WHITE PAPER

INTEROPERABILITY

New technologies bring new relevance to best-of-breed emergency room information systems

T-System

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The front door to the healthcare organization, the emergency department (ED) has clinical, financial and operational implications for the entire enterprise. The acute nature of ED patients creates a frenzied, stressful environment that healthcare reform promises to exacerbate with skyrocketing patient volume – and information requirements to match. The right emergency department information system (EDIS) can mean the difference between a hospital adapting and becoming more efficient or closing its doors. This white paper examines the best-of-breed versus single source system dilemma. It discusses how new mandates for interoperability, coupled with new, enabling technologies will allow hospitals to take advantage of best-of-breed ED-specific functionality without sacrificing integration, and delineates attributes of an interoperable EDIS. Finally, it presents an example of an effective interoperable EDIS.

What Is The Current Challenge?

Within a healthcare organization, the emergency department (ED) is among the most critical of all departments, with significant implications – clinical, financial and operational – for the entire enterprise.

Consider the numbers:

> More than half of all inpatient admissions come through the ED, making it a key determinant of hospital financial performance.[I]

> Emergency medicine typically accounts for the third-highest revenue stream in hospitals, behind only surgery and cardiology.[II]

> Approximately 45 percent of hospital revenues come from patients admitted through the ED.[III]

> ED inpatients typically comprise 71 percent of a hospital's intensive care days, 66 percent of inpatient lab tests and 58 percent of inpatient days.[IV]

Frenetic, highly stressful environments, EDs are the organization's point of entry where diagnostic decisions are made and patients are routed to various departments. The ED has different information technology (IT) needs than other departments – from critical decision support to complicated levels of documentation for reimbursement and time-sensitive workflow. Meeting these needs calls for ED-specific functionality that not all systems provide.

Why Best-Of-Breed Is Best

The functionality inherent in specialty systems has a significant impact on the ED's bottom line, affecting everything from financial returns and user adoption to clinical outcomes. By providing clinical decision support and enabling efficient operations and completion of critical regulatory, reimbursement and compliance documentation, they can help stabilize an organization, both clinically and financially.

This fact – coupled with funding from the American Recovery and Reinvestment Act (ARRA) – has led to significant growth in implementation of specialty systems for the ED. According to the Millennium Research Group, today's $110 million EDIS market will grow by over 30 percent in 2011, fueled by incentive

funding for hospitals that adopt electronic health record (EHR) technology and/or demonstrate meaningful use of EHRs in the ED.[V] But funding and functionality aren't the only drivers of this growth.

A larger, sicker Medicaid patient mix means hospitals must consider the very real prospect of a five-fold increase in ED visits. Healthcare reform will increase ED patient volume further, with as many as 34 million newly insured projected to generate 848,000 - 901,000 additional emergency room (ER) visits every year.[VI] And because each visit means new clinical data, the right emergency department information system (EDIS) could mean the difference between a hospital's adapting and becoming more efficient or closing its doors.

However – specialization – the very attribute that makes the EDIS a boon to ED, traditionally has made it a bane to the organization's clinical information system (CIS). Specialized ED data has positive implications for patient safety, efficiency and patient satisfaction; siloed ED data could have negative ones.

To unlock the data in specialty systems such as an EDIS, some healthcare organizations rely on interfaces, while others forego specialty systems altogether, opting instead for enterprise systems with ED functionality, many of which cannot meet the unique needs of the ED.

Interfaces And Single-Source Solutions: Traditions Made To Be Broken

A connected healthcare environment ensures access to health information – across care settings, among stakeholders and in response to regulatory mandates. This access has financial, clinical and operational value, from reducing redundant or inappropriate care and improving safety to streamlining workflows and reducing the cost of care. However, the data and process integration necessary to provide this access can be very difficult to manage.

For hospital CIOs, meeting these challenges has required expensive, unwieldy interfaces, which are problematic because:

> Many enterprise vendors do not allow standard HL7 interface messaging to populate data in their systems. Standard interfaces are not available for retrieving data out of many systems.

> Data encoding varies greatly between systems. Creating maps between codes used by different systems is time consuming and it can be error prone. Different systems can have different data requirements. Some of these differences are not appropriate to handle in an interface, so application and workflow changes may be necessary for two systems to share meaningful data.

> Building interfaces requires a deep knowledge of how data is captured, stored, encoded and used within systems. Many hospital IT departments lack this level of knowledge about the systems.

> Some vendors store the same types of information, such as allergies, in multiple places, making interfacing to them even more complex.

> Standards for certain types of data have not been adopted. Even within standard data structures like HL7, we are missing specifications for how data should be shared.

Some hospitals seek to avoid these challenges by implementing enterprisewide solutions, sacrificing improved efficiency, workflow, patient safety and financial benefits in the ED to facilitate and improve information flow within the hospital.

However, a monolithic, enterprisewide data model may not be ideal. On the surface, the single-source

solution may appear to provide ED-specific department functionality and workflow. In reality, many such systems are simply inpatient system functionality leveraged to fit in the ED.

Different departments capture and use information in very different ways. The ability to respond rapidly to departmental needs without affecting other areas is paramount, as is understanding the consumers and producers of data to assess a reasonable intersection of required data. For the ED, shared data is less clinically relevant than ED-specific data. Interdepartmentally, the information shared includes:

   a) Laboratory and radiology results

   b) Medication formularies

   c) Discrete data (vitals, medication history, allergies and problem lists)

   d) Physiological device data

Healthcare reform also is helping to resolve the departmental versus enterprise system dilemma. It is rendering the enterprise model even less effective by increasing the complexity of departmental needs while mandating information availability outside of the hospital. It is mandating standards that promote system interoperability and removing the aforementioned barriers, making it possible to interface two separate systems, effectively and cost efficiently.

Vendors will be required to adopt data coding and data structure standards to ensure simple, secure communication of patient records to other hospital information systems, the patient, providers outside the hospital and the larger community.

By removing many of the barriers hospitals face when interfacing separate hospital systems, this initiative eliminates the need for one-size-fits-all system solutions and allows organizations to deploy the specialty systems that create the most effective improvements in the ED.

Characteristics Of An Interoperable EDIS

What should an organization look for in an EDIS?

The best ED systems satisfy the unique workflow needs of the ED, while providing a seamless view of data from a variety of external systems. To this end, the most interoperable EDIS solutions possess several key attributes, including:

   1) Agility:
       One of the biggest challenges to remaining nimble in healthcare, especially in the ED, is evolving regulatory and patient care standards. With a rapidly changing healthcare environment, hospital systems must adapt quickly. Specialty systems can be more nimble to respond to changing needs without affecting inpatient systems because they are created on a separate platform and because the vendors that deploy those systems are more focused on the specialty needs of the ED.

   2) Standards-Based Interoperability:
       Effective information exchange rests on broad adoption of such standards as DICOM and HL7. Standards-based interoperability minimizes the effect of data transfer on existing systems and care workflows. With these standards in place, ED systems can reconcile, synchronize and exchange data with the EHR – without additional interfaces or alterations to existing systems. Beyond the individual organization, established standards facilitate integration of various systems and information sharing.

   3) Ability To Meet The Needs Of Diverse Users:
       Clinicians need quick access to the most current patient information to provide the best care, as well

as alerts and notifications to drive clinical decisions. Hospital administrators need for analytical data is increasing due to the demands of new government regulations and the desire to provide the patient with the best care possible. And, though often overlooked, the IT department needs timely and accurate information about the health and state of the organization's systems to manage resources.

T-System, Inc., the nation's leading provider of ED clinical documentation solutions, is an example of an effectively interoperable EDIS.

T-System: Interoperability In Action

Founded in 1996, T-System, Inc., employs an unmatched collaboration of clinicians, technologists and service professionals dedicated to serving the current and future clinical information and technology needs of emergency medicine. Headquartered in Dallas, Texas, T-System is the leading provider of clinically accepted emergency department information system (EDIS) solutions. Today, more than 1,700 EDs partner with T-System.

T-System ensures interoperability with:

1) **Nimble Architecture:**

The T SystemEV®'s modularized architecture allows the use of specialty open source products to supplement its capabilities. The modularized architecture easily integrates with libraries implemented in a number of different programming languages, which enables T-System to add on additional capabilities rapidly. T-System can leverage the work done by many to help solve some of the challenges facing its clients.

For example, T SystemEV uses the open XDS profile for document registry and document repository, which allows its clients to use an

existing solution or easily deploy the Open Health Tools open source document repository and registry. Not only does this give clients options, the maintenance done by the open source community offsets development costs, which allows T SystemEV to remain as cost efficient as possible.

2) **Standards-Based Interoperability:**

T SystemEV is ideal for the ED because of its architecture, interoperability and ease of use for both clinical and IT staff. T SystemEV uses the HL7 data structure to share data with hospital information systems, lab systems, and radiology systems, among others.

Integrated Health Exchange (IHE) is a core part of T SystemEV's patient care document exchange solution. T SystemEV supports the Continuity of Care Document (CCD) standard required for meaningful use, which provides a fully codified summary of the patient visit including medications, allergies, problem list, surgeries, and test results. T SystemEV currently supports integration with an IHE Document Repository and Document Registry for the storage of Continuity of Care Documents and the retrieval and display of both the CCD and the Continuity of Care Record (CCR). The Document Storage and Retrieval are handled via IHE XDS.b-based (Cross-Enterprise Document Sharing) web services that are Audit Trail and Node Authentication (ATNA) compliant.

T SystemEV can use the IHE profiles to request patient documents for a patient referred to the ED. The solution will retrieve an "ED Referral" document created by the patient's PCP from the IHE document repository and display this document for the ED physician to review. The ED physician will document on the patient and discharge the patient.

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The T SystemEV® will then generate an "Emergency Department Physician Note" (EDPN) document and send this document to the IHE document repository where the PCP can then retrieve and view the document. T-System also is expanding support for other IHE profiles such as the Patient Identifier Cross Referencing (PIX) integration profile, which associates patient identifiers from multiple systems to tie records from the same patient together. Adoption of these standards enables a scalable approach for information sharing within a hospital or within a larger community such as an HIE.

T SystemEV supports industry standards for encoding so systems using the data can interpret it in the same way. Through standard encoding, other systems can process problem lists, specific diagnoses and medication reconciliation, thereby improving care. T SystemEV's robust clinical content supports industry standard encoding such as SNOMED encoding for problem lists, past surgery lists, CPT encoding for procedures performed in the ED, ICD-9 encoding for diagnosis, and codified patient demographics including gender, preferred language, race, and ethnicity – all of which are necessary for demonstrating meaningful use.

3) **Ability To Meet The Needs Of Diverse Users:**
   T SystemEV meets clinicians' needs by providing notifications when certain events are received. Through CCD and CCR interoperability, T SystemEV also allows clinicians access to such past visit information as medications and allergies, ensuring the clinician has the most accurate, up-to-date information – even if the patient is unable to provide that information at the time of care. T-System continues to expand its web-based architecture to allow the clinician

faster access to patient data. For administrators, T SystemEV provides core operational and meaningful use reports. Through a reporting infrastructure, T SystemEV also provides access to aggregated data for determining compliance with patient safety measures, quality of care provided and ED operational efficiency, among others. T SystemEV continuously is expanding its reporting capability to expose more data elements and increase access to real-time data through web service.

Interoperability with several monitoring systems allows the IT staff to monitor the system in a way that conforms to their policies. T-System is expanding the measurability of performance metrics by extending a publish/subscribe infrastructure that publishes notifications to subscribers, which permits IT staff to control the type of data that they request from the system.

4) **Support For Future Technologies:**
   T-System continually researches emerging technologies in both the healthcare IT market and the broader IT market to ensure its solutions meet both current and future ED and hospital challenges.

   One technology now moving into the healthcare IT market is web services. Traditional HL7 (v2.x) is a solid technology for interoperability with hospital information systems, but it does not work well for interoperating with systems outside of the hospital. HL7 v2.x is a transport-agnostic protocol, but most vendors implement the protocol using TCP over IP. These implementations ensure security by requiring pre-configuration of all endpoints before messages can be exchanged. As hospitals attempt to provide enhanced patient services and interoperate with external systems, this pre-configuration requirement will present

some challenges. It may not be feasible to pre-configure all end points that need to connect into the system or all end points with which the system needs to communicate. This is where web services come into play.

Web services allow a system to provide data to external systems, both known and unknown, in a secure way without the need to pre-configure each endpoint. The external systems can connect into a secured web service to access data and/or enhanced services, such as web-based registration. T-System is employing web service-based features to solve such current interoperability challenges as sharing CCD with other systems. Web services also will be used to allow hospitals to create user interfaces that address specific needs.

Another prevalent technology is publish/subscribe over an enterprise messaging bus. Publish/subscribe is a messaging paradigm that allows a sender to publish a message without knowing which, if any, subscribers (receivers) are waiting for that message. Decoupling the sender from the receiver allows greater scalability and more flexible deployments, which, in turn enables the addition of new publishers and subscribers without having to reconfigure the system.

For example, an organization can add a new subscriber that needs to be updated when a patient's lab results have been received by the system. When the publisher of that data publishes an update for that patient, the system notifies the subscriber. Such functionality will support the addition of enhanced features to a publish/subscribe system with little impact on the existing functionality. The enterprise messaging bus provides the support needed to implement

the publish/subscribe messaging paradigm. T-System is moving toward a publish/subscribe-based messaging system to ensure its solutions continue to meet the rapidly changing healthcare environment.

The following case study is an example of T-System interoperability deployed in a state HIE.

Case Study:
Great Plains Regional Medical Center

Great Plains Regional Medical Center in North Platte, Nebraska uses The T SystemEV® to contribute ED health information to a state-run HIE. Great Plains is a full-service medical center serving 17 communities in rural Nebraska.

Great Plains participates in the Nebraska Health Information Initiative (NeHII), a statewide initiative that provides a secure way to share clinical information electronically to improve patient care quality. NeHII provides health information for more than 1.5 million patients in Nebraska, Iowa and Missouri to authorized physicians, hospitals, clinics and health insurance companies across the region.

Great Plains joined NeHII in 2010, and ED reports from T SystemEV were the first documents successfully transmitted from the hospital to the NeHII system. As NeHII continues to expand and grow, Great Plains can provide additional information through T SystemEV such as a daily download of syndromic surveillance data to the Nebraska Department of Health and Human Services.

The Future Of An Interoperable EDIS

According to KLAS, two of the most important trends influencing EDIS growth are clinician anger and the demand for integration. Ironically, the former is a function

of traditional approaches to the latter – namely, many ED physicians are angry about losing functionality when, in their search for integration, organizations move from best-of-breed EDIS systems to ED-enabled enterprise solutions.

However, as healthcare reform makes inter-organizational interoperability as critical to viability as intra-organizational integration, the advent of IHE technologies that enable connections outside the organizational walls are resolving the best-of-breed versus enterprise solution dilemma inside them. The interoperability mandate has made the EDIS choice possible. And not a moment too soon, as a steadily decreasing number of EDs braces for a rapidly increasing influx of patients. The key to balancing the ED equation? Interoperable EDIS solutions that can meet both the current needs of the ED and the future requirements of the healthcare enterprise.

[I] *Annals of Emergency Medicine*, Volume 56, Issue 2 , Pages 150-165, August 2010

[II] *National Health Statistics Reports* Number 26, August 6, 2010

[III] *National Health Statistics Reports* Number 26, August 6, 2010

[IV] *Annals of Emergency Medicine*, Volume 56, Issue 2 , Pages 150-165, August 2010

[IV] Lewis N. (2010) Emergency Departments To Invest 30% More In IT. InformationWeek, December 10. Accessed 17-Dec-10 at http://www.informationweek.com/news/healthcare/EMR/showArticle.jhtml?articleID=228800159&cid=RSSfeed_IWK_AllGoodman, JC. (2010) Emergency Room Visits Likely to Increase Under ObamaCare.

[IV] Goodman, JC. (2010) Emergency Room Visits Likely to Increase Under ObamaCare. National Center For Policy Analysis Brief Analysis No. 709. June 18. Accessed 17-Dec-10 at http://www.ncpa.org/pdfs/ba709.pdf