MATH MATTERS

Apply It.

The math behind...

Healthcare Data Analytics Research

HIMSS Analytics Asia/Middle East
EMR Adoption Model℠ - Dubai Hospitals

Stage 7	Complete EMR; CCD transactions to share data; Data warehousing; Data continuity with ED, ambulatory, OP	0.0%
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), Closed Loop Med Admin	0.0%
Stage 5	Full Complement of Radiology PACS	0.0%
Stage 4	CPOE, Clinical Decision Support (clinical protocols)	4.3%
Stage 3	Nursing/clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology	4.3%
Stage 2	CDR, Controlled Medical Vocabulary, CDS, may have Document Imaging; HIE capable	30.4%
Stage 1	Ancillaries – Lab, Rad, Pharmacy – All Installed	39.1%
Stage 0	All Three Ancillaries Not Installed	21.7%

Source: HIMSS Analytics® Database N = 23 © 2012 HIMSS Analytics 7

Technical terms used:

Smart healthcare, data mining, healthcare management, predictive modeling

Uses and applications:

Disease diagnosis, effective treatment, fraud detection, customer relationship management, improving healthcare services, and providing information to clinicians

How it works:

The emerging use of computing technology in healthcare continues to grow. Researchers have extensively applied statistical and data mining tools to enhance big data analysis. Disease diagnosis is one of the most common applications where data mining tools are achieving successful outcomes. For a specific disease, statistical analyses help to determine the key factors (e.g., age, blood pressure, cholesterol, and smoking habit) associated with that disease. Knowledge of the risk factors related to a specific disease helps clinicians to identify patients most likely to have that disease (e.g., heart disease). Health care professionals store large amounts of patients' data. It is important to analyze these datasets to extract useful knowledge by using data mining techniques. The most common techniques for classification are Naive Bayes, Decision Tree, Neural Network, Support Vector Machine, and Ensemble Learning techniques. Since training classifiers in a high-dimensional input space with hundreds of thousands of training examples can be computationally expensive, researchers continue to develop efficient data mining techniques to handle the huge number of features and examples.

In addition, data mining models help the healthcare industry to improve the level of satisfaction of patients through detecting the current and future needs of patients and predicting which patients might require specific healthcare services. Data from online credit ratings and surveys are required for this study. Another example of using data mining in healthcare is detecting fraud and abuse and identifying abnormal patterns of claims by clinicians. Identifying the most effective drug compounds for treating different populations is another example.

Interesting facts:

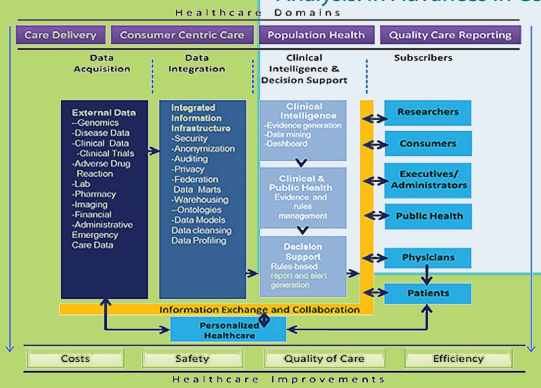
In 2011, more than 50 percent of physicians and nearly 75 percent of hospitals used basic electronic medical records (EMRs) [2]. These advancements allow healthcare professionals to access a wider scope of information to improve patient diagnosis and treatment.

References:

Agudelo, J. M. P., Pérez, N. J. C., & Pérez, J. F. B. (2014). Bioinformatics Tools and Data Mining for Therapeutic Drug Analysis. In Advances in Computational Biology (pp. 379-386). Springer International Publishing.

Groves, P., Kayyali, B., Knott, D., & Van Kuiken, S. (2013). The 'big data'revolution in healthcare. McKinsey Quarterly.

Koh, H. C., & Tan, G. (2011). Data mining applications in healthcare. Journal of Healthcare Information Management, 19(2), 65.



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