ICT BASED KNOWLEDGE MANAGEMENT IN HEALTH CARE INDUSTRY: NEED AND CHALLENGES

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Abstract: Much of the massive data, information and knowledge that is created everyday in the sphere of curative, preventive, rehabilitative and palliative care remains unleveraged to practice high quality medical care. This study is empirical and descriptive in nature and intends to examine the role of information and communication technology (ICT) based knowledge management system in mobilizing existing information within health care organization. Use of ICT based knowledge management system enhances information availability among practitioners' by offering tools and strategies to access and exchange information and thus help to reduce the incidents of medical errors. The study also examines the cost-benefit trade off and technical limitations of these systems

Keywords: Information & Communication Technologies (ICT), Indian Medical Association (IMA), Health Care Organizations (HCO), Knowledge Management System (KMS).

Introduction: Knowledge is a non replicable asset that is indispensable to organizational success. Undocumented knowledge and valuable experience of organization is lost due to lack of systems designed to conveniently capture, store and disseminate this knowledge. Knowledge management system (KMS) provides the ability to utilize and apply individual and organizational learning in a two-way process that prevents the resources and costs of reinventing the knowledge every time. KMS is a system created to manage activities and the processes that enhance the creation and utilization of knowledge within an organization. Data collection & storage, informational retrieval and application of information to create new knowledge are integral parts of KMS. Knowledge Management (KM) is based upon the use of digital formats and information technology tools to facilitate sharing and transfer of knowledge.

Knowledge management in health care industry implies developing and enhancing the systems and processes of identification and dissemination of the results of medical research relevant to clinical practice. The healthcare industry is marked by continuous improvement and innovation in all areas of medical care and needs multi-disciplinary approach to treatment of disease or illness. It is estimated that medical knowledge increases fourfold during a professional's lifetime [1] which means that one cannot practice high quality medicine without constantly updating his or her knowledge. Acquiring and assimilating skills that cross traditional specialties need opportunities and time of medical practitioners. It is not that information does not exist in the system but medical administrators face dilemma in finding and utilizing the relevant information at the right time. This is also one of the reasons of "superstitious learning" in which people and organizations repeat behaviors that were associated with particularly positive results by chance but actually have no influence on outcomes [2].

Knowledge Management in healthcare: Need to leverage organizational knowledge: In an organization, knowledge exists in two forms; explicit or factual knowledge and tacit or "know how" knowledge [3]. Instruction manuals, guides, written procedures, clinical practice guidelines or research findings are examples of explicit knowledge. Such knowledge can be documented and stored in a database and can be retrieved for reference in future. Tacit knowledge is the knowledge that practitioners gain through years of practice. It lies in their minds. The tacit knowledge is quite diffused and difficult to codify in digital forms.

KM facilitates to capitalize both explicit and tacit knowledge by offering such tools, techniques and strategies that help to transform one form of knowledge to the other. For example, if an expert surgeon is questioned as to why he performs a particular surgical procedure in a certain manner, by his articulation of the steps the tacit knowledge becomes explicit [4], this is called externalization, it means it can be documented and may be used in future by anybody who needs it.

Similarly, if a surgeon uses published research findings, which is explicit knowledge, to broaden, reframe and extend one's tacit knowledge it is internalization or explicit to tacit knowledge transformation. Evidence-based medicine is a measure of effectiveness in the process of technical care in healthcare delivery [5]. By allowing knowledge transformations, KMS facilitates the effectiveness in clinicians' technical care through integrating research evidence, patient's values and expectations and individual clinical expertise for plausible solutions. Here, we need to examine (i) how critical is knowledge transfer in delivering high quality medical

care and (ii) how can this knowledge be obtained most effectively.

Health care professionals have time constraints to share knowledge. Non existence of processes to support collection and transfer of knowledge is leading to waste of organizational knowledge. Health care organization's (HCO) may not nurture a culture of knowledge sharing and transfer hence there is no underlying incentive for such actions.

What is the cost of waste of this asset? Healthcare professionals make decisions lacking in evidence and information, which results in medical errors and losses in patients lives [6] and enhanced medicare reimbursements. According to statistics, 1 out of every 10 diagnoses in US are concluded wrong [7] costing $ 55.6 billion annually [8] while 40 out of every 100 Americans visit the emergency room (ER) where evidence-based and quick decision making is very critical [9]. Around 850,000 medical errors occur per year resulting in up to 40,000 unintended patient deaths plus other harm in UK [10].

Root causes of medical errors of the first 112 Root Cause Analysis summaries the JCAHO reviewed, the root causes in 70% of the cases were related to orientation/training, patient assessment process, communication process, physical environment and information non-availability [11]. India is recording a whopping 5.2 million injuries each year due to medical errors and adverse events. Of these, one of the biggest sources is mishaps from medications [12]. Even though healthcare (HC) is an expensive investment, its quality suffers today, due to lacking evidence-based clinical decision support (CDS) during patient-care. We should try to understand the causes of errors, to install an informative reporting system of adverse events as an essential prerequisite, to measure them, and to choose the best approaches for minimizing the harm to patients [13].

The traditional approaches of knowledge sharing and transfer among HC professionals lack process approach. HCO produces massive data everyday and it is difficult to capture every piece of relevant information from the data that is available and use it to make informed decisions. Information about patient history, symptoms, functions and lifestyle; information about diseases, diagnostics, drugs, and treatment methods, is created everyday. For instance, doctors use about two million pieces of information to manage their patients [14].

About a third of doctor's time is spent recording and combining information and a third of the costs of a healthcare provider are spent on personal and professional communication [15]. Ability to access relevant information from huge data streams that are generated everyday and internalization and externalization of this information is a major challenge before HCOs.

Role of ICT based KM Systems:

Strategies and Practices: HC practitioners' need information from generally three sources: from patients' database, clinical practice guidelines (CPG) and information from multidisciplinary functionaries, to arrive at treatment possibilities. Information and Communication Technology (ICT) offers tools to meet all three kinds of information needs. Patients' records are generally stored in electronic health record (E HR), a software system that contains life-long electronic record regarding patient's health and health treatments. CPGs are knowledge codifications based upon medical evidences that assist practitioners' in decision making. International Guideline Library is the largest web based data base of medical guidelines worldwide. ICT based knowledge management supports the two strategies known as Codification and Personalization to mobilize learning within the health care organization. The choice of strategy depends upon HCO goals, care needs of the population where it operates and investment plans. The costs involved in installation and training on ICT systems is recovered through benefits arising from repetitive use of information, patient retention, reduced information crisis, lesser diagnostic and medication errors and minimized cost of medical negligence.

Codification: Knowledge Centered Approach to KM: Codification creates electronic document system (electronic knowledge repository much like a traditional library) that codifies stores, disseminates and allows *reuse* of knowledge. For example, Access health, a call in medical center, has a knowledge repository that contains algorithms for symptoms of more than 500 illnesses and when anybody calls in, the registered nurse recommends home remedy, doctor's visit or emergency room trip to the caller based upon his/her symptoms. The first 300 algorithms have each been used an average 8000 times per year [16]. The Codification model of knowledge management extracts knowledge from experts and stores it in a database for future search and retrieval by anyone in the hospital, without the need to contact the person who originally developed it. ICT-based codification tools depend heavily on IT based systems and work through LAN that provides access to intranet, extranet, portals, expert systems, digital directories and HCOs databases. This approach is suitable for process driven organizations that focus on documentation of on-going work and results.

Personalization: Knower Centered Approach to KM: Tacit knowledge, which is not codified, can be obtained through Personalization approach to knowledge management which develops a network

that allows people find other people and offer customized advice and treatment. It is basically "people to people" (CoP) approach. Communities of practice (CoP) offer a useful perspective on technology because they are not defined by place or personal characteristics, but by people's potential to learn together [17]. This model needs moderate investment in technology, generally face to face meetings and technology based communication tools, support communities of practice. Most common social software products used by communities of practice to interact with one another are email tools such as ask me, discussion groups/listservs, e-learning tools such as learning management systems, online web meetings such as WebEx or NetMeeting, web portals, website communities, bulletin boards, Web 2.0 and white pages which is an online resource that allows people to find colleagues with specific knowledge and expertise.

HCO can use either the codification or personalization model or both depending upon its scale, strategy and preparedness for use of ICT based systems. An example in case is MARS that has adapted features from both the models. Kaiser Permanente- Ohio, United States, uses *MARS* (medical automated record system) which is a KMS in health care. In this system, patients' history, lab and radiology reports are available online; this prevents time delays and costs involved in paper reports. One of the key features of MARS is a computer generated reminder program that uses computer-generated reminders to improve physician compliance with published guidelines for cardiac disease. These guidelines have been agreed on by both the physician group and Kaiser as appropriate practice guidelines with which physicians should comply. The system also facilitates collaborations to occur; i.e., the physicians are involved in setting utilization levels and preferred treatment methods. When newer data is available either from published medical research or techniques developed by the physicians within Kaiser, with the approval of the medical group, this is added to the system [18].

Most of the HCOs in India that have adopted IT based systems, use one or more software intended for general administration and management purposes. Software modules such as pharmacy module, laboratory information system, emergency management, radiology management, dietary module, housekeeping, electronic medical records, outpatient management, nursing module, MIS dashboard, accounts & audit, payroll, billing & insurance modules etc. are the most widely used IT based applications in hospitals. Hospitals are also offering telemedicine and online support to patients without the need for personal visit to doctor. Medanta hospital, Gurgaon, is offering free video consultation (e-homecare) from all experts of various departments, through simple four-step process: User Registration -- Reports Upload – Video Consultation --- Access Prescription. Some hospitals are embracing an environment to nurture knowledge sharing and transfer. Apollo hospitals, for example, endeavors to offer a broad range of Continuing Medical Education (CME) opportunities through the web broadcasts where eminent medical experts from around the world shall come together to discuss latest developments in various specialties along with providing intensive live learning experiences. Similarly, Tata Memorial Hospital has what they call as Disease Management Group; each group has practitioners' from different faculties (personalization) that is focused on a particular medical problem along with the facility of digital library that is a hub of clinical information center for the hospital that uses state of the art technology to offer campus wide access to core information. Lilavati hospital, Mumbai conducts knowledge sharing program on modern health care developments once in a week and invitations are sent through SMS' to the Indian Medical Association (IMA) registered members.

While ICT based KMS is a powerful tool for mobilizing knowledge within HCOs, it is not absolutely free from limitations. Validation of content, publishing formats, levels of security access and processes for ensuring that the content posted is accurate, up-to-date, and consistent are challenges before the process owners. Electronic Health Records do not enable real-time access to codified knowledge thus requiring decision-support capabilities to translate CPGs into practice [7]. CPGs represent knowledge but these codifications do not describe how to apply recommended tasks [19]. Personalization model is time consuming and is expensive for patients. The success of ICT based KMS also depends heavily upon social, cultural and motivational [20]-[22] factors of HCO. These are some of the key challenges of ICT based KMS; interestingly they can be divided as technical and non-technical challenges. While technical challenges may be overcome with advances in technology, challenges related to HCOs cultural and motivational aspects need a clear vision and persistent effort over a period of time.

Discussion: ICT based KMS should be adopted by HCOs to capture and utilize its valuable and unique knowledge in order to elevate the quality of health care services. HCO must harness both explicit and tacit knowledge, not as a matter of choice but in the interest of high quality and low error medical care. While non-ICT based options of knowledge transfer

and use are time consuming, prone to errors and slow; ICT based systems allow fast and easy retrieval and mobilization of knowledge. Before switching to ICT based systems, communication and training on these systems is essential. Organization wide awareness and implementation programs should be planned. At the same time health organizations must also focus upon process measures that track efficacy of these systems. Performance measures such as quantity and quality of knowledge sharing activities, the depth of organizational involvement in knowledge sharing processes; number of participants in communities of practice and measures that track improvements in employee attitude, physician engagement, and consumer satisfaction with medical care must be tracked on a periodic basis. ICT based tools should not be assumed as replacement of face to face meetings rather they should be used to create context for such meetings. Adoption and liberal use of ICT based systems by HCOs in mobilizing organizational learning will pave way for further innovations in the field that will help overcome the present limitations.

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