Welcome to **Health Management Information Systems, Administrative, Billing, and Financial Systems**. This is Lecture a.

The component, **Health Management Information Systems**, is a “theory” component that provides an introduction to health care applications and the systems that use them, health information technology standards, health-related data structures, and enterprise architecture in health care organizations.

Lecture a examines the relationship of administrative, billing, and financial systems to the health care information system, explains applications that need to be integrated in health care information systems, explores health care organizations’ integration strategies, identifies the critical elements for integration of these systems with clinical information systems, and discusses how health care organizations may gain valuable insights from integrated data through data analytics and trending.
The Objectives for this unit, **Administrative, Billing, and Financial Systems** are to:

- Explain applications that need to be integrated in health care information systems;
- Describe the strategies used by health care organizations to ensure integration of functions;
- Discuss the critical elements needed to integrate billing, financial, and clinical systems.
Additional Objectives for this unit, **Administrative, Billing, and Financial Systems** are to:

- Discuss the core elements of a Master Patient Index (MPI)
- and Describe current trends to establish a Unique Patient Identifier (UPI).
Let’s begin with a definition of an information system. American Health Information Management (AHIMA) defines information system as “An automated system that uses computer hardware and software to record, manipulate, store, recover, and disseminate data (that is, a system that receives and processes input and provides output)” (AHIMA, 2012, p. 181).

Connecting information system to health, a health information system is one which is used within the health care domain. For example, Vogel & Perrault (2001) view a health care information system (HCIS) as the system that facilitates communication, organizes, integrates, and stores information, coordinates work among various health care professionals, supports documentation, record-keeping and reporting functions, and otherwise supports the needs of the health care organization.

Another example is a hospital information system (HIS). This is a system which is comprehensive in that it contains the clinical, administrative, financial, and demographic information about each patient (AHIMA 2012).

Administrative, billing, and financial systems that facilitate the revenue cycle and other administrative tasks are components of information systems used in provider and health care organizations.
Coming from a functional perspective, Vogel & Perrault (2006) identified HCIS components that support the following purposes:

- Patient management and billing
- Department management
- Care delivery and clinical documentation
- Clinical decision support
- Financial and resource management

Patient management and billing and financial and resource management will be briefly described in the next few slides.
Patient management and billing systems are systems that support the management of the patient. An example would be the patient identification functionality and the supporting technology, a master patient index. AHIMA (2012) defines a master patient index as “A patient-identifying directory referencing all patients related to an organization and which also serves as a link to the patient record or information, facilitates patient identification, and assists in maintaining a longitudinal patient record from birth to death” (p. 210). Lecture 9b will discuss the master patient index in more detail.
Another example of a system that supports patient management is the admission-discharge-transfer (ADT) module. AHIMA (2012) provides the following definition of this component:

“The name given to software systems used in healthcare facilities that register and track patients from admission through discharge including transfers; usually interfaced with other systems used throughout a facility such as an electronic health record or lab information system.” (AHIMA, 2012)
Financial and resource management systems are systems that support the business functions of the organization or practice. An example would be an accounts payable system and a supporting technology would be claims administration. Financial and employee data are stored in these systems.
In a physician setting, the practice management system (PMS) provides a combination of financial and administrative functions. A PMS automates a physician office’s patient appointment, scheduling, registration, billing, and payroll functions (AHIMA, 2012).

Integration of the electronic medical record with the PMS is paramount in today’s health care environment. For example, the stage 1 meaningful use criteria, which came about via the Health Information Technology for Economic and Clinical Health (HITECH) Act, includes requirements for the electronic collection and reporting of patient demographics along with clinical data.
As the previous slide shows, separate information systems are needed because they must meet the specific and often unique needs of a clinical or support department with specialized functionality. With so many systems in use in a health care organization, information integration is required in order to have the right information available to those who need it in an expeditious manner.

According to the Healthcare Information and Management Systems Society (HIMSS, n.d. a), “HIMSS is a cause-based, not-for-profit organization exclusively focused on providing global leadership for the optimal use of information technology (IT) and management systems for the betterment of health care” (para. 1).

HIMSS (n.d. b) defines integration as “the arrangement of an organization’s information systems in ways that allows them to communicate efficiently and effectively and brings together related parts into a single system” (para. 1).

Finally, Vogel & Perreault (2006) state “The objectives of coordinated, high-quality, and cost-effective health care cannot be completely satisfied if an organization’s multiple computer systems operate in isolation” (p. 484).
Patient care is often organized around department or function, and applications were developed to support them. For example, as noted previously, patient management and billing systems are systems that support patient management functions such as patient identification whereas clinical information systems support health care provider’s functions such as clinical documentation.

A number of applications need to be integrated. Some of these applications are:

First, from the patient management and billing component – patient tracking which monitors patient movements. The master patient index, addressed in lecture b, is another application found in this component which needs integration.

Second, from the department management component – electronic document management which manages documents (not data).

Third, from the care delivery and clinical documentation component – order entry and results reporting.
Two more examples of applications that need to be integrated:

- from the clinical decision support component – Computerized provider order entry where clinical-event monitors integrated with results-reporting applications can trigger alerts, and

- from the financial and resource management component - Patient profiling.
Vogel & Perreault (2006) describe the two strategies health care organizations use to ensure integration of functions as “First, a strategy for data preservation must be developed by providing access to data and implementing an approach for standardizing the meaning of those data” and second is the need to have separate components in the information management plan for data management, applications and business logic, and user interface in order to permit flexibility (p. 503).
HIMSS (2007), identified the following key components of enterprise integration:

- **Master person index**: A database and rules engine that contains a unique identifier for every patient or person in the enterprise, and generally finds a patient’s medical records regardless of prior names used by the patient. This ensures that a complete medical record can be obtained for a patient for patient safety purposes.

- **Single sign-on with context management**: This permits a user to enter one name and password in order to access multiple applications; context management passes the patient identifier from one application to the other.

- **Data warehouse**: Permits access of information across the enterprise through the use of a central data repository or storage system. This functionality is more recently being delivered by “just-in-time” coordinated access across multiple databases (known as “threading”), which allows for on-demand compilation of patient records” (p. 9).
Selection and implementing standards is also key to enterprise integration. These standards include structure and content, (e.g., patient identifier), vocabulary, i.e., clinical data representations, (e.g., Systematized Standard Nomenclature of Medicine Clinical Terms), content exchange, (e.g., Health Level Seven International (HL7) Standard Clinical Document Architecture), and privacy and security (e.g., National Institute of Standards and Technology (NIST) encryption algorithm).

Using standards allows for the transfer of data as well as having the data be "understood" in multiple systems.
The Office of the National Coordinator for Health Information Technology published *The Health Information Technology: Initial Set of Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology Final Rule* (2010) which includes the following standards for the certification of EHR technology:

- **Content exchange standards**
  - NCPDP SCRIPT Standard
  - HL7 Clinical Document Architecture (CDA), CCD
- **Vocabulary standards**
  - SNOMED CT
  - LOINC
- **Privacy and security standards**
  - NIST encryption algorithm
  - NIST hashing algorithm

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- Content exchange standards for exchanging electronic health information. For example, the National Council for the Prescription Drug Programs (NCPDP) Prescriber/Pharmacist Interface SCRIPT standard or the HL7 Clinical Document Architecture (CDA) Release 2, Continuity of Care Document (CCD).
- Vocabulary standards for representing electronic health information. Two examples of vocabulary standards are the Systematized Nomenclature of Medicine Clinical Terms and Logical Observation Identifiers Names and Codes.
- Standards for health information technology to protect electronic health information created, maintained, and exchanged. For example, one standard is an encryption algorithm identified by the National Institute of Standards and Technology (NIST) as an approved security function in Annex A of the Federal Information Processing Standards (FIPS) Publication 140–2. Another example is a hashing algorithm with a security strength equal to or greater than SHA–1 (Secure Hash Algorithm) as specified by the NIST in FIPS PUB 180–3. (p. 44650).
Lack of connectivity among billing and financial and clinical systems creates problems with care delivery. Vogel & Perreault (2006), point out the following problems that can occur if administrative and clinical data are not integrated:

“If clinical and administrative data are stored on separate systems, then data needed by both must either be entered directly into both systems or be copied from one system to the other. In addition to the expense of redundant data entry and data maintenance incurred by this approach, the consistency of information tends to be poor because data may be updated in one place and not in the other, or information may be copied incorrectly” (p. 484).

Vogel & Perreault (2006) explain the integration requirements. “From an organizational perspective, information should be available when and where it is needed; users must have an integrated view, regardless of system or geographic boundaries; data must have a consistent interpretation; and adequate security must be in place to ensure access only by authorized personnel and only for appropriate uses” (p. 483).

Two types of integration, data and process, will be reviewed next.
It is no wonder that information systems to support data and process integration are vital to the operations of a health care organization (Vogel & Perreault, 2006). A tool for data integration is the interface engine.

In addition, as Vogel & Perreault (2006) point out, “Even with an interface engine managing data among disparate systems, however, an organization still must solve the thorny issues of synchronization of data and comparability of similar data types” (p. 484). The next slide will explain the interface engine in more detail.

For process integration, technologies must address operational workflow and human organizational systems.
HIMSS (2010) defines an interface engine as “…an interface tool that translates functions from different systems and protocols into a common format to facilitate information sharing. It is a translator for data for files to pass between systems” (p. 65). Thus, an interface engine is a type of tool for sharing data among disparate systems.

According to Vogel & Perreault (2006), the interface engine serves as the central connecting point for all interfaces and thus a system needs only to be linked to the interface engine as the engine then handles the exchange of data to other systems that need it.
To move data from one functional application to another also requires a content exchange standard. Content exchange standards supply the specifications for the format of data exchanges, thereby providing the ability to send and receive medical and administrative data in an understandable and usable manner across information systems.

Health Level Seven International (HL7) provides a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery, and evaluation of health services. According to HL7’s web site, HL7 is “an American National Standards Institute (ANSI)-accredited standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services” (HL7, 2011, para. 1).

HL7 messaging standards move data in standard formats.
The revenue cycle is an example of where system integration is essential. Managing the revenue cycle performance for hospitals and health care organizations requires the integration of various information systems. AHIMA (2012) defines revenue cycle as “The process of how patient financial and health information moves into, through, and out of the health care facility, culminating with the facility receiving reimbursement for services provided” (p. 305).

Revenue cycle management is the management of “all administrative and clinical functions that contribute to the capture, management, and resolution of patient service” (Health Care Financial Management Association (HFMA), n.d., para 1).

Hospitals and health care organizations integrate systems between front-end clinical data collection via the electronic medical record systems and the backend billing functions and data analyses thus combining all systems to successfully manage the revenue cycle.
Next we move on to a discussion on how health care organizations can gain valuable insights from integrated data through data analytics and trending. A data-driven organization has the capacity to analyze the clinical as well as financial data thereby providing opportunities to improve patient care.

The image from Agosta (2010) shows the dynamic between islands of information represented by the individual health care information systems’ components, that is admissions, lab, radiology, surgery, pharmacy, discharge, billing, etc., data integration, and meaningful use.

As Agosta (2010) points out, “The problem is data fragmentation – islands of information. The goal is demonstrating meaningful use of Health Information Technology (HIT) to improve quality, increase revenue, and reduce cost – and also to qualify for financial reimbursements. The proposed method to get there is data integration” (p. 1).

Agosta (2010) goes on to state “Meaningful use of HIT requires designing data integration so that HIT adds value in transforming the delivery of health care services. At the front end, an example is capturing and encoding clinical data such as vital signs like pulse, blood pressure, heart rate and so on in electronic form, then using this data for clinical decision support” (p. 6).

A more complex example of data integration is computerized physician order entry (CPOE). For this situation Agosta (2010) explains, “CPOE requires the integration of several sets of data. Patient demographics are required. Physician identification is
needed. Diagnosis data is needed. The procedure and treatment of data have to be integrated with the diagnosis and patient demographics and physician data. If the physician order is more complex than 'take two aspirin and call me in the morning,' then supplementary data stores need to be marshaled to encode prescription drug identifiers, laboratory services and test results, consultations with other providers, imaging studies, and so on.” (p. 6).
Healthcare organizations have historically struggled to find the elusive link between the investment in information technology and improved organizational performance. At least a portion of this gap has been driven by the focus on the implementation of information technology (IT) solutions to support transactional workflow with little to no attention paid to how people actually use the information contained in these solutions to make decisions. The strategic value of IT lies in its power to provide clinicians and leadership with direct visibility into the care delivery process. When little or no attention is given to the strategic use of information as part of an electronic health record (EHR) implementation, organizations are often disappointed by the return on investment and value received as a result of the significant investment (Clinfowiki, 2011, para. 1).

One solution to help close this gap is in the implementation of business intelligence and data warehousing. Loshin (2003) (as cited in The Data Warehousing Institute Faculty Newsletter, 2002), defined business intelligence as “The processes, technologies, and tools needed to turn data into information, information into knowledge, and knowledge into plans that drive profitable business actions. Business intelligence encompasses data warehousing, business analytic tools, and content/knowledge management” (p. 6).
Clinfowiki (2011, para. 3) lists the following examples of Business Intelligence applications:

- Decision Support Systems,
- Executive Information Systems,
- Online Analytical Processing (OLAP),
- Query and Reporting Tools,
- Business Process Monitoring,
- Performance Scorecards and Dashboards,
- Data Mining, and
- Predictive Analytics
This concludes Lecture a of *Administrative, Billing, and Financial Systems*.

In this lecture, administrative, billing, and financial systems that need to be integrated in health care information systems were explained, health care organizations’ strategies to ensuring integration of functions were described, and critical integration elements discussed. The final topic covered was business intelligence applications. These tools can help health care organizations gain valuable insights from integrated data through data analytics and trending.
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