KNOWLEDGE MANAGEMENT OF HEALTHCARE BY CLINICAL-PATHWAYS

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abstract

Healthcare is a knowledge-intensive service provided by professionals, such as medical doctors, nurses, and pharmacists. Clinical-pathways are used by many healthcare organizations (HCOs) as a tool for performing the healthcare process, sharing and utilizing knowledge from different professionals. In this paper, case studies were performed at two HCOs that use clinical-pathways actively in the healthcare process. Theoretical model construction, sharing, utilization, and creation of the knowledge by different professionals, were tested by the case study of two HCOs which use clinical pathways actively. The theoretical model was a knowledge creation model which creates new knowledge continuously. In this theoretical model, clinical-pathways are suggested to be an effective tool for knowledge management in healthcare.

1. Introduction

The current healthcare is asked to lower costs, and simultaneously is also required to improve the quality of continuous care. Furthermore, healthcare is a knowledge intensive service provided by professionals, such as medical doctors, nurses, and pharmacists. Therefore, in many HCOs, management based on knowledge management used in the industrial world is being carried out (Bose, 2003).

From the latter half of the 1990s, clinical-pathways began to be used as a tool for performing optimization of healthcare resources and enhancement of care quality by HCOs (Every, 2000). Nowadays, clinical-pathways are used as a tool for carrying out knowledge management in many HCOs. However, knowledge management used in many HCOs only shares and utilizes different professionals' knowledge through information technology (IT). No concrete theoretical model of creation of new knowledge by health-care professionals using clinical-pathways has been built. New knowledge needs to be created for continuous enhancements of the quality of healthcare treatment, and a theoretical model for this is required. (Vanhaecht, 2006).

The aim of this research is filling in current gaps in this knowledge, through construction of a theoretical model of systematic knowledge creation in the healthcare process according to professionals' collaboration using clinical-pathways.

2. Clinical-pathways

Clinical-pathway applies critical-path idea methods (used in process control in industry) to the healthcare process as a management tool, and was developed in the United States in 1985 (Zander, 1988). Clinical-pathways have been designed as an approach to improve the quality of healthcare.

Such clinical-pathways are structured instruments which lead to optimal interdisciplinary patient care. Practice of clinical-pathways involves all healthcare professionals, physicians, nurse staff, physiotherapists, social workers, etc. Clinical-pathways can offer everyday standard diagnosis and healthcare treatment. It can be thought of as a visualization of the patient healthcare process. The development and implementation of clinical-pathways are multi-faceted and resource-intensive processes involving all concerned parties. Clinical-pathways are used in healthcare in many countries (Campbell, 1998; Zander, 2002).

Sharing and integration of the knowledge of diverse professionals are important for implementation of a successful healthcare process using clinical-pathways. Clinical-pathways establish optimal resource utilization and improve communication among doctors, nurses, and other staff (Coffey, 2005). However, in the healthcare process using clinical-pathways, it is difficult to respond to patients' individuality (Kwan, 2003; Shi, 2008).

3. Knowledge Management

Knowledge management is a business concept. In the business world, competitiveness is felt by many to be based on an organization's ability to acquire new knowledge. Nonaka & Takeuchi described a knowledge-spiral that creates new knowledge. In particular, it models how tacit knowledge can be externalized and discussed, thereby making it explicit. It stimulates questioning and creative thinking and values the externalization of tacit knowledge in order to be able to implement change (Nonaka & Takeuchi, 1995).

The interaction of different knowledge is performed "ba." The setting of "ba" is very important in knowledge management (Nomura, 2002).

Another theory of knowledge management is the "communities of practice." Communities of practice are phenomena said to "galvanize knowledge-sharing knowledge and change". They are defined as "groups of people bound together by shared experience and passion for joint enterprise." This can be described as cross-functional terms brought together to capture and spread ideas and know-how (Etienne, 2000). However, the disadvantage of the "communities of practice" model is its informal nature.

4. Healthcare Knowledge

Within the modern healthcare discipline, an emphasis was placed on formalization Evidence based medicine (EBM) provides a tool for communicating the relative effectiveness of health interventions where quantitative data exists. Many regard the evidence base as not really telling the whole story. Many healthcare professionals can not manage their patients simply as biomedical models, and there is often another dimension to disease and management of patient care. The failure to recognize the limitations of EBM leads to tension being created when it cannot be implemented. Healthcare professionals often lack a language with which to communicate important knowledge to a patient because there is no evidence base. The recognition of this limit is important for many healthcare professionals (Simon, 2002).

Clinical guidelines have been described as "systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances" by Hurwitz(Hurwitz, 1994). Clinical guidelines are created based on EBM (Schneider, 2006).

5. Knowledge Management in Healthcare

Knowledge management is used in many HCOs, because healthcare is a knowledge intensive service provided by professionals. When a HCO introduces knowledge management into their process management, it is important to take into consideration the culture inherent to each expertise (Russ, 2005).

In knowledge management, sharing and utilizing scientific evidence of explicit knowledge is required for implementation of EBM. However, there is no combination with a scientific basis about explicit knowledge acquired by clinical experience which each professional has accumulated so, carrying out effective clinical practices is difficult. Therefore, knowledge management which can share and utilize both explicit and tacit knowledge is required by HCO (Sandars, 2006).

In modern health care systems, healthcare providers face many new challenges with regard to quality and cost of care, as well as the satisfaction and training of professionals. The introduction of knowledge management in healthcare process management is an effective solution to these challenges (Kitchiner, 1996).

The core of a team working in modern healthcare is changing from the doctor to the patient. Accordingly, within a team, knowledge management which can create the optimal healthcare process for the patient by various professionals will be required (Metaxiotis, 2006).

Knowledge management of HCO must provide (Wahle, 2008)

1) Framing of the standardized healthcare process, and support of the optimized clinical practice.
2) Effective and efficient management of health-care professional employment.
3) Better quality care offered to the patient, and related provision of information.

6. Knowledge Management by Clinical-pathways in Healthcare

Clinical-pathways are developed through collaborative efforts of doctors, nurses, pharmacists, and others to improve the quality and value of patient care. Clinical-pathways are prepared using clinical guidelines based on EBM of the visualized knowledge. But, the context knowledge of healthcare professionals is essential in using a clinical guideline. The production process of a clinical guideline is based on an agreement formed by this discussion, so, the care team can provide optimal healthcare treatment. Clinical-pathways are a tool for utilizing diverse knowledge (Mitton, 2007).

A typical healthcare process can be managed by clinical-pathways. However, clinical-pathways are not suitable in some complicated cases. (Cardoen, 2008).

7. Research Approach

We carried out the case studies in two hospitals, Saiseikai Kumamoto Hospital and Fukui General Hospital. These hospitals mainly use clinical-pathways activities for healthcare process management.

Case studies were performed from May 2006 to October 2007. The methods of research were documents analysis, participant observation, and interviews with clinical-pathways directors.

Documents of each hospital's clinical-pathways activities were classified into categories of the cause and moment of introduction, the feature of activity, management of activity, and analyzed the contents of each category. The contents of document analysis were verified by participant observation to clinical-pathways activities.

The purpose of these interviews was to obtain information about the intentions and interpretations of clinical-pathways activities which were not obtained from document analysis. By analysis of the data obtained from our investigation, it is possible to observe

the healthcare process using clinical-pathways common to two hospitals. The extraction of the knowledge process from these clinical-pathways is our main goal.

8. Research Result

8.1 Case 1: The clinical pathway activity of Saiseikai Kumamoto Hospital

8.1.1 The background and the characteristics of Clinical pathway activity

In 1996, clinical-pathways were introduced at this hospital. The main reason for introducing it was for patients to understand the outline of healthcare contents by clinical-pathway. The introduced clinical-pathway was a tool which promoted communication between healthcare professionals and patients. The chief directors of this hospital propelled the new strategy of clinical-pathways. The chief hospital director understood that clinical-pathways were an improvement tool of healthcare quality after participating in a clinical- pathway seminar held in 1998 in Boston. The chief hospital director especially noted that clinical-pathways were effective in the collaborative work in healthcare by professionals. As a result, the clinical-pathway activity rule of this hospital is that all the staff members participate.

8.1.2 Details of Clinical pathway activity

Clinical-pathway activity is a healthcare process constituted of production, implementation, and improvement process.

1) Production process:

Clinical-pathways are produced in workshops (WS) in which all professionals who focus on a specific disease participate. In WS, the healthcare target "outcome" is set up as a milestone of the patients' conditions. Accordingly, in the WS, discussions by diverse healthcare professionals on how best to achieve the "outcome" are important in the production process. The expression of diverse ideas from many participants is important in clinical-pathways production. In addition, guidelines and medical records are referred to in clinical-pathway production.

2) Implementation process:

Many clinical business routines using clinical-pathways are assessed by healthcare professionals for "outcome." The objective assessment of "outcome" is important in the implementation process of clinical-pathways. The condition of a patient whose "outcome" assessment is different from the usual case is called "variance." In using clinical-pathways, response of "variance" by healthcare professionals adapts for a patient's individuality. It is important to write down the medical records of a patient's condition which cannot be assessed by "outcome." The intuition obtained by observation by professionals is also recorded.

3) Improvement process:

All the related professionals gathered together as in the production process, and used statistical analysis of "variance" to improve the clinical-pathways. Based on the analysis of "variance", the diverse healthcare professionals involved discussed the issues. The responses led to the setup of a new "outcome." The clinical-pathways director said that the healthcare process using clinical-pathways verifies healthcare contents. Setup of the

subjective hypotheses by specialists was effective for the creation of new "outcome." Professionals' new knowledge is required for creation of a new "outcome."

8.2 Case 2: The clinical pathway activity of Fukui General Hospital

8.2.1 The background and the characteristics of Clinical-pathway activity

In 1999, the healthcare professionals of ophthalmology referred to clinical-pathways of other hospitals and produced their own. In 2000, the chief hospital director, who considered standardization of services for patients, decided to make clinical-pathways activities into a tool of the healthcare process management at the hospital.

The clinical-pathways activity is a tool which makes it possible to share medical records among patients and healthcare professionals.

8.2.2 Detail of Clinical pathway activity

Clinical-pathway activity is a healthcare process consisting of production, implementation, and improvement process. And so, a system which decreases the user load in all the processes was built.

1) Production process:

Although the related professionals produced the clinical-pathway using collaboration, it was carried out based on the clinical-pathway production manual. The method of setting concrete "outcome" was written down in the manual. The agreement formed by discussion of diverse professionals was essential to setting the "outcome." The clinical-pathways administrator said, "Different professionals' diverse knowledge is visualized in setting "outcome" by free discussion, the environment for this is important." In addition, guidelines and medical records are referred to in clinical-pathways production.

2) Implementation process:

Assessment of "outcome" was considered to be important in the implementation process. Furthermore, response and record when "variance" occurs in the condition of patients were also considered to be important. The healthcare professional needs observation of a patient's new condition which could not be assessed by "outcome." The professional needs to write down new patient information in medical records. And, the professional’s subjective judgment using patient's medical record is also important.

3) Improvement process:

"Variance" was totaled and statistical analysis was conducted. The improvement of "outcome" was made from analysis of data using the "variance" analysis table. However, the agreement formed by discussion between the related professionals was necessary for the improvement of "outcome." The clinical-pathway director said, "By conducting factor analysis using "variance," the quality of the healthcare treatment offered to a patient can be improved." In addition, setting a new "outcome" of a patient's new condition which could not be assessed by "outcome" is important in this process. Setting a new "outcome" needs a lot of patient information which was written down the medical records. Therefore, patient information was collected in the process of implementation.

8.3 The healthcare process in common clinical pathways activity

An outline of the research results is shown in Table 1.

The clinical-pathways activities of two hospitals consisted of processes of "production," "implementation," and "improvement." And each process was connected to the next continuously.

Table 1: Research result of Cases study

	Case1	Case 2
Production process	All the related professionals' participation were indispensable The Purpose of this process is the setup of "outcome" The environmental setting which extracts diverse knowledge was important. The guidelines and medical records were referred for	Although a setup of "outcome" was the purpose, the production manual existed. The related professionals' participation were desired Most important was expressing diverse ideas The guidelines and medical records were referred for
Implementation process	Clinical business routine was the assessment of "outcome" The responses and records of "variance" were important Subjective records were also important.	Assessment of "outcome" based on a manual was clinical routine The responses and records of "variance" were important The intuition of professinal wrote down medical recordeds
Improvement process	Improvement of "outcome" based on "variance" This process should be essential to enhancement in quality	Improvement of "outcome" based on "variance" analysis table produced by the total of "variance" This process should be essential to enhancement in quality

The common elements acquired from the contents of each process are as follows.

1. Production process:
   a) In this process, setup of "outcome" was important.
   b) In setup of "outcome", participation was required of all related professionals.
   c) The environment for discussion between professionals for setting the "outcome," is important.
   d) The guidelines and medical records are referred to in production.
2. Implementation process:
   a) The objective healthcare process (by assessment of "outcome") was recorded.

b) The response and record of "variance" showed the response of the patient individually to the health care process.
c) Record of the condition of patients that could not reach desired "outcome" was also considered as important.
d) Subjective judgment of professionals is also considered as important.

3. Improvement process:
a) "Outcome" was improved using statistical analysis of "variance" obtained in the implementation process.
b) In the improvement process, participation was required of all related professionals, as in the production process.
c) The quality of the healthcare treatment offered was upgraded by improvement of “outcome”.
d) Setting a new "outcome" using hypothesis of healthcare professionals based on observations of new patient's condition is recommended.

9. Research Findings

9.1 Theoretical implication

From the research, a theoretical model which shows the knowledge process of clinical-pathway activities using the concepts of "outcome" and "variance" was built (Fig. 1). The theoretical model shows the interaction in the healthcare process of clinical-pathways, tacit knowledge, and explicit knowledge. The tacit knowledge used in the healthcare process is context knowledge which each professional has, such as know-how and skill. The explicit knowledge used in the healthcare process is objective knowledge, such as the guidelines and the contents of medical records.

The characteristics of the theoretical model, including the interaction of tacit knowledge and explicit knowledge, include:

1) Each healthcare process is shown "ba" of knowledge process which carries out the interaction of different knowledge,
2) Each "ba" are "Accept", "Integrate", and "Practice" and connected spirally,
3) "Accept" exists in the production process and discussion is needed to set an "outcome" by accepting the knowledge from different participant.
4) A contradiction model which can create new knowledge continuously was built from the case studies of two hospitals.
5) "Integrate" exists in the processes of production and implementation, and through participants’ discussion, they can integrate expertise into optimal whole knowledge and set up "outcome.
6) "Practice" exists in the processes of implementation and improvement, and practicing leads to optimal knowledge on the clinical side and to the professionals acquiring new knowledge.
7) Spiral risen "Accept" exists in the improvement process. The new knowledge acquired by practice and the results of “variance” analysis allow for the setting of a new “outcome” by hypothesis and the clinical-pathway is improved.

In this model, if the process of improvement did not exist, the creation of dynamic knowledge would be very difficult. Therefore, clinical-pathway directors consider the

process of improvement as very important.

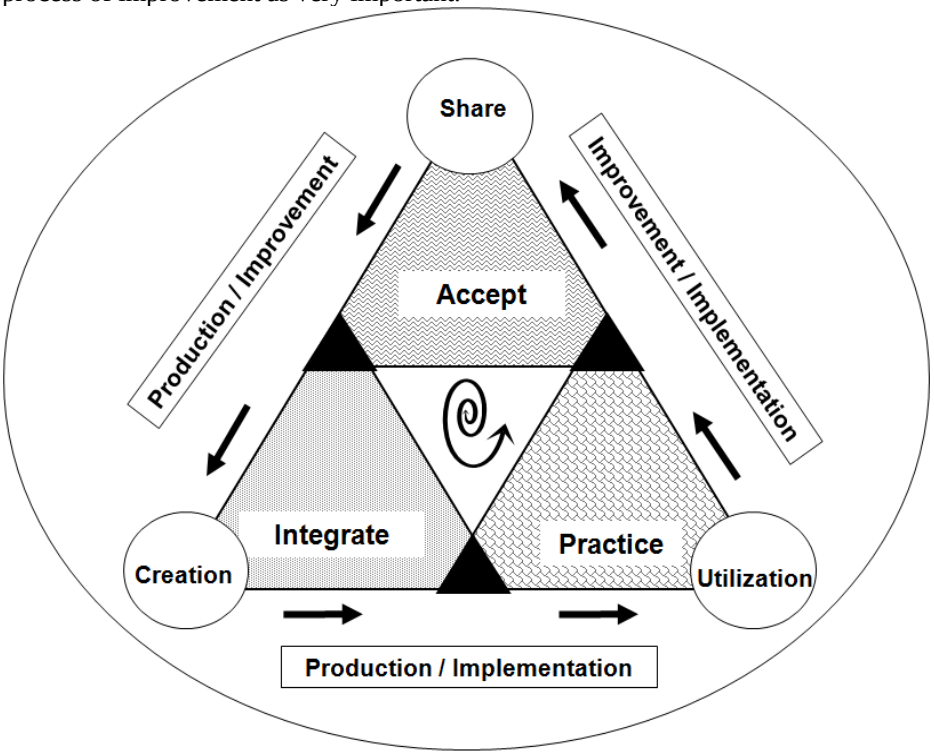

Fig 1. Theoretical Model

9.2 Practical implication

Knowledge communication is promoted between different professionals through clinical-pathways activities in healthcare practice. By participating in clinical-pathways activities, diverse healthcare professionals may be able to have interdisciplinary team consciousness and spread out the human network.

If the healthcare domain is comprised in the human science, healthcare professionals have to comprehend a condition of a patient who cannot assess by objective data. Healthcare is the science which understands human quality of life deeply.

10. Discussion

"Ba" of this theoretical model has the interaction of tacit knowledge and explicit knowledge. This differs a little from the "SECI" model (Umemoto, 2004). Using guidelines and medical records of explicit knowledge is essential for production of clinical-pathways. Clinical-pathway activities model in this study was no interaction between the tacit knowledge which exists in the "SECI" model. In the healthcare process,

it was suggested that explicit knowledge is an interface among professionals for whom formal knowledge differs.

Sharing of different knowledge is important for continuous implementation of knowledge management. Accordingly, environmental structure of "ba" which accepts different knowledge is the knowledge management director's essential responsibility. The creation of new knowledge is possible because diverse knowledge is shared (Nomura, 2002). Clinical-pathways directors were doing their best to the environmental setting which diverse knowledge expresses for setup of "outcome." Environmental setting of "ba" is required for knowledge management of clinical-pathway activities.

11. Conclusion

The theoretical model which can create new knowledge continuously was built from case studies of the two hospitals. Clinical-pathways express clearly that tacit knowledge is a part of the healthcare processes. Therefore, knowledge processes are included in clinical-pathways. "Ba" of this knowledge process consists of "Accept", "Integrate", and "Practice." Each "ba" is carrying out the interaction of different knowledge. These “ba” are organizational knowledge creation models connected spirally. However, if the process of improvement does not exist in clinical pathways, this model does not function. In addition, promotion of the knowledge communication between healthcare professionals by clinical-pathways activities is important for excellent healthcare management.

In future study, we will create a system to observe the process of knowledge sharing. We plan to produce a system that supports clinical-pathway activities.

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