum of care that encompasses wellness, prevention, health maintenance and disease management, from conception and birth through end of life. Telehealth offers multiple points to access care and uses health information technology to eliminate duplication of services and coordinate collaborative care. mHealth (wireless communication devices like tablets or smartphones) enables anywhere authorized access to electronic patient information—the virtual practice of medicine. Cloud computing is a service that enables constant availability of patient care applications and data via a shared pool of configurable computing resources.

EMR and EHR Adoption

EMRs and EHRs are not synonymous, but are often used interchangeably. An EMR refers to the electronic collection, storage, retrieval and communication of an individual’s health data by a healthcare provider, clinic or hospital. An EHR refers to electronic collation, storage, retrieval and communication of an individual’s health data collected from healthcare practitioners, hospitals, laboratories, pharmacies and institutions.

The Healthcare Information and Management Systems Society (HIMSS) has taken a leadership position in defining stages (0 through 7) of EMR adoption in terms of 37 installed healthcare applications. The Centers for Disease Control and Prevention (CDC) defines Stage 3 as a “basic EMR,” i.e., a system with patient demographics and history, patient problems list, physician clinical notes, list of patient medications and allergies, computerized orders for prescriptions, and the ability to view laboratory and imaging results electronically. Stage 7 is a complete EMR with continuity of care documentation, including data warehousing and patient information sharing.

The HIMSS EMR adoption model has been accepted in North America and with some modifications internationally. Globally, government financing and provider incentives have driven EMR adoption. Adoption has been greater in developed countries with global healthcare budgets and universal health systems than in those dominated by private and non-profit business models. Internationally, EMR adoption by primary care providers far exceeds EMR adoption by hospitals, where HIT connectivity and interoperability remain issues.

STATS at a Glance

- 2009: More than 95 percent of primary care doctors in Europe, Australia and New Zealand used some form of basic EMR.
- 2011: 57 percent of office-based, U.S. physicians (primary care and specialists) used EMR/EHR systems; 34 percent had Stage 3 basic system
Virtual access to EMRs and patient care apps were top priorities cited by respondents in the 2012 HIMSS Leadership survey.

Virtualization supports the fundamental mobile nature of provider practices.

• 2010: 67 percent of U.S. hospitals reached Stage 3 EMR adoption

• 2009 to 2010: U.S. hospitals continue to advance progressive EMR capabilities in Stage 4 and Stage 6, 12.8 percent compared to 18.2 percent

Initial EMR adoption is expected to accelerate as smaller community hospitals in the U.S. are contracting with integrated delivery networks (IDNs) to have access to their applications via data centers. Hospital installation of more advanced EMR applications, such as clinical support decision systems, is also expected to accelerate, as the benefits to patient care and patient safety are realized. Hospital IT virtualization will provide the operational efficiencies to make this expansion financially feasible. In the 2012 HIMSS Leadership survey, respondents cited the following as top priorities:

• Server infrastructure with virtual services
• Mobile devices
• Virtual desktop/laptops

Virtualization and Provider Practices

Patients seeking and requiring healthcare may be seen in physician offices, clinics, hospitals, outpatient, surgery centers, skilled nursing and/or long-term care facilities, or at home. Likewise, physicians and nurses attend to the needs of patients in one or more of these settings in any one day. New healthcare delivery models—Accountable Care Organizations (ACOs) and Patient Centered Medical Homes (PCMHs)—have been proposed to provide a coordinated continuum of care to achieve better health outcomes and reduce duplication of services. Both require sharing patient data between providers and wider networks of data access.

• This level of patient data sharing requires seamless and secure integration across the continuum of care.

• An EHR is pivotal to full integration of patient information as well as to provide clinical decision support function, and business and clinical analytics capabilities.

• Secure access and on-demand availability of patient data are mandatory requirements to ensure patient safety and deliver quality care.

• Virtualization supports the inherently mobile practice style of physicians in a HIPAA-compliant manner. In a virtual desktop environment, tablets, smartphones, iPhones and the like allow secure access to patient information—nothing is stored on the device.

STATS at a Glance

• 2010: 36 percent of office-based U.S. physicians e-prescribe, and the majority write prescriptions via their EMRs

• 2011: 42 percent required a mobile component in choosing an EMR; 56 percent of physicians use smartphones and 25 percent use tablets for work-related activities (COMPTIA survey of 350 physicians and healthcare administrators and 400 IT companies)
Creating a virtual hospital environment offers the most options to transform challenges into opportunities.

- 2012: 83 percent used desktop computers as the primary computing devices, whether at home, the office or the hospital, and use mobile devices for clinical purposes (Spyglass survey of 100 U.S. office-based physicians)\(^2\)

50,000 FOOT PERSPECTIVE

Health information technology is a pivotal factor in creating sustainable health systems that deliver quality services and programs along a coordinated continuum of care. Availability and on-demand access to patient information anytime, anywhere are non-negotiable parameters. The ability to share patient data along the continuum of care affords optimal clinical decision support and the opportunity to achieve better patient outcomes. A secure, scalable virtual environment to integrate patient information from multiple sources is a “must have” as healthcare organizations and providers move toward Stage 7 EMR advancement and a sustainable future.

Similarly, desktop virtualization is a “must have” to hospital C-level executives focused on internal operational efficiencies. Virtual desktop implementation enables EMR rollout and interoperability by giving providers access to department-specific clinical applications. It also can contribute to demonstrating HIPAA compliance by controlling the flow of patient information, and verifying and monitoring access. On a more fundamental level, operational costs associated with software upgrades and help desk requests can be reduced.

There are incontrovertible challenges, however. Hospitals and hospital systems are currently faced with limited budgets, staff shortages, decreasing reimbursements, and financial penalties if they don’t meet Meaningful Use requirements by 2014. Concurrently, the demand for services will continue to rise with aging populations and increasing prevalence of chronic diseases. Reimbursement for services is not aligned with basic economic principles of supply and demand.

HIT departments will play prominent roles in assisting hospital and hospital system executives in meeting these challenges by facilitating provider experiences and productivity and increasing operational efficiencies. There is no magic bullet, but creating a virtual hospital environment offers the most options.

Objective One  ➔ Create an architecture and platforms that leverage Investments in legacy systems with new investments in virtualization that allows an “accrual” of benefits to maximize the return of investment.

- Establish that applications, server hardware, the operating system and I/O devices and drivers are compatible

- Confirm applications are candidates for virtualization and servers are fault-tolerant

- Assess software applications and associated workloads to determine required resources, user demand, uptime and response time—level of fault tolerance
**Objective Two** → Adopt a user-centric approach that ensures the user experience is “seamless, predictable, responsive and secure” regardless of the device used (personal computer, netbook, iPhone, tablet, palmtop computer, etc.).

Hospitals are dynamic environments where routines are subject to disruptions from emergency situations. In a community hospital, a woman in labor and delivery may need an emergency c-section. In acute care and trauma centers, all departments and staff are trained to expect the unexpected. Physicians, nurses, allied care workers, and IT staff are constantly on the move as needed. Under these conditions, virtualization must focus on the needs of the user and not the device or desktop. The latter are simply enabling technologies to improve the clinical experience, maximize productivity, and facilitate patient safety. In effect, the user-specific information is decoupled or separated from the desktop and application, and housed and managed through a user virtualization platform. Information technologies can then be used to apply this information—on demand—to any desktop or device used in a personal, seamless, secure and predictable way.

- The user experience becomes less complex with single sign-on (SSO) access that creates a flow from application to application and enhances session mobility.
- Access to patient care applications is fast and efficient; IT staff is able to give back time to physicians.
- By defining user-based activities, controls can be designed and implemented to secure and monitor access by location, device and application.
- Security is ensured by having patient information displayed but not stored on end-point devices.
- Defining user-based activities affords a predictable, fault-tolerant user experience.

**Best Practices**

From the 50,000 foot perspective, the goal of IT virtualization is to support a coordinated continuum of care within a hospital and across healthcare organizations. For providers, the goal is to provide the right service, to the right patient, at the right time, in the right place, at the right price. For HIT departments, the goal is to enable providers to have the right information, when needed, as needed. A concurrent objective is to leverage IT resources and achieve operational efficiencies.

→ **Kettering Health Network (KHN)**

Background. In prior years, KHN had replaced its servers with a VMware vSphere environment running on HP BladeSystem servers, with benefits realized in increased performance, improved security, smaller datacenter footprint, and reduced maintenance time.
Situation. KHN planned to implement an EPIC EMR system across its 60-plus healthcare facilities and recognized that minimal disruption in clinical workflow was key to provider acceptance and utilization. Concurrently, the IT department wanted to address PC sprawl that evolved over time, projecting a savings in maintenance time and money.

Solution. KHN chose VMware to design and install its virtual desktop infrastructure, based on its past experience with the company. VMware alliance partners helped with the Epic rollout, and leveraged hardware and software tools to streamline virtual desktop log-on, on-demand access to patient information, and session mobility.

Impact. Streamlining log-ins saved 10 to 15 minutes per shift for each of the 1,500 caregivers. Thin clients were managed remotely for improved efficiency (less cost and less maintenance than PCs) and improved workflow (less disruptions). Stricter security precautions were implemented, as no sensitive data was stored on local devices. Scalability was planned for future mobility virtualization, including the use of iPads, and access to in-patient images outside of the hospital brought benefits in terms of productivity and supported physician work preferences.

→ MidMichigan Health (MMH)

Background. MMH has installed Cerner Millennium EMR for surgery and pharmacy, and plans to install additional modules of the Millennium suite and the Allscripts EHR at its four medical centers in the future. Clinicians are able to log in and out on a network of thin client devices placed at different points of care via Cerner Instant Access and VMware View.

Situation. MMH wanted to improve the clinical and nurse user experiences as the system moves toward advanced stages of EHR adoption. Concurrently, the IT department wanted to enhance security and ease IT service-level responsibilities.

Solution. MMH licensed up to 900 View desktops. Microsoft® Windows® XP-embedded HP thin clients (wired and wireless) are deployed at patient bedside and other strategic points of care. Physicians access a patient's EMR at bedside by tapping the thin client with their ID badge. Roaming SSO enables instant access to clinical desktops.

Impact. Installation of thin clients at patient bedside, coupled with on-demand access to EMRs and SSO, improved clinical performance and allowed providers to spend more time with their patients. Centralized application updates simplified IT management, and fewer resources were needed to maintain client hardware. Thin client devices were significantly less expansive than PCs. MMH plans to continue the roll out of the program to different sites, and to provide seamless remote access for other devices, from iPads to zero clients.

→ Beaufort Memorial Hospital (BMH)

Background. In 2011, BMH, a rural 197-bed community hospital, was ranked among the top 150 “most wired” U.S. hospitals. The hospital was recognized for having computers installed in every patient room, which allowed physicians to access EMRs with CPOEs, barcode-scanned, bedside medication verification, and nurse notes. The user experience, however, did not foster
utilization. Staff had to remember six or more passwords to access applications used daily as needed. In addition, the existing system used PC client devices that gave rise to security vulnerability and IT cost inefficiencies.

Situation. Implementation is not utilization. BMH wanted to improve the user experience by speeding availability and on-demand access to patient information. Concurrently, the IT department wanted to realign use of its limited resources by enhancing mobility and security.

Solution. BMH leveraged its newly acquired server speed (90 percent virtualization of its data center applications via VMware vSphere®, the Cisco Unified Computing System (UCS)) servers and EMC storage. Virtualization was extended to desktops via VMware View with Imprivata SSO software, and PC-over-IP zero clients. The IT department uses VMware ThinApp to deploy applications to the virtual desktops that enable remote desktop access from home computers and mobile devices, such as notebook PCs and iPads.

Impact. Within the first six months of the roll-out, there were 400 concurrent users, and more will be converted as legacy PCs are replaced. The user experience has improved availability and on-demand access to patient information. Log-in time has been reduced by 50 percent, and increased physician satisfaction has been recorded. IT cost efficiencies have been realized, and the hospital has met Meaningful Use criteria for financial incentives and patient safety.

GOING FORWARD

Information and communication technologies, mobile devices and intelligent medical devices are transforming the practice and delivery of healthcare. Providers are currently using these combined technologies to access medical and research information online or via apps; access EMRs; view radiology images or laboratory findings from an office, clinic, hospital or home; and monitor patient vital signs and conditions. It is also becoming increasingly apparent that patient care applications and data are expected be readily available, where and when the clinician needs access. The clinical desktop is now viewed as part of healthcare’s tier 1 infrastructure. A desktop outage is considered a severity 1 incident.

To achieve affordable care through an integrated continuum of services, providers and healthcare organizations expect and need on-demand access to patient information and patient care applications, anytime, anywhere. In turn, consumers expect and demand that their information be kept safe, secure and protected, with qualified access. To meet these expectations, healthcare providers are turning toward cloud-based architectures built on virtualization technologies to deliver constant, ubiquitous and secure access to patient care applications and patient data—delivered as a highly available, managed service. Frost & Sullivan believes proactive organizations will provide the necessary infrastructure to realize better health outcomes and lower total cost of ownership (TCO), and virtualization will become the norm in the near future.

To maximize return on investment and minimize risk, proactive organizations will adopt a user-centric perspective, and create IT architecture and platforms that leverage investments in legacy systems with new investments in virtualization. Proactive organizations will ensure the user experience is seamless, predictable, responsive and secure.
REFERENCES

1 2011 HIMSS Analytics Report on Health Information Exchange, Patient-Centered Medical Home and Accountable Care Opportunities for Engagement and Transformation through Emerging Care Delivery Models.


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