Informatics and HIM: Enabling Semantic Interoperability and the Learning Health System

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By Anna Orlova, PhD

Medical informatics is a field formalized in the 1990s with the rise of the adoption of information technology in healthcare including electronic health records systems (EHRs), laboratory information management systems (LIMS), radiology systems, and other health information technology (HIT) products.[1] Since then, various healthcare domains adopted informatics, creating informatics domains such as health sciences informatics, clinical informatics, nursing informatics, dental informatics, public health informatics, bio-medical informatics, operational informatics, and others.

Based on the joint definition of informatics with the American Medical Informatics Association (AMIA), AHIMA defines informatics as "the interdisciplinary field that studies and pursues the effective generation and uses of health data, information, and knowledge for scientific inquiry, problem solving, and decision making, motivated by efforts to improve human health, public health and population health."[2]

The main purpose of informatics is to ensure that user needs—work processes as well as data and information needs—are adequately supported by HIT. Using the main informatics scientific methodology known as modeling, informaticians are "translators" that communicate the needs of the users (clinicians, public health professionals, consumers, government, and others) into the functional requirements for the information systems and HIT applications, allowing applications to support users' needs.[3]

Informatics and HIM

Recognition that health information management (HIM) intersects with informatics in many ways has been realized by HIM professionals and medical informaticians "because the core skill set for both [informatician and HIM] positions is very similar," according to an article published in *Applied Clinical Informatics*.[4] Facilities that adopted EHR technology had been utilizing informatics methods for codification of health information in EHR systems, clinical documentation improvement (CDI), ensuring patients access to their own information (consumer empowerment and engagement), data analytics and population health analysis, data reporting, and other applications.[5]

HIM professionals and informaticians are frequently engaged at the provider or payer level to ensure the fidelity of patient-related data that flow into/from EHRs and other information systems involved in the generation of the patient-encounter data (LIMS, radiology, pharmacy, public health, and other information systems), data warehouses, and financial systems.[6]

All these efforts, both by informaticians and HIM professionals, are aimed at allowing clinicians to share health data, information, and knowledge via the means of interoperable HIT.

Supporting Semantic Interoperability

Health Level Seven (HL7) defines "interoperability" as "the ability to [capture,] communicate, and exchange data accurately, effectively, securely, and consistently with different information technology systems, software applications, and networks in various settings, and exchange data such that clinical or operational purpose and meaning of the data are preserved and unaltered."[7] AHIMA has added the word "capture" to the original definition to better enable its use of the definition.

One of the most challenging efforts of informatics is to enable representation of content in information systems, so that these systems can capture quality data, assemble these data into quality information, and share this information with those who need to know. Representation of the data-information-knowledge continuum in HIT products is a foundation for semantic

interoperability, one of the three pillars of interoperability (i.e., semantic (content), technical (communication infrastructure), and functional (information governance or "rules of the road").

HIM and informatics are well positioned to support semantic interoperability in HIT products because HIM activities are very closely aligned with the informatics methodology (modeling) in representation of content and translating data into information and into knowledge, thus addressing user needs and delivering quality data, information, and knowledge to those who need to know.

Figure 1. Semantic Content Components

Figure 1, above, presents knowledge components that comprise semantic content (knowledge continuum) that is supported by HIT systems. Examples of semantic content components in healthcare include:

Knowledge

1. Guidelines and best practices
2. Use cases (specific scenarios of care described in the guidelines and/or best practices)

Information

3. Information that is needed/generated within a use case as medical summaries, documents, records, images, forms, reports, etc.

Data

4. Datasets that populate specific information categories such as patient demographics, triage notes, medical summaries, and others
5. Value sets and codes that define specific data elements and computer codes for these values

Informatics is a field that models the organization and relationship across these components of semantic content.

Figure 2. Semantic Content Components, Informatics, and HIM Practices

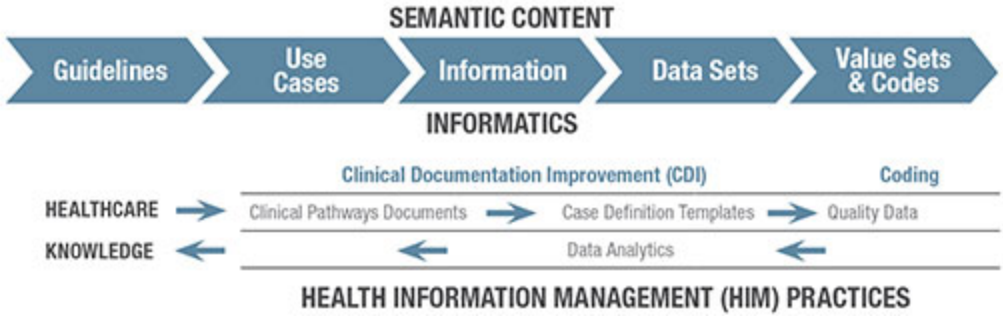


Figure 2, above, shows that HIM through CDI, coding, and data analytics make it possible for semantic content components to work together, enabling semantic interoperability of health information systems.

For example, CDI efforts stand for a classical informatics activity in modeling clinical content to be captured in the clinical documentation. CDI specialists work with clinicians (physicians and nurses) to formulate clinical pathways documents—such as operational procedures that clinicians will follow in care delivery, based on the review of the clinical knowledge from the clinical guidelines, best practices, and peer-reviewed medical publications. They further work with clinicians to develop case definition templates—such as how to document malnutrition or blood loss anemia in the EHR systems—to capture data that will be generated through the clinical pathways to assure capture, processing, and use of quality data and information in HIT applications.

Coding efforts assure that data are adequately translated into a machine-readable format and can be effectively assembled into information. Data analytics verifies completeness and correctness of data, integrity of information and, lastly, validates the knowledge itself. Today, HIM professionals are involved in all of these activities (CDI, coding, and data analytics) thus supporting professionals in various informatics domains. This includes providing clinicians with data at the point of care and enabling surveillance activities and research through data analytics for public health professionals, researchers, and others.

Supporting the Learning Health System

Semantic interoperability is closely aligned with the concept of the Learning Health System (LHS), which was discussed at length in the 2015 Interoperability Roadmap from the Office of the National Coordinator for Health IT (ONC).[8] In fact, the LHS cannot be achieved without semantic interoperability.

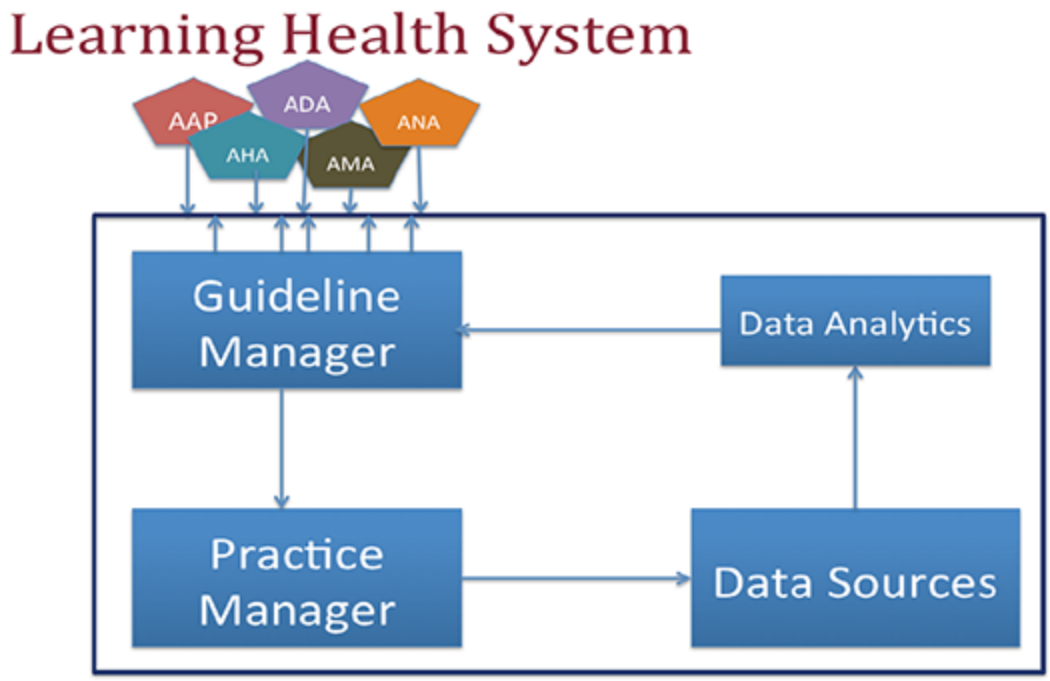
The concept of a continuous Learning Health System "is based on cycles that include data and analytics to generate knowledge, leading feedback of that knowledge to stakeholders, with the goal to change behavior to improve health and to transform organizational practice. At the heart of the Learning Health System is instilling the capacity and commitment to learn at all levels of the healthcare system, making every stakeholder interaction an opportunity to continuously improve the system."[9] Various academic and research organizations support LHS activities.[10,11]

HIM through CDI, coding, and data analytics is well positioned to support the LHS. This becomes specifically apparent after modeling the HIT systems components that support LHS.

Figures 3A/3B. HIT Modules Supporting Knowledge Generation: (a) LHS and (b) HIM and LHS

This chart shows how the American Academy of Pediatrics (AAP), American Medical Association (AMA), American Diabetes Association (ADA), American Nursing Association (ANA), and American Hospital Association (AHA) would interact with the Learning Health System by supplying clinical knowledge to the Guideline Manager. Note: CHDA stands for Certified Healthcare Data Analyst—a data analytics credential offered by AHIMA.

Figures 3A



Figures 3B

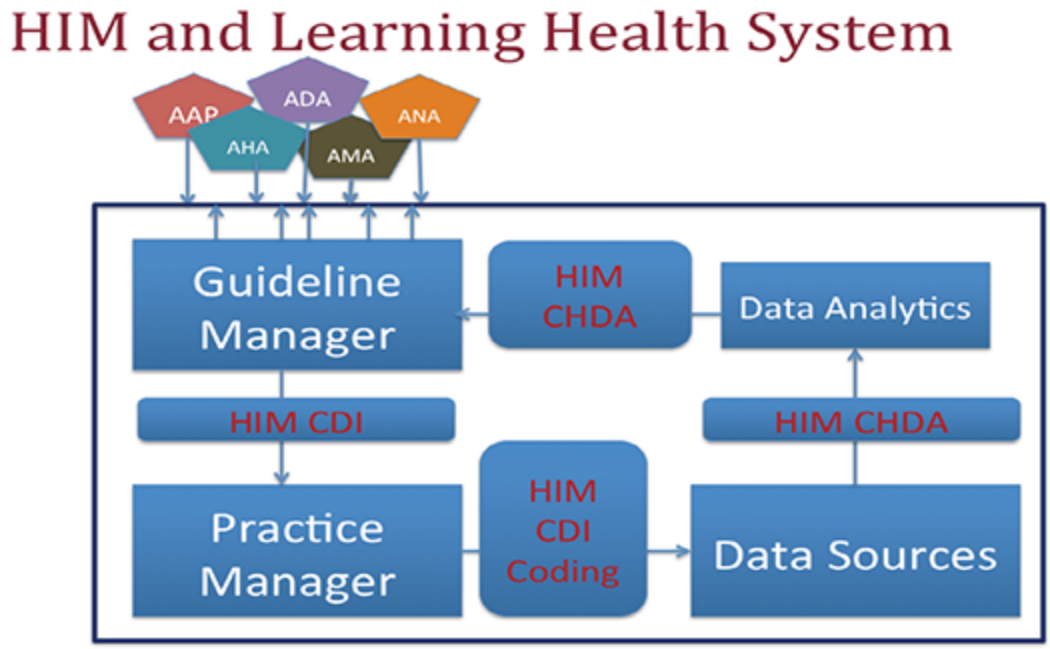


Figure 3a, above, presents modules within a health information system participating in the knowledge generating process depicted on Figures 1 and 2, such as guideline manager, practice manager, data sources, and data analytics engine. This is shown as follows:

Knowledge

1. **Guideline Manager** module contains resources of medical knowledge described in the guidelines, best practices documents and peer-reviewed publications developed by various professional associations, committees, public health associations, and agencies.

Knowledge and Information

2. **Practice Manager** module contains operational procedures and required documentation (clinical pathways, case definitions, and documentation templates) developed and used by an organization (healthcare facility) based on the guidelines and best practices.

Data

3. **Data Sources** are various HIT applications (EHRs, LIMS, public health information systems, mHealth applications, etc.) that contain data captured according to the operational procedures and completion of the required documentation defined by an organization.
4. **Data Analytics** module allows one to process data from the Data Sources to ensure:

    A. The desired outcomes of care delivered according to the operational procedures, and, ultimately, guidelines and best practices
    B. Validation of the guidelines and best practices themselves thus supporting substantiation of the current knowledge and/or producing new knowledge (i.e., supporting LHS)

It is interesting to note that the HIT modules described above and depicted in Figure 3a were originally specified by the Integrating the Healthcare Enterprise (IHE) in 2009 under the Patient Care Coordination Technical Framework (PCC TF) to guide the development of IHE content profiles for semantic interoperability. AHIMA believes that IHE PCC TF very well represents the HIT modules for knowledge generation, management, and use in a Learning Health System. As shown on Figure 3b on page 48, today HIM professionals operate these modules capturing, managing, analyzing, and enabling the authorized access to information for healthcare stakeholders.

With growing HIT adoption, the industry is beginning to see a modernization of the HIM profession and expansion of its traditional roles of record managers and coders into pure informatics activities such as workflow and data flow modeling under CDI, quality data capture through coding, and, finally, knowledge validation through data analytics. HIM is also seeing that today every healthcare organization is discovering this transformation on its own.

Best practices of this growing modernization need to be documented and standardized to introduce effective HIM/informatics practices in organizations that are moving towards HIT adoption. In a knowledge sharing, semantically interoperable electronic environment of LHS, practices for data-information-knowledge management at various organizations that own participating data sources have to be harmonized and standardized, and brought up to the levels which will assure that only quality data-information-knowledge is contributed into exchange. It is time to align HIM/informatics practices with HIT capabilities and refine the roles and activities for HIM professionals in informatics, so that HIM practices can effectively support semantic interoperability and the knowledge generation/sharing process of LHS depicted on Figures 2 and 3b.

Achieving semantic interoperability and LHS will require cross-collaboration of various organizations representing health and HIT stakeholders. HIM professionals look forward to discussions and specific activities with all interested parties that will help the industry to jointly build semantic interoperability and LHS in healthcare.

Notes

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Anna Orlova (anna.orlova@ahima.org) is senior director of standards at AHIMA.

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