



Chapter V

Data and Knowledge

Learning Objectives

- Identify key standards in the health care information systems arena and indicate how they support interoperability
- Identify the coding systems used in health care and their conceptual frameworks
- Contrast aggregated clinical data with aggregated administrative data
- Delineate the pros and cons of various representation and reasoning schemes for medical knowledge—flow charts, databases, decision theory, and rule-based expert systems
- Develop a utility analysis for a medical decision
- Develop a rule-based expert system for a medical decision
- Construct a situation under which a decision-support system is likely to succeed in practice
- Differentiate vision and robotic systems from medical diagnosis systems
- Use effectively a medical literature retrieval system

In the 1960s and early 1970s, the emphasis in hospital information systems was on operational control—active monitoring of routine task performance, with emphasis on doing highly structured tasks better, faster, and cheaper. This *operational control* has been extensively achieved with systems such as patient accounting and medical

records. The next era of application, which followed in the late 1970s and early 1980s, shifted attention toward functional effectiveness in the form of management control (Tan, 2001). In practice, this is often accomplished by data aggregation, analysis, interpretation, and presentation (Bali, 2005). Since the 1980s, a major trend has been the development of knowledge-based systems to support clinical care.

Data

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) emphasizes the distinction between *aggregated* and *comparative* data. To aggregate in this context means to combine standardized data and information. Comparative data is data about the internal operations of an entities and data about other comparable entities; an entity then compares its performance with those of others by analyzing the internal and external data.

Aggregated Clinical Data

Prior to computerization, a hospital might have maintained a *card catalogue* that documented the number of surgeries of each type performed in the hospital. These and numerous other procedure and disease patterns were coded with nationally or internationally standardized codes. With the increasing prevalence of electronic medical records and other databases, card catalogues are no longer needed. Instead, a query can be generated against the patient medical record database to answer questions, such as how many surgeries of a certain type were performed in the hospital. With the computer, the range of queries that can be quickly answered is much greater than was the case when card catalogues were the source of information. Whether with card catalogues or electronic medical records, the coded data constitutes aggregated clinic data.

Another source of aggregated data is a *registry*. Registries are lists that generally contain the names and other identifying information of patients seen in a particular area of a health care provider. For instance, a register might show the people seen in the Emergency Room. Research also benefits from registries. The mission, design, size, methodology, and use of technology vary with each kind of registry. Examples of some of the most widely used registries include cancer, AIDS, birth defects, diabetes, organ transplants, and trauma. Cancer registries are the most common and are elaborated here. Physicians and epidemiologists concerned with assessing cancer incidence, treatment, and results have long accepted the collection, retrieval, and analysis of cancer data as essential. The types of cancer registries are defined as either hospital-based or population-based (Smith, 2000).

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