# Knowledge-Based Technologies in Medical Management: Trends and Challenges in the 21st Century

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**Abstract**

In looking at the future of knowledge-based technologies, we will have to acknowledge that the widespread changes that are presently occurring will escalate as we move into the future. These changes will be enormous in scale, global in scope and will extend across all sectors. In advance of knowledge based technologies will contribute towards Vision 2020, is **"to develop a nation of healthy individuals, families and communities through a health system that is equitable, affordable, efficient, technologically appropriate, environmentally adaptable and consumer friendly, with emphasis on quality, innovation, health prevention and respect for human dignity and promotes individual responsibility and community participation towards an enhanced quality of life."** This paper highlights the possible application of knowledge based technologies technique in medical management perspective.   In addition, the trend and its challenges in the 21st Century are also discussed.

**Keywords**: *Knowledge Based Technology, Medical Management, ICT application*

## 1.0  Introduction

The Malaysian government is currently exploring the different health care systems and their abilities to provide high quality and cost effective heath care.   One of the approaches been implemented is a highly ambitious Tele-health plan that has been designed to integrate information technology into the health systems. The role of information technology in

healthcare is well established in Malaysia since 1957. Nowadays, Malaysia is in the process of implementing a highly ambitious to modernize healthcare system in conjunction with that to integrate information technology (IT) into the health system for example 'Telehealth' plan designed to integrate ICT into the health system. Indeed, the medical management is important issues to upgrade their management and efficiency.

The emergence and adoption of knowledge-based technology is clearly perceived by government as crucial to competitive survival and increasing success of medical provision, for example, the Ministry of Health (MoH) is responsible for healthcare, running the public network, including state hospitals and clinic. The convergence of information and communication technologies (ICT) is being ushered as the sweeping social change. A burgeoning literature of books and articles devoted to the dramatic growth in the size of the electronic network community depict the overwhelming magnitude of the technology. Nevertheless, knowledge based technology in medical management have evolved to provide a critical tools in the process of decision quality knowledge support and decision making.

This paper aims to discuss the possible application of knowledge based technologies technique in medical. In addition, the trends and its the challenges in the new millennium are also discussed.

## 2.0 Medical Management

Typically medical management refers to medical management guidelines. Medical management guidelines that include diagnostic and interventions, hospital length of stay, intensity of service, home care, and access to specialists have often focused on the potential trade-off between cost reductions and quality of care (American Academy of Pediatrics, 2001). Indeed, how the knowledge and technology can be improve medical management?. Knowledge and technology preserve as supporting tools and will be accelerates progressively towards quality of care in medical management.

## 3.0 Knowledge Based Technologies Medical Management (KBTMM): Tool and Technologies

Whether they realize it or not, most of medical management in Malaysia already possess the fundamental tools necessary to initiate a reasonable KBMM programmes. Generally, KBMM tools facilitate knowledge generation, codification and transfer. Typical KBMM tools include the WWW, GroupWare, Internet, Intranet, databases and Knowledge Base System (KBS).

**Table 1** A View of Medical Knowledge, Knowledge Bases and Knowledge Services

| Type of Knowledge | Types of Knowledge Bases | Types of Knowledge Services |
|---|---|---|
| • Medical Knowledge<br>• Organizational Structure<br>• Operational workflow<br>• Protocols/Guidelines<br>• Medical Procedures<br>• Business Rules<br>• Patient/Community<br>• Staff Profile<br>• Resource Inventory (Human, Equipment, Building, etc) | • Domain Knowledge<br>• Protocol Knowledge<br>• Workflow Knowledge<br>• Policy Knowledge<br>• Lessons Learnt Knowledge<br>• Admission Knowledge<br>• Delivery Knowledge Performance<br>• Discussion Knowledge<br>• Business Knowledge<br>• Change Adaptation<br>• Communication Knowledge<br>• Enterprise Documentation | • Healthcare Entity Modeling<br>• Transfer of Best Practices<br>• Benchmarking<br>• Audit Trails<br>• Resource Scheduling<br>• Product /Service Accreditation<br>• Policy Revisions<br>• Workflow Revisions<br>• Training Programs<br>• Business Ventures<br>• Strategic Knowledge Services |

**Source**: http://www-sop.inria.fr/acasia/workshop/IJCAI99-OM/PAPERS/Cheah

Table 1 shows a sample of the various types of knowledge that have been identified to exist in a medical management.

*Figure 1*

Knowledge Based Technologies in Medical Management
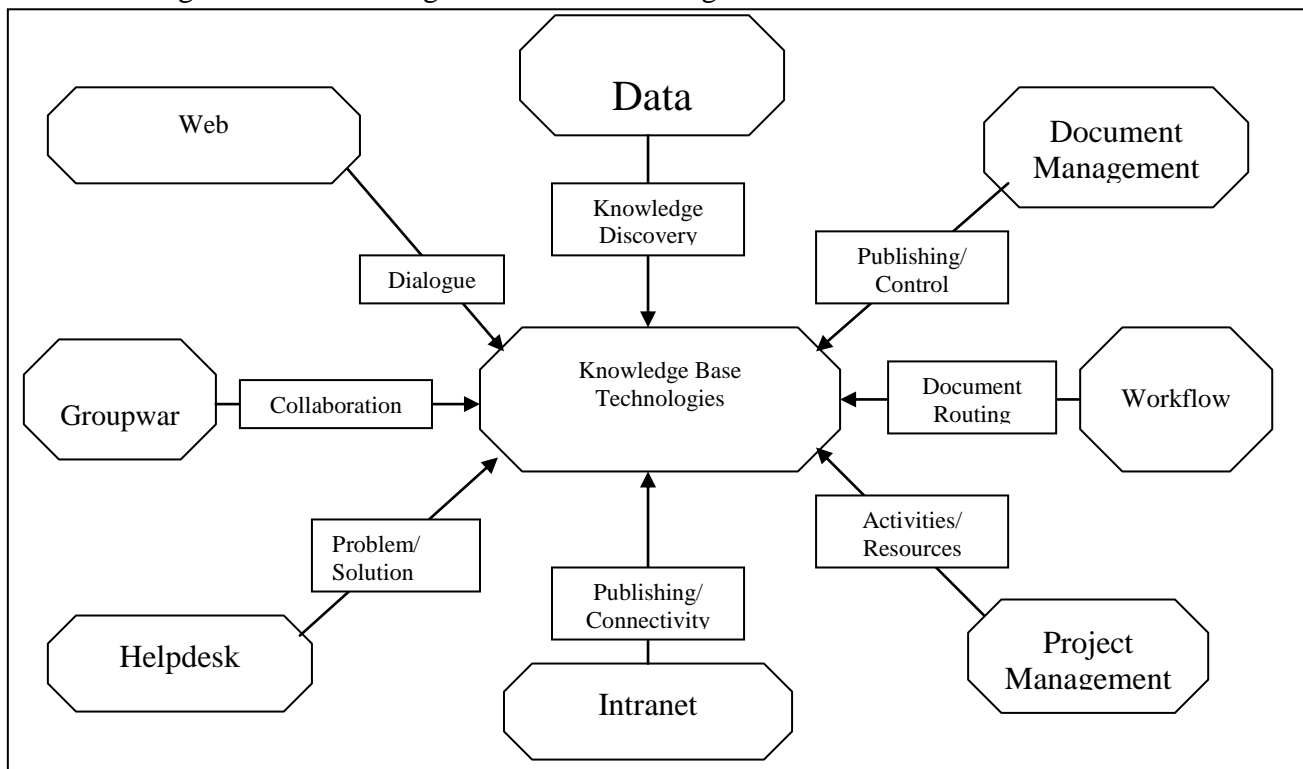
**Source**: Adapted from Grey, 1998a: http:www.smithweaversmith.com/kmtools.htm

Figure 1 shows that the most knowledge based technologies medical management already possess the fundamental tools necessary to initiate a reasonable k

### *4.0    Trends in Knowledge Based Technologies: Medical Management*

*Recently, the using of knowledge based technology environment is still to growth significantly.*

Table 2 **Types of Knowledge Based Medical Expert System**

| Types of Medical Expert System | Year | Description |
|---|---|---|
| 1. MYCIN<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1976 | To provide assistance to physicians in the diagnosis and treatment of meningitis and bacteria infection |
| 2. PUFF<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1979 | To interpret measurements related to respiratory tests and identify pulmonary disorders. |
| 3. INTERNIST<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1970s | To perform a diagnosis of the majority of diseases associated with the field of internal medicine |
| 4. HELP<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1980 | To provide clinicians with alerts and reminders, data interpretation, and patient diagnosis facilities, patient management suggestions, and clinical protocol. |
| 5. *DXplain*<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1987 | To assist in the process of diagnosis, taking a set of clinical finding signs, symptoms and laboratory data. |
| 6. Hepaxpert 1, 11<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1989 | To interpret test for Hepatitis A and B and has been in routine use at the Hepatitis Laboratory of the University of Vienna Medical School. |
| 7. Iliad<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1990s | To diagnosis in internal medicine. Current use is as a teaching tool for medical students. |
| 8. Jeremiah<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1992 | To provide dentists with orthodontic treatment plans for cases suitable for treatment by general dental practitioners with knowledge of removable orthodontic techniques. |

| 9. DoseChecker<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1994 | To assist the staff pharmacists with monitoring drug orders for a set of drugs, which must carefully dosed for patients with possible renal impairment. |
|---|---|---|
| 10. PEIRS<br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1994 | It is a Pathology Expert Interpretive Reporting System. |
| 11. QMR<br><br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1990s | To assist physicians in the diagnosis of an illness based upon the patient's symptoms, examination findings and laboratory test. |
| 12. Apache 111<br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1990s | To predict an individual's risk of dying in the hospital. |
| 13. MDDB<br>(K.S. Metaxiotis, J.E. Samouilidis,2000) | 1990s | To assist physician's with the diagnosis of dysmorphic syndromes. |
| 14. *NEOROgina*<br>(Fadzilah Siraj *et al*., 2002) | 2001(new) | To predict the presence of angina in patients. |

Figure 2

Trends in Knowledge based technology to Knowledge process, and AI technologies
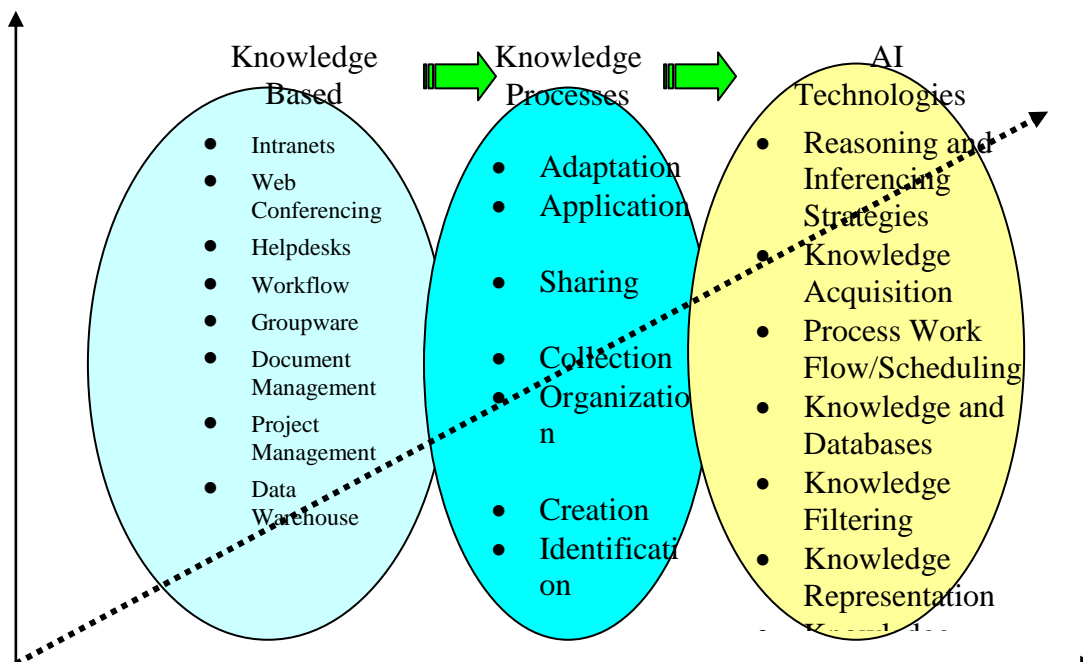
### 5.0 Challenges Knowledge based technology for future: Medical Management

Fortunately, technologies such as mobile and wireless networking solutions have matured over the last few years and are now both able and affordable enough to meet these challenges. Despite the increasing use of expert systems in medicine, it should be stressed that the development of such systems for medical application has to surpass some basic obstacles, such as:

- Medical tasks are difficult because of difference between individual patients and the uncertainty of the available clinical data.
- The range of acceptable errors is very small because of ethical concerns and malpractice risks.
- Funding for capital expenses is in short supply.

Three main factors that have been contributed to use knowledge based technologies in medical management. It has some significant advantages in comparison with the traditional computer systems. These advantages are the following (K.S. Metaxiotis *et al*.):

- *Availability*
  Experts are not instinctive. They have to be trained and then practiced. It generally takes over five years for someone to acquire expertise in a particular area. In contrast to the human, an expert system has all the expertise inside; it never gets tired or dies. The included knowledge is often more readily available to trainee experts or users.

- *Consistency*
  Even the best experts can make mistake or may forget an important point. Once an expert system is programmed to ask for and use certain inputs, it is not flat to poor memory. If a line of reasoning is acceptable, it will remain so in different consultations.

- *Comprehensiveness*
  An expert can only sketch ahead his own knowledge and experience. In some domains an expert system could encapsulate the knowledge of more than one proficient and as a result offer several options.

Critical issues requiring effective responses will be those related to the economics of health care, the setting of priorities, the concept and practical definitions of quality, the emphasis on effectiveness and efficiency, the appropriate use of technology and the empowerment of patients and their families. Our concerns with equity need to be reflected and monitored in effective practical terms. There will be a need to develop innovative models for planning and delivering health care to individual patients and the community. This can result in different practice patterns being developed with new roles emerging for different categories of health care workers, including doctors. The forces driving reform will also influence medical practice and the role of the doctor of the future.

### 6.0 Conclusion

Generally, Malaysia should have move faster towards upgrading their effectiveness and efficiency in medical management. It is because in the medical management environment is

perceived as being 'information rich' yet 'knowledge poor'. Doctors need to be able to change and adapt as the knowledge base changes. As individuals as well as professionals, doctors need to have wide interests outside their profession, so that they can become well-rounded people. Reform in medical education is critically important in our considerations in developing the healthcare system of the future and shaping the doctor of the future.

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