A Model for Measuring Industry-Wide Adoption and Capability of Healthcare Analytics and Data Warehousing in the USA

Dale Sanders

The United States (US) healthcare industry is undergoing three major, overlapping developments in the evolution of data management and information technology utilization: (1) Data collection, characterized by the adoption and meaningful use of electronic medical records; (2) Data sharing, characterized by the adoption of health information exchanges; and (3) Data analysis, characterized by the adoption of enterprise data warehouses and analytic tools.

In 2004, the Healthcare Information Management Systems Society (HIMSS) published the seven-stage EMR Adoption Model (EMRAM), creating a pivotal framework for measuring the industry's advancement toward the use of computerized medical records. The EMRAM was also useful to vendors and led to the development of the federal Meaningful Use criteria. In addition, hospitals and physician organizations used the EMRAM as an internal guide for assessing their progressive utilization of an EMR. No such industry-wide framework for the adoption and utilization of health information exchanges (HIEs) exists, but, recently, several organizations have published frameworks for business models to address the poor track record of economic sustainability for HIEs.

The adoption of enterprise data warehouses, business intelligence and analytics in healthcare is estimated at approximately 10%, with substantial growth anticipated in the next decade (Frost & Sullivan 2012). A generally accepted framework for adoption and meaningful use of data warehouses and analytics in healthcare could be very beneficial, in ways similar to the HIMSS EMRAM. The eight-level framework depicted in Figure 1 is proposed for that purpose, with the hope that comments and feedback for improvement will result in a nationally recognized standard.

The previously mentioned data collection phase, characterized by the urgent deployment of EMRs, will not, by itself, have a significant impact on the quality or cost of healthcare in the US. Numerous retrospective studies of EMR deployment have yet to reveal anything other than a very modest return-on-investment (ROI) (Goodman 2005; Hillestand et al. 2005) and those modest returns are very dependent on complex local factors of deployment. More recently, the US Secretary of Health and Human Services and Attorney General issued a national letter of warning (24 Sep 2012) to five healthcare industry associations, suggesting that electronic health records are actually increasing the cost of care in the US by enabling fraudulent billing and "up coding." However, the investment in EMRs, as a source of workflow transaction data, is fundamentally required to achieve the value that is accessible in data warehousing; and the ROI from data warehousing is well-documented (Nucleus Research 2002). The ROI from the more than $50B invested in EMRs, let alone impactful health reform, will not be realized until the healthcare industry invests in enterprise data warehousing and commits culturally to the exploitation of data – that is, to become a data-driven culture, incented economically to support optimum health at the lowest cost.

FIGURE 1.
Healthcare Analytic Adoption Model©

Level 7	**Personalized medicine: Integration of genomic, familial, text, and patient self-reported data used for predictive modeling, preventive care and wellness management.**
Level 6	**Waste elimination:** The focus is in maximizing quality and minimizing cost of production. Complex modeling and forecasting is readily available. Data from ACO partners and claims is integrated with patient specific costing and claims data and used for identification and elimination of variability & waste in the complete, end-to-end care process.
Level 5	**Cultural data literacy:** Permanent technical and clinical improvement teams in-place for top 10 conditions; at least 60% of employees have access to KPIs actionable to their role. Analytics are embedded in the EMR to affect clinical & financial improvements at the point of care.
Level 4	**Evidenced-based population management:** Patient registries for at least the top 10 patient conditions within the organization, supporting acute & chronic condition mgmt; measurement of clinical guideline usage; and clinical research
Level 3	**Automated external reporting:** Regulatory and other reports such as Value-based Purchasing, PQRS, MU; accreditation/ regulatory such as JCAHO, ACC, STS, HEDIS. Adherence to industry standard vocabularies are required at this Level.
Level 2	**Automated internal reporting:** Key performance indicators, highly interactive dashboards and reports that allow for effective hospital and clinic management and business modeling are available.
Level 1	**Vocabulary, metadata, & data governance:** Searchable metadata repository, core data elements linked with standardized naming and data types. Data governance & stewardship processes in place.
Level 0	**Core data integration:** As a minimum – EMR Level 3 data, Revenue Cycle, Financial, Costing, Supply Chain, and Patient Experience integrated into a single data warehouse.

Historically, healthcare delivery organizations in the US have focused on, at best, managing quality and cost separately. In truth, were it not for pressure from the federal government and private insurance companies, the US healthcare system would be even less inclined to measure, and less mature at measuring, quality of care. In addition, the predominant methodology in US healthcare enterprises is to measure cost of operations, not cost of production, the latter being a reflection of the costs required to achieve the production of a given outcome and the former being simply an indication of current run rates unrelated to product quality. In the future, CFOs and other C-level executives must manage both quality and cost and understand the interplay between the two, as implied in the healthcare value equation, below. This equation represents the foundational motive underlying healthcare analytics in the future.

$$\text{Healthcare value} = \frac{\text{Adherence to evidence-based medicine} \times \text{patient-reported outcome}}{\text{Cost of production} + \text{reasonable operating margin}}$$

A follow-on paper, to be published in the next issue month, will provide further details and arguments for the importance of a Health Analytic Adoption Model as a means of deriving the value from substantial US EMR investments.

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About the Authors

Dale Sanders is Senior Advisor to the Cayman Islands National Health System; Senior Vice President, Healthcare Quality Catalyst; Senior Research Fellow, The Advisory Board.

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