Chapter 15
Enforcing Data Integrity in Pharmacy

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ABSTRACT

Data integrity is essential to every organization and to every healthcare practitioner in order to ensure the correct use of patient information to optimize care. It provides the assurance that the data you see every day is the same as it was the day before. It assures you that the drug dosage regimen "QID," whether you define it as four times daily or four times daily with meals and at bedtime, is applied using the same parameters for every patient, as you define a patient, across every day (or any time period), as you define day in your health care setting. Definitions about data must be made by the business person (the practitioner), rather than by Information Technology (IT). Only by doing this can appropriate business rules by applied by a database, which manages the information used in electronic medical records. Once a decision is made about what a datum represents, whether by an individual or a group, it is imperative that the decision remain consistent over time. Should the definition evolve, it is also imperative that that evolution be tracked. Thus, organizations must establish governance committees to maintain consistency both across an organization and across time. Governance committees must have the highest level of authority to ensure that rules are not overridden on a casual, intermittent basis. Once business rules for data have been established, use of a relational database provides one of the strongest tools for ensuring that data integrity is maintained. This chapter explores the concepts serving as the foundation for today's relational database management systems. A top-down approach is described using an Entity-Relationship diagram that can be used to create a relational model for implementation in a relational database management system. A bottom-up approach is described using functional dependencies and normalization. A pharmacist should be able to apply these concepts in corporation with a database architect to ensure the appropriate, consistent use of drug data within an organization. A pharmacist must be able to validate all drug information being used across the organization in order to minimize medication errors and optimize patient care. Only by being the subject matter expert on governance committees and working closely with IT and quality assurance can pharmacy maintain appropriate control over the use of drug information by healthcare technology.

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INTRODUCTION

The need for correct information in healthcare is vital, but the ability to maintain—and provide—correct information lags behind our need today. Correct information is only as good as the integrity of the data. Pharmacy has long operated under the axiom "the right drug to the right patient at the right time." Today's application of technology within healthcare leads to a rephrasing of this to: "the right information to the right person at the right time." Information systems throughout an organization require careful review and assessment in order to ensure that this occurs. (Lapinsky, 2008; Ward, 2004) This underlies the need for high data integrity. But data integrity can become mind-boggling. Understanding the simple phrase "Data integrity is 'keeping data 'whole'" becomes an etymological adventure. The more an individual uses data over time, or the more data is used by a wider audience with broader needs, the greater the risk for different interpretations—thus, the need for stronger rules to ensure data integrity. Data integrity must be applied across a system. Not a computer system; rather, an organizational system. Maintenance of data integrity requires agreement on the definition and purpose of all data by all individuals within an organization. Today's widespread use of electronic storage and sharing of data highlights our limited ability to control quality and consistency of data. Thus, it is imperative that we utilize processes and tools to ensure data integrity.

Appropriate enterprise governance and data governance must be assigned from the top authority in an organization down in order to improve odds that no data mistakes are made. Data governance is the task of setting standards for what type of data can be entered in a record of a column. It is commonly the authority of a team of technical and business users. Enterprise governance is the corporate assignment of authority to the person who has the right to decide data governance rules. If a database is used by only one person, that person has the authority. If a database is used by multiple departments in an organization, it is wise to establish an enterprise governance committee to identify and enforce lines of authority across decision makers throughout the organization. This ensures that the person responsible for data in a column is not overridden inappropriately.

Data integrity is the primary purpose for utilizing a Relational Database Management System (RDBMS). RDBMS is a software application and - along with a Structured Query Language (SQL), a programming language built upon the same mathematical principles—a relational data model. The relational data model is both so simple and so powerful that is has become the largest software application industry, with a market size of $18.8 billion in 2008. (Gartner, 2009) This chapter introduces concepts for the relational model and its appropriate application to RDBMS and SQL used in healthcare systems, in order to allow pharmacists to ensure the quality of drug information is applied consistently and appropriately. Relational databases are in common use today by individuals or across entire companies or organizations through data warehouses. Many vendors continue to extend the relational concept in competition with other data sharing concepts that include object-oriented and multi-dimensional modeling. At this point, RDBMS vendors remain in the lead in both capabilities and market dominance. (Feinberg, 2011; Monash Research, 2011)

BACKGROUND

Edward (Ted) Codd first proposed the relational model in 1970 (Codd, 1970). The relational model is based on first-order predicate logic. Since that time, an RDBMS has become the primary tool for storing and retrieving data across major organizations. It has also been applied to applications focused on personal storage and retrieval of data. Much of this growth has come from the simple, elegant principle of the relational model, along