

A Conceptual Framework for Community Pediatrics Using Knowledge Management

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ABSTRACT

Knowledge management, the management of corporate and individual knowledge, has been adopted by many organizations, including medicine. However, Knowledge management in community pediatrics, an arm of public health, has not been fully researched. Although, medical information systems have been developed over the past decade, they have not fully solved the capture, retrieval and reuse of medical knowledge. This is because most of the information systems deal with information technologies excluding intellectual resources, which in reality is the most important part of knowledge management. This paper proposes a conceptual framework for knowledge management in community pediatrics. First, it gives a high-level overview of medical knowledge and knowledge management. Next, it discusses knowledge in the media domain. It explains the conceptual framework proposed, giving details of the various knowledge management components. The paper is concluded with a brief discussion on other application areas of the framework.

Keywords: knowledge management; community pediatrics; public health; medical knowledge; medicine..

1. INTRODUCTION

Knowledge could be defined as the cognizance of facts or events from an observation learning events from an observation, learning, experience, and understanding of a reality in a particular context at a specific period of time (Oladejo, & Osofisan, 2011). In recent times, corporate organizations have discovered the need for the management of all forms of relevant knowledge. This is, perhaps, due to the non-productivity of information resources gotten from information management systems alone. Going a step further, these should be convertible to actionable knowledge. Such a process involves knowledge creation, capture, sharing and maintenance. The integration of these components for community pediatrics, an arm of community medicine is the focus of this paper.

Knowledge management is the process of transforming information and intellectual assets into enduring value (Skyrme, 1999). It connects people with the knowledge they need to take action. According to World Health Organization (WHO) (2006), "knowledge management approaches in public health should capture and respond to more of the critical knowledge needed to ensure public health preparedness; manage and integrate the information which already exists through indexing, cross-referencing and sharing. Ultimately, these would enable virtual teams to work collaboratively with access to shared knowledge at local, national and global levels".

The purpose of this research is to affirm the above claim and provide a knowledge management framework for community paediatrics. The paper is organized as follows: Section 2 discusses medical data, information and knowledge, as these play important roles in knowledge management. Section 3 focuses on an extensive discussion on knowledge management. Section 4 discusses knowledge management in the medical domain. Section 5 offers an explanation of community pediatrics.

A knowledge management framework is then proposed for community pediatrics. Finally, conclusions are drawn for further research.

2. MEDICAL DATA, MEDICAL INFORMATION AND MEDICAL KNOWLEDGE

Medical data is one which consists of a patient's medical history, treatments, diagnoses and frequent health information about immediate family and occupation. Medical information can be defined as any information regarding an individual's medical history, mental or physical condition, or medical treatment or diagnosis by a health care professional. Knowledge could be defined, in the medical context, as the ability of a medical professional to remember and interpret acquired medical information. Several researchers gave the idea that there is a clear distinction among data, information and knowledge (Davenport, 1997; Davenport & Prusak, 1998, Quigley & Debons, 1999, Choo et al, 2000; Stenmark, 2001; Harsh, 2007; Oladejo & Osofisan, 2011). Figure 1 shows the transition from data to information and then to knowledge.

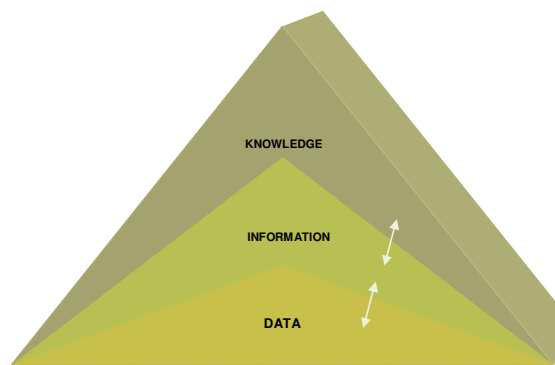


Fig. 1: Transition from Data → Information → Knowledge

From the above diagram, the arrows show the forward and backward transition from one state to another. Data is being converted to information when it has been modified and given meaning. Information is created when data is valued in some way, such as when categorized, sorted and extracted. Information is converted to knowledge once it is processed in the mind of individuals. It also becomes knowledge when critical thinking, evaluation, structured or organization is applied to support decisions or understand concepts. Knowledge becomes information once it is articulated and presented in the form of text, graphics, words, or other symbolic forms. A source of information could also become data and this can be combined with other forms of data for further processing. An example of such transition could be as follows; age, sex and other personal data are collected from a patient for medical purposes. Large forms of this medical record could be a source of information for nurses and doctors, probably to determine the occurrence of a particular disease among a range of patients with respect to age. This in turn, could become knowledge for a medical professional, when mixed with the tacit knowledge gotten from previous medical knowledge. It could be helpful in easier diagnoses and treatment of subsequent patients.

2.1 The Need for Knowledge Management

As pointed out earlier, information management system basically uses the computer as a tool for providing information to solve recurring operational problems. This can no longer be sufficient as there is certainly the need to incorporate the ideas, knowledge of medical professionals and culture of the medical field. Furthermore, knowledge management is highly essential for medical decision making. Hence, knowledge management is the solution.

There are diverse opinions from researchers about knowledge management and several definitions have existed since its inception. To discuss a few of them, Hedlund (1994) define knowledge management as the generation, representation, storage, transfer, transformation, application, embedding, and protecting of organizational knowledge. Skyrme (1999) opines that knowledge management is the explicit and systematic management of vital knowledge - and its associated processes of creation, organization, diffusion, use and exploitation. Newman and Conrad (1999) also stated in their work, that knowledge management is a discipline that helps improve the performance of individuals and organizations by maintaining and leveraging the present and future value of knowledge assets.

Rumizen (2002) defines knowledge management as the systematic process by which knowledge needed for an organization to succeed is created, captured, shared and leveraged. Jarrar et al (2010) are of the view that Knowledge management is the process of continually managing knowledge of all kinds to meet existing and emerging needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities.

All the definitions above point to the fact that knowledge management deals with all of the four core components stated below:

- The knowledge
- The organizational culture
- Resources used, which could be human, technological or operational, depending on the organization's asset.
- The processes involved in the capture, retrieval and reuse of knowledge.

3. KNOWLEDGE IN THE MEDICAL DOMAIN

Medical knowledge is created through collection of local experience around specific clinical cases and health services/programs, generation of new understandings of relationships between specific factors, processes, and outcomes from primary research and policy development (Mosawi, 2011). He also opined that knowledge management could be applied to medicine using a set of principles, tools and practices which enable people to create medical knowledge, share, translate and apply what they know to create value and improve effectiveness.

People are important bearers of knowledge in the medical domain and carry a considerable part of medical knowledge in their minds. For this reason, small mutations in the workforce can have a substantial impact on global performance. The knowledge management process within a medical domain can only be described taking into account the fact that it is made up not only of processes and material resources but also of people by whom knowledge is generated.

Montani (2002) discusses the nature of medical knowledge. He opined that the introduction of Hospital Information System (HIS) into clinical practice has led to the memorization of a huge quantity of data being generated through day to day activity and reporting the unarticulated experience of individual workers. HIS hereby represents a source of implicit knowledge. This is because it contains the distribution of evidence-based prescriptions, in electronic format, which makes the general domain of knowledge more and more available for exploitation. Physicians reason, most times, by recalling past situations similar to the current one. The process is often biased by the tendency to recall only more recent cases. Montani also suggested that a methodology enabling the retrieval of the entire operative knowledge available, also related to older examples, is the key solution. Medical knowledge consists of implicit and explicit knowledge.

Implicit knowledge is essential for sharing other clinicians' experiences. Explicit Knowledge is also very important as well as hypothetico-deductive reasoning which is implemented by medical doctors. Past literature shows that Knowledge Management (KM) has been applied to specific areas of medicine. Hsia et al., (2006) proposed a conceptual framework that integrates the nursing process, Knowledge management activities and enabling Information Technology (IT) for designing such a nursing Knowledge Management System (KMS). Dieng et.al (2006) built a medical ontology for knowledge management for a health care network. This enables a

cooperative diagnosis by members of the health care network who are doctors, nurses, and social workers. Almeida et.al (2010) developed a knowledge management system for supporting creation, capture, storage and dissemination of information about epilepsy and epileptic seizures. Abidi et al (2009) developed a web-based knowledge sharing medium for fostering a community of pediatric pain practitioners that engage in collaborative learning and problem solving. The design and use of a web portal featuring a discussion forum to facilitate experiential knowledge sharing based on their knowledge sharing model (LINKS) was presented. Orzano et al., (2008) pointed out that knowledge management should be seen as a framework for positioning primary care practice to meet the challenges of a rapidly changing health care system in the 21st century. No doubt, the adoption of knowledge management strategies and practices by the medical domain can, to a large extent, help to improve the performance of health care workers and programs as well as contribute to reaching the end goal of improving health outcomes among communities.

3.1 Existing Knowledge Management Framework in Health

Lau (2004) presented a conceptual knowledge management framework in health. Figure 2 shows the framework.

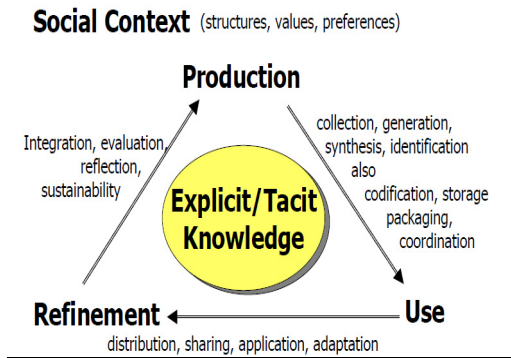


Fig 2: A Conceptual Knowledge Management Framework in Health (Lau, 2004)

The framework provides an conceptualization of knowledge management for the health setting. It initially defines knowledge as information combined with experience, context, interpretation, and reflection. The knowledge source may be explicit or tacit depending on where it is. Each core KM concept is expanded into the following sub concepts:

- Knowledge production has two parts: creation of knowledge through collection, generation, synthesis, and identification; and organization through codification, storage, packaging, and coordination.
- Knowledge use consists of distribution, sharing, application, and integration.
- Knowledge refinement consists of evaluation, reflection, adaptation, and sustainability.

- Social context refers to the underlying structures, values, and preferences of individuals and organizations.

This framework focuses on the knowledge management approach to general medicine and not on particular aspects of medicine. As stated in section 2.3, Hsia et al (2006), however, proposed a conceptual framework for designing nursing knowledge management systems, an arm of medicine. The conceptual framework integrates nursing process, KM activities, and enabling Information Technology (IT) for designing such a nursing KMS. The framework indicates the critical knowledge management activities in nursing process and the enabling IT based on the task/technology fit theory. The framework is shown in figure 3 below.

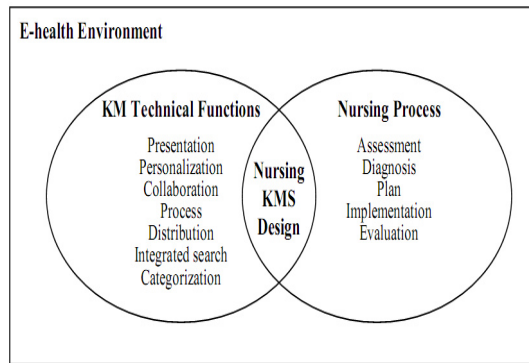


Fig 3: An integrated model of nursing KMS Design (Hsia, 2006)

3.2 Community Pediatrics

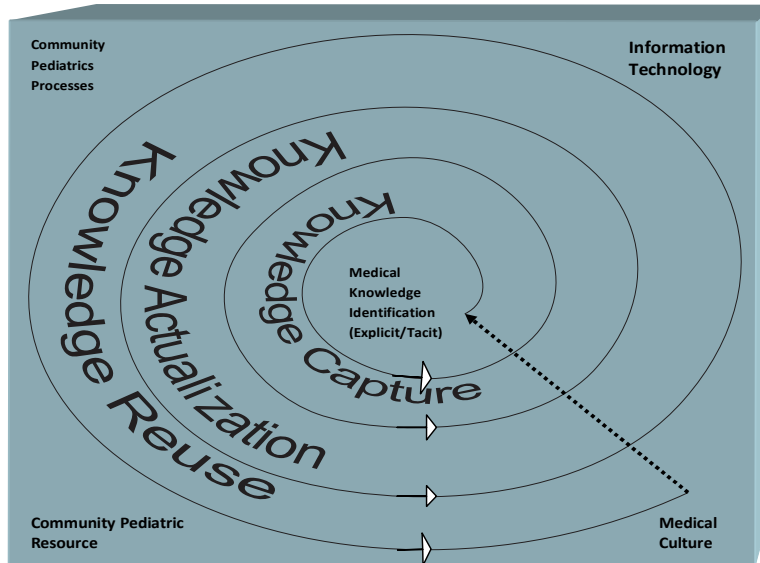
The American Academy of Pediatrics (AAP) produced a definition of community pediatrics which states as follows: "Community pediatrics is all of the following:

- A perspective that enlarges the pediatrician's focus from one child to all children in the community. A recognition that family, educational, social, cultural, spiritual, economic, environmental, and political forces act favorably or unfavorably, but always significantly, on the health and functioning of children.
- A synthesis of clinical practice and public health principles directed toward providing health care to a given child and promoting the health of all children within the context of the family, school and the community.
- A commitment to use a community's resources in collaboration with other professionals, agencies, and parents to achieve optimal accessibility
- An integral part of the professional role and duty of the pediatrician." (AARP, 1999)

Community pediatrics focuses on children of all ages from newborn through adolescence. The aim is to improve the health and well being of children by enlarging the focus of care from one child to all children in the community. The communities in which children live heavily influence their health (Solomon et al, 2006), hence, the need for community pediatrics.

3.3 Adaptable Knowledge Management Framework for Community Pediatrics (AKMCP)

The knowledge management framework consists of the essential components of knowledge management and its application to community pediatrics.



From the diagram above, the arrows show the direction and flow of medical knowledge while the dotted arrow shows that the processes may not necessarily follow the sequence as there may be the need to go back to the previous processes. The framework consists of the following components;

Knowledge Management Processes.

Knowledge management processes are the methods used to capture and share knowledge. They consist of the following:

- **Medical knowledge Identification.** This involves tacit knowledge which is acquired knowledge of medical professionals over time, and explicit knowledge which is digitized in medical documents, reports, books and records.
- **Knowledge Capture.** This involves the capture or retrieval of the medical tacit and explicit knowledge generated during diagnoses, surgeries and prescribed treatment conducted by visiting doctors. This knowledge should be captured for easy reuse by rural health workers in (situations) case of emergencies on non availability of doctors. Information Technology (IT) could contribute to knowledge capture through the ubiquitous use of word processing, which generates electronic documents that are easy to share via the Web, e-mail, or a document (Marwick, 2001). This leads to the actualization of knowledge.

- **Knowledge Actualization:** This involves the capitalization of medical knowledge. Corporate memory and knowledge management systems are developed at this stage. There are existing tools used for the development. To mention a few, CommonKADS , protégé, Ontolingua, and WebOnto (Dominque, 1998) are some of them.

- **Knowledge Reuse.** Medical knowledge can be extracted, stored, refined and reused. This involves need to reuse knowledge captured for future purposes. Intranets and internets aid the quick access to use and reuse of knowledge. Search techniques are used for knowledge retrieval.

Community Pediatrics Processes

These are the processes or series of activities performed in most pediatric section of rural health care centers. They include examination of child patient, diagnoses, treatment and health education.

Community Pediatric Resources.

These are resources needed for the smooth running of the knowledge management system. They include human resources, operational resources, medical and physical resources. Human resources are people who are rural medical professionals. They generate store and share knowledge which helps in cultivating an environment that encourages knowledge sharing and use of knowledge management systems.

Operational resources are medical files and records, medical and physical resources such as medical equipment used in rural community centers.

Medical Culture

Medical culture can be defined as values, principles, norms and unwritten rules and procedures guiding the medical profession. It comprises basic assumptions and beliefs that govern medical activities.

Information Technology

Information technologies offer a potentially useful environment within which to build a multimedia repository for rich, explicit knowledge. Input is captured by forms for assigning various labels, categories, and indices to each unit of knowledge through computer systems and applications. Information technology enhances the storage, retrieval, and exchange of knowledge.

4. FUTURE WORK AND CONCLUSION

The implementation of Adaptable Knowledge Management Framework for Community Pediatrics (AKMCP) is being carried out by the authors and it is hoped that the framework can be implemented on other arms of medicine. Knowledge management in community pediatrics could promote the quality of care among children patients. Its adoption will no doubt enhance the diagnoses and treatment of children patients. This can be achieved if the framework is made use of, as rural health workers can easily have access to the system for review of medical knowledge for recent diagnoses and treatment of certain diseases in children. This in turn could help improve rural health care among children. The acceptance and use of knowledge management strategies by community pediatrics will no doubt have a significant improvement in the performance of rural health care professionals. Most notably, they will be able to have quality-based practice which will in turn help improve their services to the rural communities. The application of the framework to other sections of the medical field could also help improve health care services in general.

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