

Preface

When in doubt, tell the truth....

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The key to the success of the clinical healthcare sector in the 21st century is to achieve an effective integration of technology with human-based clinical decision-making processes. By doing so, healthcare institutions are free to disseminate acquired knowledge in a manner that ensures its availability to other healthcare stakeholders for such areas as preventative and operative medical diagnosis and treatment. This is of paramount importance as healthcare and clinical management continues its growth as a global priority area.

A few basic statistics: the average physician spends about 25 percent of his or her time managing information and is required to learn approximately two million clinical specifics (The Knowledge Management Centre, 2000); in the UK, each doctor receives about 15 kg of clinical guidelines per annum (Wyatt, 2000); up to 98000 patients die every year as a result of preventable medical errors—in the USA, it is estimated that the financial cost of these errors is between \$37.6 billion to \$50 billion (Duff, 2002); adverse drug reactions result in more than 770,000 injuries and deaths each year (Taylor, Manzo, & Sinnett, 2002); in 1995, more than 5 percent of patients had adverse reactions to drugs while under medical care—43 percent of which were serious, life threatening, or fatal (Davenport & Glaser, 2002). To further compound these pressures, biomedical literature is doubling every 19 years. These statistics illustrate how difficult it is for healthcare institutions and stakeholders to successfully meet information needs that are growing at an exponential rate.

Knowledge Management (KM) as a discipline is said not to have a commonly accepted or *de facto* definition. However, some common ground has been established which covers the following points. KM is a multi-disciplinary paradigm (Gupta, Iyer & Aronson, 2000) that often uses technology to support the acquisition, generation, codification, and transfer of knowledge in the context of specific organisational processes. Knowledge can either be tacit or explicit (explicit knowledge typically takes the form of com-

many documents and is easily available, whilst tacit knowledge is subjective and cognitive). As tacit knowledge is often stored in the minds of healthcare professionals, the ultimate objective of KM is to transform tacit knowledge into explicit knowledge to allow effective dissemination. The definition of KM by Gupta, Iyer, & Aronson (2000) is one such description amongst many—whichever KM definition one accepts, one unmovable truth remains: healthcare KM has made a profound impact on the international medical scene.

Of course, the notion and concept of management *per se* is nothing new in the clinical environment. Innovations and improvements in such disciplines as organizational behavior, information technology, teamwork, informatics, artificial intelligence, leadership, training, human resource management, motivation, and strategy have been equally applicable and relevant in the clinical and healthcare sectors as they have been in others. Clinicians and managers have used many of these disciplines (in combination) many times before; they may have, inadvertently and partially, carried out knowledge management *avant la lettre*.

Proactive and considered use of these previously unintentionally used KM components and techniques would reap enormous clinical and organizational benefits. Respected healthcare institutions the world over, including the UK's National Health Service (NHS), have adopted (or are in the process of adopting) the KM ideal as the driving force of current or planned modernization and organizational change programs.

Modernization and change on such a massive scale is similar to the choices faced following the purchase of a nearly derelict house. Do you carry out cosmetic changes? Do you choose to extend? Or is the work so large that it would be more efficient to pull down the existing structure and start from scratch? With this last option, one also has the opportunity to apply a more solid foundation, one that is underpinned by modern materials, which meet contemporary guidelines and regulations. This is the challenge faced by the healthcare sector. "Blowing up" existing structures affords stakeholders the opportunity to sift through the *disjecta membra*, discarding the obsolete, in order to pick out the most relevant aspects for a future-proof healthcare system.

And what of technology? Until recently, the focus of Information and Communication Technology (ICT) solutions for healthcare was on the storage of data in an electronic medium, the prime objective of which was to allow exploitation of this data at a later point in time. As such, most healthcare ICT applications were purpose built to provide support for retrospective information retrieval needs and, in some cases, to analyze the decisions undertaken. Technology, incorporating such tools and techniques as artificial intelligence and data mining, now has the capability and capacity (Deveau, 2000) to assist the healthcare knowledge explosion, real-life examples of which will be found in this book.

The upsurge of clinical-related research can be traced to new scientific domains (such as bioinformatics and cybernetics) which evolved from trans-disciplinary research; from this, clinical systems found an increased interest in recycling knowledge acquired from previous best practices. KM professionals, and indeed experts from knowledge engineering (KE) domains, had attempted to bring together different methodologies for knowledge recycling.

KE practitioners have tended to focus on codified knowledge (i.e., to discover new ways of effectively representing healthcare related information). Practitioners from KM

have mainly concentrated on the macro and policy aspects and how healthcare-related information can best be disseminated to support knowledge recycling and the creation of new knowledge. This contrasting approach by practitioners of these two domains is leading to the emergence of a new knowledge age in clinical healthcare. The plethora of new technologies offering more efficient methods of managing clinical services mean that practitioners, academics and managers find it increasingly difficult to catch up with these new innovations and challenges.

It should be noted that any progress in the arena of clinical KM requires the support and cooperation of clinicians, healthcare professionals and managers, academics and, of course, patients. This has to be carefully balanced against the legislation and regulations laid down by national and international Governments as “even minor organizational changes may have unexpected harmful effects” (Tallis, 2004). Further, all stakeholders have to work together to banish the view that “once academics get hold of something, nothing would happen” (Tallis, 2004). Clinical KM programs and initiatives are therefore a skilful blend of necessary regulation, opinion, viewpoint, partnership, recognition of issues and challenges (and how best to overcome them) and the willingness to learn from the experiences, and mistakes, of other implementations.

Organization of the Book

With the obvious global need for understanding in this evolving area, this book provides a valuable insight into the various trends, innovations, and organizational challenges of contemporary clinical management. Such is the interest in the clinical KM arena that I was overwhelmed with expressions of interest to submit chapters. I have managed to carefully select the most appropriate of these but, in doing so, left out many almost as deserving. All contributions underwent a double blind review process in order to ensure academic rigor. Readers can therefore be assured that only the very highest quality of contributions were accepted for the final publication.

The book contains 17 chapters, split into three sections; the first contains chapters which describe opportunities and challenges for the clinical KM sector. The second section is comprised of chapters that discuss some of the organisational, cultural and regulatory aspects of clinical KM. The final section describes clinical and healthcare cases that demonstrate some of the key aspects of KM theory in action.

Section I: Key Opportunities and Challenges in Clinical Knowledge Management

A chapter by Bali, Dwivedi and Naguib begins this section of five chapters and examines the factors necessary for the successful incorporation of KM techniques into the clinical setting. Alternative healthcare management concepts are reviewed and discussed.

The next chapter by Marinos, Marinos, Kordatzakis, Pragmatefteli, Georgoulas and Koutsouris discusses the efficacy of framework adoption for the healthcare sector. The

authors argue that the software industry requires healthcare standardization to promulgate frameworks that will make software development more efficient.

Nugent and Augusto's chapter on time-related data for Internet-based healthcare provides the rationale for Internet usage for a holistic approach to distributed healthcare management. The work is supported by case study examples.

The chapter by Ontrup and Ritter demonstrates how contemporary information retrieval methodologies can open up new possibilities to support KM in the clinical sector. They go on to discuss novel text mining techniques and algorithms that can increase accessibility to medical experts by providing contextual information and links to medical literature knowledge.

Orr's chapter talks about privacy and security challenges during healthcare KM system implementation. The chapter uses a number of evolving simple visual and mnemonic models that are based on observations, reflections, and understanding of the literature.

Section II: Organisational, Cultural and Regulatory Aspects of Clinical Knowledge Management

Having introduced some of the key issues and challenges for clinical KM, this section presents chapters that highlight organisational, cultural and regulatory aspects. In the first of six such chapters, Yolles considers the notion of knowledge cycles and sharing. He argues that while knowledge is necessary for people to execute their jobs competently, there is also a need to have the potential for easy access to the knowledge of others.

The next chapter by Berler, Pavlopoulos and Koutsouris discusses the importance of key performance indicators for healthcare informatics. The authors explore trends and best practices regarding knowledge management from the viewpoint of performance management

Vdaygiri and Goose present novel methods and technologies from the corporate world. They explain how such technologies can contribute to streamlining the processes within healthcare enterprises, telemedicine environments, and home healthcare practices.

The next chapter by Wang and Feng continues the theme of novel technology and focuses on the fundamental theories of biomedical image registration. The authors explain the fundamental connection between biomedical image registration and clinical KM that could improve the quality and safety of healthcare.

The role of an integrated drug delivery system is tackled by Price and Summers. The move towards electronic data capture and information retrieval is documented together with cross-organisational working and sharing of clinical records. The authors identify key drivers for change and explain the crucial role that all stakeholders play to bring about effective and efficient patient care.

Finally in this section, Raghavan discusses the concept of medical decision support system and the knowledge sharing standards among such systems. The evolution of

decision support in the healthcare arena is explained together with the need for knowledge sharing among medical decision support systems.

Section III: Knowledge Management in Action: Clinical Cases and Application

This section of six chapters builds upon the preceding sections and presents clinical KM cases in action. Clarke, Lehaney and Evans start the section with their chapter on the exchange and sharing of knowledge between the emergency services of a UK county. The highly participative study takes into account technological potential and constraints, organisational issues, and geographic factors. Lessons learned include the need to adopt a more closely integrate operational and strategic planning in the area and to make more explicit use of known and tested methodologies.

Johnson's chapter on the Cancer Information Service discusses how societal trends in consumer and client information behavior impact on clinical knowledge management. The service serves as a critical knowledge broker, synthesizing, and translating information for clients before, during, and after their interactions with clinical practices; thus enabling health professionals to focus on their unique functions.

Golemati, Mougiakakou, Stoitsis, Valavanis and Nikita describe basic principles and applications for clinical decision support systems. The authors discuss how such systems make use of advanced modeling techniques and available patient data to optimize and individualize patient treatment. The chapter concludes by stating that knowledge-oriented decision support systems aim to improve the overall health of the population by improving the quality of healthcare services, as well as by controlling the cost-effectiveness of medical examinations and treatment.

Knowledge intensive inter-organizational systems for healthcare are the basis for the chapter by Paavola, Turunen and Vuori. The chapter promulgates recent findings and understanding on how information and knowledge systems can be better adopted to support new ways of work and improve productivity in public funded healthcare. The authors advise that issues related to clinical KM such as the varying information and knowledge processing needs of clinicians from various medical expertise domains should be examined carefully when developing new clinical information systems.

Sittig's chapter provides an overview of the efforts to develop systems capable of delivering information at the point of care. The author examines systems in four distinct areas: library-type applications, real-time clinical decision support systems, hybrid systems and finally computable guidelines, all of which combine to provide an effective point of care.

The section ends with Whittaker and Van Beveren's case study chapter that introduces social capital as a concept useful in identifying the ingredients necessary for knowledge sharing in healthcare. The authors highlight the importance of social capital where information and knowledge systems are used in the sharing process. They conclude that the use of social capital to analyse knowledge sharing initiatives will lead to more holistic approaches.

I have managed to solicit chapters from countries as diverse as Finland, Japan, Germany, Australia, Northern Ireland, Greece, New Zealand, the USA, and the UK, demonstrating the importance being afforded to this increasingly key area on the international stage. I hope that academics, clinical practitioners, managers, and students will value this text on their bookshelves as, in the ensuing pages, there is much food for thought—*bon appétit*.

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