Healthcare Knowledge Management Primer

Nilmini Wickramasinghe,
Rajeev K. Bali, Brian Lehaney,
Jonathan L. Schaffer, and
M. Chris Gibbons

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Major goals of exploratory data mining are data cleaning, unification and understanding. Some of the data operations undertaken during exploratory data mining include: sampling, partitioning, charting, graphing, associating, clustering, transforming, filtering and imputing. Predictive data mining deals with future values of variables and utilizes many algorithms; including regression, decision trees and neural networks. Predictive data mining also involves an assessment step, which compares the effectiveness of different models according to many performance metrics. Figure 3.1 shows an integrated view of the knowledge discovery process, the evolution of knowledge from data to information to knowledge, and the types of data mining (exploratory and predictive) and their interrelationships. In this one figure, all the major aspects connected with data mining are captured, emphasizing its integral role in knowledge creation. This is not normally explicitly articulated in the existing literature although the connection between data, information and knowledge is often discussed; for example (Chung and Gray, 1996; Becerra-Fernandez and Sabherwal, 2001; Holsapple and Joshi, 2002; Choi and Lee, 2003).

Data mining then, is the non-trivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns from data (Fayyad *et al.*,1996). It is essential to emphasize here the importance of the interaction with experts who always play a crucial and indispensable role in any knowledge discovery process in facilitating prediction of key patterns and also identification of new patterns and trends.

CASE EXERCISE: KM AND PERSONAL HEALTH RECORDS—A MALAYSIAN PERSPECTIVE[5]

Background

In trying to propel Malaysia into a "developed nation" status, the Government of Malaysia has formulated vision and mission statements such as the Malaysian Vision 2020 as well as the Malaysian Healthcare Vision. In trying to actualize both these visions into reality, the government and the Ministry of Health of Malaysia (MOHM) have started preparing through the *Integrated Telehealth Initiative* where the Lifetime Health Record (LHR) is used as the basis for continuous care.

The LHR is the central key delivery of Malaysia's integrated telehealth application. The LHR correlates each episode of care for an individual into a continuous health record. It is the summarized health record of every individual compiled from their electronic medical records. These records refer to a patient's electronic medical records that are cumulatively derived from the clinical support system (such as clinical information system, laboratory information system, pharmacy information system and patient management system) and it can be collected and gathered from the various spectrums of health information systems and healthcare levels. The most important consideration, however, is that the LHR should contain not only longitudinal health summary information but also incorporate online retrieval of patient health histories whenever required. In order to achieve this, standard data sets for LHR should be established

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for supporting the implementation of the integrated telehealth initiatives for collecting and generating the national LHR repository. This research aims to produce the optimal amount of patient health data for developing and proposing standard data sets of LHR that would be used to support the implementation of Malaysia's integrated telehealth system and creating the national LHR repository.

Methods

The research was carried out through a case exercise approach conducted at the outpatient department of MOHM. The data obtained from the case exercise (by way of structured interviews and accessing archived records) would be used to develop standard data sets of LHR. The interviews were carried out by ten assistant researchers who were appointed to conduct the interviews with thirty doctors in thirty outpatient clinics. The assistant researchers were selected from medical graduates who had extensive knowledge in the medical domain. By doing this, the discussion between interviewer and respondent was conducted smoothly.

Background of Malaysia Healthcare System

Current Healthcare Delivery System and Physical Set-up

The Malaysian public healthcare system is structured in a hierarchical pyramid-based concept. At the base of the pyramid is a broad array of primary healthcare services (such as health centers, polyclinics, mobile clinics and maternal and child clinics) spread throughout the country. The next level consists of district hospitals in every one of 120 districts, feeding into state general hospitals in each state capital. At the top of the pyramid lies the Hospital Kuala Lumpur, which is the national tertiary reference centre that provides specialist and super specialist services for the nation. In terms of the physical healthcare facility setup, the healthcare premises are normally developed within the area where the most population is living. Since 1998, 95 percent of the population were living within a 5-kilometre radius of the nearest healthcare facility. This setup enables patients from anywhere in the country to be referred to the appropriate hospital, to access and visit several healthcare facilities through a nationwide network of clinics, hospitals and other health programs in a convenient manner.

Background of Outpatient Clinics

The outpatient clinics department administratively reports to the Family Health Division of Public Health Services of MOHM. Healthcare services are provided through various health centers and community polyclinics strategically located in the most populated areas in the district. The health centers and community polyclinics comprise the first level of service made available to the community. The services provided are comprehensive at this level, essentially comprising maternal health, child health, acute care of diseases, chronic care of diseases, mental health, geriatric care, community-based rehabilitation, well person services and health promotion.

Notes

1 Each entry explains how data mining enables the knowledge transfer from the type of knowledge in the cell row to the type of knowledge in the cell column.

2 This case has been adapted from a larger paper From Data To Decisions: A Knowledge Management Approach For Productivity Increase In A Radiology Department, *International Journal of Biomedical Engineering and Technology* by T. Goodfellow, R. Bali, R. Naguib, and N. Wickramasinghe, 1(3): 259–272.

3 This case was prepared by Ranveer Nagra as the basis for a class assignment rather than to illustrate either effective or ineffective handling of an administrative situation.

4 Case supplied by J.H.J. Choi, V.E. Krebs, T.M. Omilanowski, and J.L. Schaffer, Advanced Operative Technology Group, Orthopedic Research Center, Cleveland Clinic, U.S.

5 This case was prepared by Mohd Khanapi Abdul Ghani as part of his PhD research work and appears courtesy of the Knowledge Management for Healthcare (KARMAH) research subgroup (BIOCORE) at Coventry University (U.K.)—www.coventry.ac.uk/karmah.

6 This case was prepared by Vikram Baskaran as part of his PhD research work and appears courtesy of the Knowledge Management for Healthcare (KARMAH) research subgroup (BIOCORE) at Coventry University (U.K.)—www.coventry.ac.uk/karmah.

7 Robert (Buzz) Conn, (Project Manager, Scientific Technologies Corporation, U.S.), Frank J. Welch MD (Medical Director, Pandemic Preparedness Louisiana Office of Public Health, U.S.), Michael L. Popovich (CEO, Scientific Technologies Corporation, U.S.). Email address: Michael_Popovich@stchome.com, website: www.stchome.com.

8 This case appears courtesy of Michael L. Popovich (CEO, Scientific Technologies Corporation, U.S.), Dr Jeffery J. Aramini (Public/Animal Health Epidemiologist, Director of Canadian Operations, Scientific Technologies Corporation, Canada) and Michael Garcia (Vice President/COO, Scientific Technologies Corporation, U.S.). Email address: Michael_Popovich@stchome.com, website: www.stchome.com. [An extended version of this case appears in Popovich M.L., Aramini J.J., and Garcia M. (2008) Immunizations: The First Step in a Personal Health Record to Empower Patients, *Studies in Health Technology and Informatics*, 137: 286–295.

9 This case supplied by David Johnston (Director, Applied Network Solutions Ltd, U.K.) with special thanks to Barbara Harrell-Bond OBE, chairman of AMERA, for giving her permission to produce the AMERA case study.

10 This case was prepared by Aapo Immonen as part of his PhD research work and appears courtesy of the Knowledge Management for Healthcare (KARMAH) research subgroup, BIOCORE, at Coventry University (U.K.)—www.coventry.ac.uk/karmah.

11 This case has been adapted from a larger paper: Gibbons M.C., Brock, M., Alberg A.J., Glass T., LaVeist, T.A., Baylin, S., Levine, D., and Fox, C.E. (2007) The Sociobiologic Integrative Model (SBIM): Enhancing

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