Research and Policy Model for Health Informatics and Information Management

by Elizabeth Layman, PhD, RHIA, CCS, FAHIMA

Health informatics and information management (HIIM) is an applied research discipline that integrates health, computer science, and business. Researchers in an applied discipline answer the questions of why and how. Policy makers, who can be leaders of health systems, legislators, or regulators at governmental agencies, are often the sources of these questions. In this research model, data collection is driven by external questions focused on the use of information in a real-world situation.

As practitioners in this discipline, we must begin to ask ourselves questions such as these: How can the information gathered over more than 100 years be organized into a systematic body of knowledge? More important, how can future investigations be guided to advance the body of knowledge?

This special issue investigates the HIIM discipline's role in policymaking and research. Experts from many areas of specialization within the HIIM discipline review the current state of the discipline within their specialty. In their observations and analysis, they provide insights into future policies and implications of policies. They recommend research to support these directions or the general advancement of the discipline's body of knowledge.

For more than 100 years, personnel in health informatics and information management have functioned quietly behind the scenes. In that role, they have developed policies and procedures for the management of health records. Most often, these personnel worked for one healthcare organization, typically the acute care hospital. They managed the records and information systems of one organization. Now, however, these same personnel work for integrated delivery systems. They manage records across the continuum of healthcare. Thus, they need to know the governmental regulations, accrediting standards, and conventions of practice for several sites or potential sites of healthcare including physician group practices, acute care hospitals, skilled nursing facilities, home health agencies, and hospice facilities. Practitioners in the HIIM discipline now develop policies and procedures for all these sites.

Governmental regulations, accrediting standards, and conventions of practice form the parameters of policies and procedures. Now, though, personnel must also consider evidence-based practice. Leaders ask, "Upon what evidence is this policy or procedure based?" or "How do we know that this policy is effective or this procedure efficient?" The evidence comes from

research. Thus, it has evolved that, to the traditional role of developer of policies and procedures, health informaticians and information managers now add the role of researcher.

Research findings or evidence, however, must be interpreted and disseminated. Health informaticians and information managers have long made the distinction between data and information. Information is data that have been analyzed and interpreted. However, in today's healthcare system, we need to go beyond information. All stakeholders, healthcare providers, administrators, policy makers, patients, and clients need knowledge. Knowledge is information that has been organized into a structure. The discipline of health informatics and information management is now building its body of knowledge. We must become knowledge managers and disseminate knowledge, not just information.

The structure of our body of knowledge is evolving. One structure promulgated by the American Health Information Management Association (AHIMA) is the Data Quality Management Model (Figure 1). I would propose a more inclusive and comprehensive model that expands the AHIMA Data Quality Management Model into a Research and Policy Model for Health Informatics and Information Management (Figure 2). This model is built on the familiar input-process-output model, a conceptualization of Von Bertalanffy's general system theory.[1] This expanded model shows the impact of the discipline on healthcare and society.

As health informatics and information management researchers create and refine evidence about the discipline, evidence can be inserted into the model. In this way, the model organizes and provides a context for the evidence. The model also shows potential relationships and gaps in evidence. Thus, the model can provide a systematic approach to the discovery, investigation, and validation of evidence. The process of research itself can become structured and organized. Using the proposed model highlights gaps in knowledge and thus assists in directing the next generation of research.

The relationship components of the Research and Policy Model for Health Informatics and Information Management correspond to the input-process-output model. Inputs affect the process, and the process affects the outputs. In this model, the relationships flow both ways, as shown by the dual directions of the arrows. Thus, outputs can affect the process, and the process affects inputs. Each of the three components of the model—inputs, process, and outputs—will be discussed.

Domains of inputs into quality health data are individual attributes, professional standards and conventions, technological characteristics, and societal expectations. Each of these domains has several sectors, such as individual persons, individual groups, individual organizations, and individual systems. In another example, the domain of professional standards and conventions includes terminologies and nomenclatures, messaging standards, regulations, voluntary standards, and professional practice standards, to name a few. The domain of technological characteristics uses the broad definition of technology as a means of doing a societal activity. Thus, technology includes methods, tools, procedures, protocols, techniques, or devices used in society. The inputs are theorized to affect the quality of health data. However, as previously noted, the arrows point both ways. Thus, quality health data could affect individual attributes, professional standards and conventions, technological characteristics, and societal expectations.

For example, evidence about the lack of accuracy in data could affect *future* technological characteristics or *future* revisions of professional standards and conventions.

The process or core of the model is quality health data. Characteristics of data quality originate in the Data Quality Management Model.[2] These characteristics are accessibility, consistency, currency, granularity, precision, accuracy, comprehensiveness, definition, relevancy, and timeliness.[3] The domains of the inputs affect quality health data, and quality health data affects outputs.

The domains of the outputs are society, population health, individuals' health, and the profession. Similar to the input domains, these output domains also include multiple sectors. For example, population health could be the health of a nation, such as the United States or Kuwait. Population health could also be the health of citizens in a rural region of a U.S. state or a Canadian province. Population health could also be the health of one managed care organization's members or one underserved group. The domain of individuals' health could look at the health outcomes for persons with various diseases, such as cancer, multiple sclerosis, or diabetes; with various health statuses, such as family history of cancer or heart disease; or with various risk assessments. The domain of the profession includes several sectors, such as educational curricula, the members' perceptions of themselves, and others' perceptions of the discipline's members.

Using this model, a researcher could conduct a correlative study investigating the relationship between an element of individual attributes and quality health data. For example, the researcher could investigate the relationship between cognitive response to alerts and the accuracy of health data. Another researcher could conduct a study investigating the relationships among cognitive response to alerts, accuracy of health data, and health outcomes for patients with chronic congestive heart failure.

Two recent articles in *Perspectives in Health Information Management* and two articles in this special issue provide an opportunity to "test" the model. These articles investigate various aspects of health informatics and information management.

The first article described the use of decision support in a nursing home clinical information system.[4] The decision support comprised triggers and their associated alerts. The researcher described the proportion of triggers and alerts within and across residents' diagnoses. For six months, the clinical information system was queried daily, and data were collected on the triggers and alerts activated. Data from two of the three nursing homes involved in the study were used because the third facility's data were viewed as inaccurate. While few nursing homes have implemented clinical information systems, the researcher proposed that findings from these few implementations could inform and improve the design, implementation, and evaluation of future systems. Types and frequencies of triggers and alerts were analyzed.

Two input domains from the proposed model were involved in the study, technological characteristics and individual attributes. For example, in terms of system functioning, nursing home staff members were unaware of the location of alerts and how to address them. In terms of individual attributes, the users' perceptions were affected by the availability of technical supports and equipment and by the preparation for change. Again in the language of the model, the researcher suggested that data from both input domains affected the accuracy of data (quality health data). Basing his remarks on his findings, the researcher noted potential areas of future software development. In this case, in the language of the model, the findings from quality health

data fed back into the input domain of technological characteristics. Although the researcher did not interpret his findings regarding the effects of the availability of technical supports and equipment and preparedness for change, these findings, if inserted into the model, would suggest that quality health data fed back into individual attributes (organizations and personnel). The researcher specified that the purpose of the study did not include the testing of the effect of the clinical information system on residents' outcomes. However, the structure of the model suggests that a potential future study would be the investigation of the effect of quality health data, derived from the clinical information system, on residents' outcomes, that is, population health or individuals' health.

The second article described ambulatory care physicians' levels of awareness and engagement with patients who maintain personal health records (PHRs).[5] Generally, the physicians' levels of awareness and engagement were low. The focus of this study was the input domain: the physicians' levels of awareness and engagement represent the input domain of individual attributes. The researchers did not investigate the relationships between awareness and engagement and the process of quality health data nor did they investigate the outputs. However, in the article's literature review, the researchers suggested *potential* relationships. The researchers suggested a relationship between the input domain and the process domain of quality health data. The researchers associated the inclusion of data from PHRs with "complete" records and with accessible and available records. These descriptors align with the characteristics of "comprehensiveness" and "accessibility" of quality health data. In the article's literature review, the researchers also suggested a relationship to the output domain. The researchers noted that enhanced availability can reduce the costs of medical care or, in the language of the model, the society sector of the output domain. The researchers also cited literature that related persons' use of PHRs with increased health and decreased absenteeism. In the language of the model, these outcomes are encompassed in the sector of individuals' health in the output domain.

In this special issue, Brodnik and Houser examine the role of health informatics and information management researchers. These authors call upon health informatics and information researchers to investigate and determine the best systems, procedures, and programs to delivery quality, safe, and effective care and services to the public. Thus, in terms of the model, skills and interest in research would be individual attributes. Moreover, the research would be conducted in domains on the input and output sides of the model. For example on the input side, determining the best systems would focus technological characteristics. Additionally, determining the best procedures would focus professional standards and conventions. On the output side of the model, the delivery of quality, safe and effective care via quality health data would affect the domains of society, population health, and individuals' health. Thus, these authors' insights have implications for many aspects of the model.

Finally, in their article "Expanding the Health Information Management Public Health Role" in this special issue, Houser and colleagues discuss the role of health informaticians and information managers in public health research and data management, policy development, and disaster preparedness and response management. These researchers contend that health informaticians and information managers are positioned to support the core public health functions of assessment, assurance, and policy development. Following the model, these researchers' discussion focuses on the input domain of individual attributes. The researchers describe the attributes of health informaticians and information managers in terms of their

expertise, skills, and knowledge. Implied is the effect of the expertise, skills, and knowledge on quality health data and, consequently, on the domain of population health.

Health informaticians and information managers have much to contribute to health research and policymaking. A record of contributions spans more than 100 years. Researchers have investigated a range of diverse topics including personality traits; classifications, nomenclatures, and terminologies; computer alerts; educational techniques; factors in the successful implementation of clinical systems; managerial techniques; and prevention, diagnosis, and treatment of disease. The next step for researchers in the discipline is to adopt a theoretical approach to structure their diverse information into knowledge. A suggested model for this theoretical approach is the Research and Policy Model for Health Informatics and Information Management. Much additional work on this model is needed, such as the clarification of boundaries between items and the establishment of direct relationships among inputs and outputs. Future research will discover and define these refined components. Ultimately, knowledge derived from this model will support the efforts of policy makers to improve the U.S. healthcare delivery system.
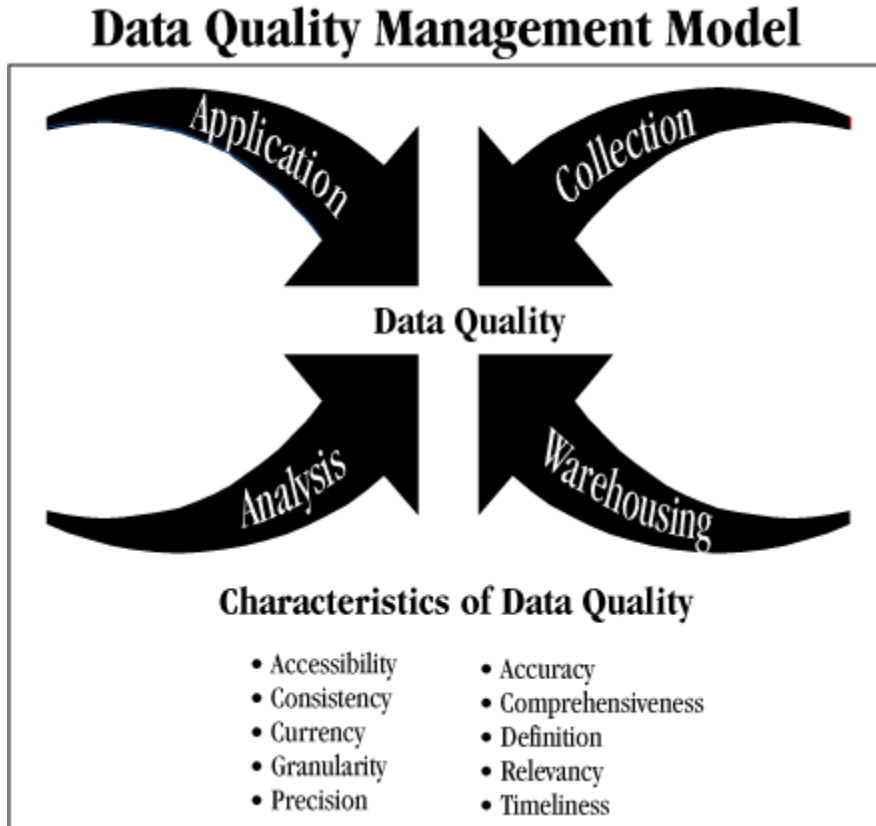
Elizabeth Layman, PhD, RHIA, CCS, FAHIMA, is professor and chair of the Department of Health Services and Information Management at East Carolina University in Greenville, NC.

Notes

1.   Von Bertalanffy, L. "An Outline of General System Theory." *British Journal for the Philosophy of Science* 1, no. 2 (1950, August): 134–165.

2.   AHIMA Data Quality Management Task Force. "Practice Brief: Data Quality Management Model." *Journal of AHIMA* 69, no. 6 (1998): n.p.

3.   Ibid.

4.   Alexander, G. L. "A Descriptive Analysis of a Nursing Home Clinical Information System with Decision Support." *Perspectives in Health Information Management* 5, no. 12 (2008): 1–22.

5.   Fuji, K. T., K. A. Galt, and A. B. Serocca. "Personal Health Record Use by Patients as Perceived by Ambulatory Care Physicians in Nebraska and South Dakota: A Cross-Sectional Study." *Perspectives in Health Information Management* 5, no. 15 (2008): 1–16.

Figure 1

AHIMA's Data Quality Management Model

Data Quality Management Model

Application · Collection

Data Quality

Analysis · Warehousing

Characteristics of Data Quality

- Accessibility
- Consistency
- Currency
- Granularity
- Precision

- Accuracy
- Comprehensiveness
- Definition
- Relevancy
- Timeliness

Source: AHIMA Data Quality Management Task Force. "Practice Brief: Data Quality Management Model." *Journal of AHIMA* 69, no. 6 (1998): n.p.

Figure 2

Research and Policy Model for Health Informatics and Information Management