

The Importance of Enterprise Integration

A Work Product of the HIMSS Enterprise Integration Task Force

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Transformation Continues

“We have the most advanced medical system in the world, yet patient safety is compromised every day due to medical errors, duplication and other inefficiencies. Harnessing the potential of information technology will help reduce errors and improve quality by making it more effective and efficient.”

Source: Senators Bill Frist (R-TN) and Hillary Rodham Clinton (D-NY) in a joint statement on the growing consensus on health information technology, June 30, 2005

Enterprise Integration (EI)

Enterprise Integration (EI) seeks to connect systems to achieve system interoperability.

In layperson's terms, EI seeks to enable software from different vendors to communicate, notwithstanding differences in infrastructure technology and application architecture.

Who Benefits from EI

- The Healthcare Enterprise
 - Improve care; improve quality; reduce costs
- Payors
 - Reduce payments; improve data availability
- Employers
 - Transparency; reduced premiums
- And Most of All - Patients

Benefits of Enterprise Integration

Patient Safety and Quality of Care

- Timeliness of care delivery
- Accuracy of care delivery (reduction of medical errors)
- Data accessibility (ease of access to all data needed for consultation and treatment)
- Legibility and accuracy of medical records
- Reduce duplication of medical tests
- Enhances continuity of care
- Emerging benefits:
 - Self-administration and remote monitoring
 - Medical Intelligence: use of evidence-based medicine

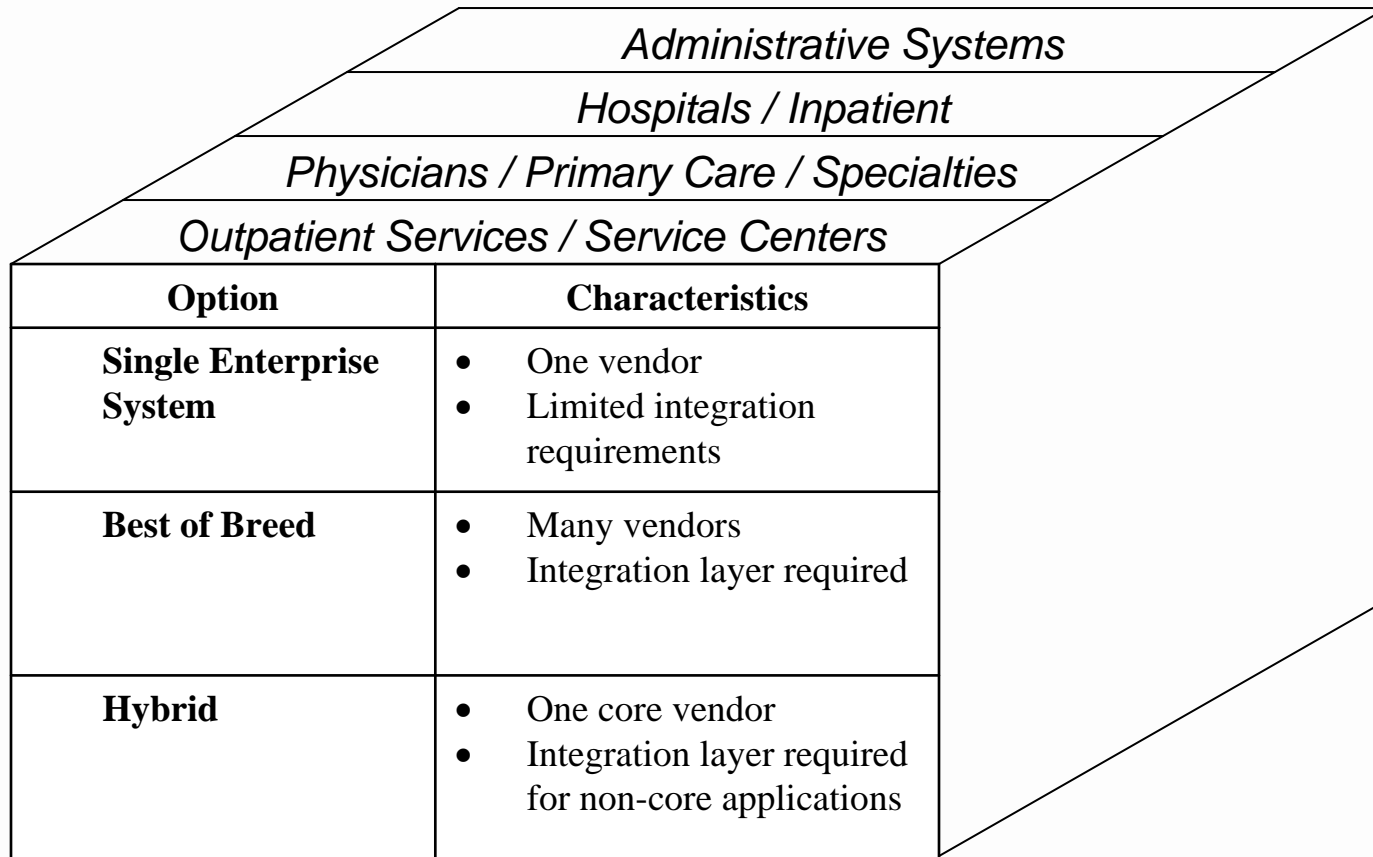
Enterprise Application Strategy

- Enterprises may choose to implement:
 - Separate applications in each enterprise domain
 - One or more integrated application suites across the enterprise
 - Combination (hybrid approach) across the enterprise
- Enterprises grow by acquisition, and by default end up with a hybrid approach
- The challenge:
 - To integrate data and functionality across these applications;
 - To make the result understandable and usable to the clinicians;
 - To keep operational costs within acceptable limits; to allow applications to be added and subtracted as needed while not disrupting operational stability

Enterprise IT Strategy Options

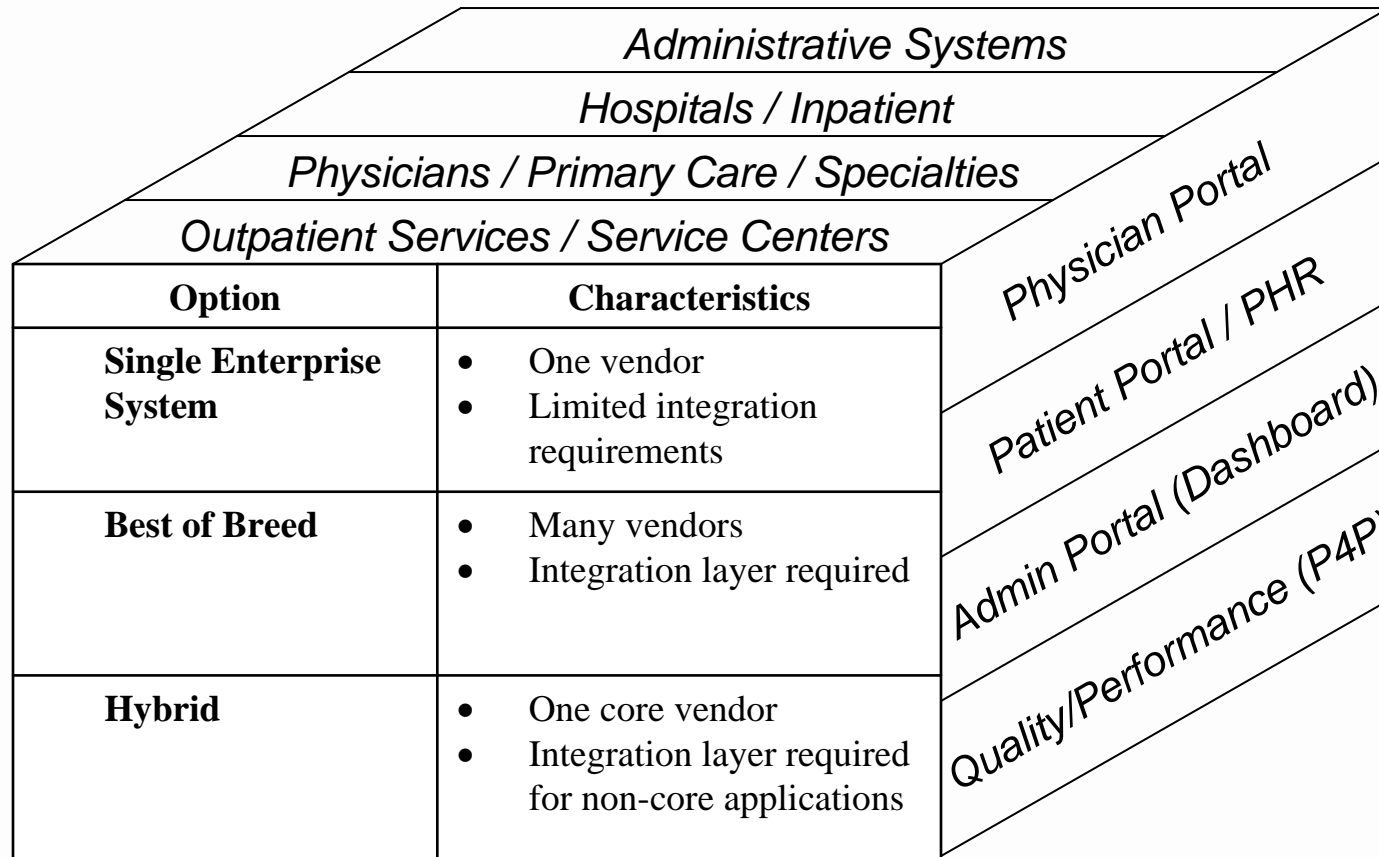
Option	Characteristics	Remarks
Single Enterprise System	<ul style="list-style-type: none"> ● One vendor ● Limited integration requirements 	<ul style="list-style-type: none"> ● Cost effective ● Procedures and policies dictated by system feature set ● Limited departmental functionality
Best of Breed	<ul style="list-style-type: none"> ● Many vendors ● Integration layer required 	<ul style="list-style-type: none"> ● Extensive in-house support ● High cost ● Enhanced departmental functionality ● Disjointed view of data
Hybrid	<ul style="list-style-type: none"> ● One core vendor ● Integration layer required for non-core applications 	<ul style="list-style-type: none"> ● Core vendor CPOE and other Point-of-Care functionality ● Moderate to high cost ● Good strategy for achieving higher levels of enterprise functionality

More on Enterprise IT Strategy Options



Real World: Today's enterprises are composed of many business, each of which may have both core and best-of-breed vendors. Are there really any "Single Enterprise Systems" left in the country?

More on Enterprise IT Strategy Options



Real World: Adding to the complexity, we have different constituencies demanding different **views** of the same data, requiring portals which gather data from different data bases to present specialized longitudinal summaries.

Why Best of Breed/Hybrid Strategy?

Separate applications are needed because:

- Must meet the specific and often unique needs of a clinical or support department with specialized functionality;
- Core application simply does not contain functionality needed in particular departments;
- Best-of-breed or “best-fit” applications are politically a better *sell*;
- Medical science and regulation often move faster than core application vendors requiring unique solutions;
- Particular “one-off” requirements dictate unique or in-house solutions.

Common element: *Integration*

- Regardless of the reason, individual applications must be integrated with core hospital systems and even other departmental applications:
 - > Patient registration / event data
 - > Orders & Results
 - > Physician & other “master files”
 - > Application Context
 - > Allergies & Clinical Summary
 - > Charges & financial data
 - > Business intelligence
 - > and lots more ...

Why Interfaces & Integration?

- Even “Integrated Product Suites” or “Integrated Enterprise Systems” are often cobbled together from many independently developed or acquired applications.
- Under the covers, even the most closely pre-interfaced application suites have separate supporting database schemas and often even different architectures.
- In order to interconnect integrated product suites it is not unusual to have to break and reestablish existing “pre-integration” data links in order to smoothly transfer data from one domain to another.
- Cross-enterprise applications such as transcription, portals, administrative/HR, P4P and quality reporting, and many others require connectivity across and between core and specialty applications.
- *Because the business simply demands it.*

Why would an Organization Implement an “Interfaced” Systems IT-Strategy?

- Goal (or requirement) to introduce different applications over an extended timeframe;
- The need for “robust” functionality not available in a fully integrated system, i.e., Best of Suite/Best of Breed;
- Specific Departmental Requirements not available in a fully integrated system;
- Requirements of a Merged Healthcare Entity with many systems in various stages and with various requirements;
- Extremely limited availability of fully integrated HIS Systems (& those available often have areas of limited functionality, or are themselves sets of pre-integrated applications).

Integration

- Integrated application suites are consolidated through a common data model and consistent application design;
- Separate applications require an interface capability in each application and connectivity between the applications;
- Complex IT environments often require the addition of specialized software to manage the flow of data and facilitate business recovery after system outages;
- Single vendor applications can still require integration of applications when the vendor has acquired third party products;
- There exist different *types* of integration: data, functional, contextual, and even semantic.

Workflow and Efficiency

- Hospital care is often organized around department or function, and applications were developed to support them: integrating these functions can save time and money;
- Staff spend time coordinating supplies, information, determining where the patient will go next: integrating systems can help reduce time spent on these tasks:
 - Integration can help optimize workflow;
 - IT implementation without integration can make it worse;
- IT can help streamline processes: consider application implementation as part of overall process redesign
 - Can use workflow design to change processes from serial to parallel which improves both efficiency and patient outcomes;
- Moving routine and repetitive functions to automation makes staff available for more productive and rewarding tasks.

Workflow Considerations

- IT is often implemented for one group or department without fully considering downstream and interdisciplinary impacts
 - Information could be used for multiple purposes by multiple people
 - People other than the supported group might need to change their workflow because of an implemented system
 - Constant flow of information is needed between different skill sets, each with their own information needs and vocabulary
- Consider each departmental or *specialty* application within the larger enterprise context!

Workflow Considerations (cont'd)

- Integrated applications can transform workflows when the fit between IT and process is addressed
- Health care systems and processes are complex, so workflow models need to include actors and the information they use
- Integration can help make information available to those who need it and prevent the same question being asked and documented multiple times:
 - However, not necessarily the same language or terms are used to describe patient data or events
 - Systems have to satisfy multiple caregivers because they are used by multiple caregivers

Key Components of a Fully *Integrated* Enterprise Include:

- **Interface Engine** controlling data flows between applications;
- **Master Person Index:** A database and rules engine that contain a unique identifier for every patient in the enterprise, regardless of how many other unique application patient indices exist;
- **Single Sign-on with common authentication:** a process that Permits a user to enter one name and password in order to access multiple applications;
- **Context Management:** a process for passing user interface (display) context (patient, physician, user, and even item information) from one application to the other without user involvement;
- **Common Code Sets** allow for the maintenance and transfer of data that can be used and “understood” in multiple systems
- **Data Warehouse:** Permits access of information across the enterprise through use of a central data repository or storage system
- **Semantic Interoperability:** data is not only transferred from one application to another, but its *meaning* is translated to match the receiver

Integration of Acute Care with Ambulatory Care Environments

- Most of the time, these two environments have their own core systems, so integration can be especially problematic
- Goals & Issues
 - Electronically & automatically share results data (Lab & Radiology) across both Acute & Ambulatory care environments (**bi-directional!**)
 - Consistent & accurate demographic and insurance data for patients across the continuum (eMPI spans both)
 - Improve reimbursement across the continuum of Acute & Ambulatory care by sharing of encounter data between them
 - Improve the flow of ePHI across the continuum to improve care delivery, reduce errors & promote better patient outcomes.
 - Facilitate gathering and reporting of episodic data, quality data, and patient / member health data.

Key Integration Issues

- Record Linkage & Identification
- Data Quality
- Data Synchronization
- Business Rules Management
- Collaboration
- Business Intelligence/Analytics
- Security & Privacy

Interoperability & Technological Compatibility Issues

- **Link patient records over time from various sources and from institution to institution**
- **Ensure the privacy and security of patient information, as required by HIPAA; including audit trails**
- **Be built on an open and scalable platform; customizable so different users can view information in the manner that is best for them**
- **Be accessible from remote locations on an as needed basis**
- **Assist clinicians with collecting relevant information**
- **Assist clinicians and other health care providers with clinical care**
- **Support payer-specific information**
- **Allow different applications to provide a unified view across all encounters**
- **Support quality assurance activities**
- **Support clinical image storage and multimedia such as PACS systems**

Enterprise Integration & Business Intelligence

- Enterprise Integration
 - Provides the foundation to access data across multiple Healthcare Information Systems
 - > **Clinical Systems** > **Financial Systems** > **Administrative Systems**
 - Data from multiple sources can be placed into Data Warehouse for analysis including:
 - > **Patient Demographics** > **Inventory** > **Orders, Labs, Pharmacy, Results**
- Business Intelligence Tools
 - Allows for analysis, correlation and reporting of data across multiple sources
 - Provides the ability to meet Pay for Performance Initiatives
 - Deficit Reduction Act of 2005 - 21 Quality Measures for 2007: If not reported reimbursement will be reduced by 2%
 - H-CAHPS - Hospital Consumer Assessment of Healthcare Providers and Systems - 36 Quality Measures for 2008
 - Bridges to Excellence - Monetary Rewards for Use of Evidence-Based Medicine and Use of Interoperable Electronic Health Records

HIMSS Analytics EMR Adoption Model

- HIMSS Analytics' EMR Adoption Model identifies and scores a healthcare provider's EMR capabilities, ranging from limited ancillary department systems to a fully paperless EMR environment.
- HIMSS Analytics has developed a methodology to automatically score the 4000+ hospitals in the HIMSS Analytics Database (derived from the Dorenfest IHDS+ Database™) on their level of EMR implementation.

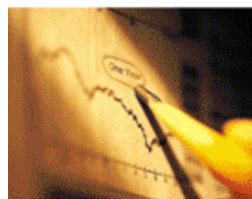
HIMSS Analytics EMR Adoption Model

Stage	Description
0	<ul style="list-style-type: none"> Some clinical automation may exist. Laboratory and/or pharmacy and/or radiology not installed.
1	<ul style="list-style-type: none"> All three major ancillaries (laboratory, pharmacy and radiology) installed.
2	<ul style="list-style-type: none"> Major ancillary clinical systems feed data to clinical data repository (CDR) that provides physician access for retrieving and reviewing results. CDR contains a controlled medical vocabulary (CMV) and the clinical decision support system and rules engine for rudimentary conflict checking. <i>Optional for extra points</i> - Information from document imaging systems may be linked to the CDR.
3	<ul style="list-style-type: none"> Clinical documentation installed (e.g. vital signs, flow sheets, nursing notes, care plan charting, and/or the electronic medication administration record (eMAR) system) are scored with extra points and are implemented and integrated with the CDR for at least one service in the hospital. First level of clinician decision support is implemented to conduct error checking with order entry (i.e. drug/drug, drug/food, drug/lab, conflict checking normally found in the pharmacy). Some level of medical image access from picture archive and communication systems (PACS) is available for access by physicians via the organization's intranet or other secure networks.
4	<ul style="list-style-type: none"> Computerized practitioner/physician order entry (CPOE) for use by any clinician added to nursing and CDR environment. Second-level of clinical decision support related to evidence-based medicine protocols implemented. If one patient service area has implemented CPOE and completed previous stages, this stage has been achieved.
5	<ul style="list-style-type: none"> The closed loop medication administration environment is fully implemented in at least one patient care service area. The eMAR and bar coding or other auto-identification technology, such as radio frequency identification (RFID), are implemented and integrated with CPOE and pharmacy to maximize point-of-care patient safety processes for medication administration.
6	<ul style="list-style-type: none"> Full physician documentation/charting (structured templates) are implemented for at least one patient care service area. A full complement of radiology PACS systems is implemented (i.e. all images, both digital and film-based, are available to physicians via an intranet or other secure network).
7	<ul style="list-style-type: none"> Clinical information can be readily shared via electronic transactions or exchange of electronic records with all entities within a regional health network (i.e., other hospitals, ambulatory clinics, sub-acute

HIMSS Analytics EMR Adoption Model

EMR Adoption Model Structure Ensures Objectivity

- All application capabilities within each stage must be operational before that stage can be achieved.
- All lower stages must have been achieved before a higher level will be considered as achieved.
- A hospital can achieve Stages 3-6 if it has met all of the application requirements for a single patient care service (e.g. single nursing floor, cardiology service).
- Using the rules above, additional points are given for the implementation of applications in stages higher than the one fully achieved by the healthcare organization.. In this fashion, other implementation paths than those prescribed by the stages can be taken into consideration for correlation with quality and financial research.



EMR Adoption Model, 2006 Trends

		2006 Data Sets		
		Final	3 rd Q	1 st Q
Stage 7	Medical record fully electronic; CDO able to contribute to ICEHR as byproduct of SEHR	0.0%	0.0%	0.0%
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), full PACS	0.1%	0.1%	0.1%
Stage 5	Closed loop medication administration	0.5%	0.5%	0.6%
Stage 4	CPOE, CDSS (clinical protocols)	3.0%	2.7%	2.5%
Stage 3	Clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology	18.0%	14.2%	11.2%
Stage 2	CDR, CMV, CDSS inference engine, may have Document Imaging	38.8%	42.9%	46.7%
Stage 1	Ancillaries – Lab, Rad, Pharmacy	18.9%	21.8%	19.8%
Stage 0	All Three Ancillaries Not Installed	20.7%	17.9%	19.0%

EMR Adoption Model Q1 2007

% of US
Hospitals

Stage 7	Medical record fully electronic; CDO able to contribute to ICEHR as byproduct of SEHR	0.0%
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), full PACS	0.3%
Stage 5	Closed loop medication administration	1.3%
Stage 4	CPOE, CDSS (clinical protocols)	2.1%
Stage 3	Clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology	21.3%
Stage 2	CDR, CMV, CDSS inference engine, may have Document Imaging	39.3%
Stage 1	Ancillaries – Lab, Rad, Pharmacy	16.3%
Stage 0	All Three Ancillaries Not Installed	19.5%

HIMSS Analytics: Selected Terms Defined

SEHR: Shared Electronic Health Record as defined by ISO TC/215

ICEHR: Integrated Care Electronic Health Record as defined by ISO TC/215

LEHR: Local EHR as defined by the ISO TC/215; otherwise, known as an EMR by HIMSS Analytics

CDR: Clinical Data Repository

CMV: Controlled Medical Vocabulary

CDSS: Clinical Decision Support System

CPOE: Computerized Prescriber Order Entry

PACS: Picture Archival Computer System

CDO: Care Delivery Organization

Electronic Medical Record (EMR)

A computer-based patient medical record. An EMR facilitates access of patient data by clinical staff at any given location; accurate and complete claims processing by insurance companies; building automated checks for drug and allergy interactions; clinical notes; prescriptions; scheduling; and sending and viewing labs. The term has become expanded to include systems which keep track of other relevant medical information. The practice management system is the medical office functions which support and surround the EMR and relevant medical information.

For questions, please contact:

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