

Knowledge Management System in Health & Social Care: Review on 20 Practiced Knowledge Management

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Abstract. *The importance of managing medical information has become very critical in the healthcare delivery system. Medical information nowadays are optimized towards serving different areas such as; diagnosing of diseases, planning and administration, treatment and monitoring of patient outcomes, services and costs. This article provides a review into various Health and Social Care systems which encompasses the Knowledge Management value. For analysis, more than 30 systems that are related to Health and Social Care were gathered via Internet research, only 20 of these systems were finally selected based on recent system development and popularity of the system.*

Keywords: *Health Care, Knowledge, Knowledge Management, Social Care, system*

1. Introduction

Operation of Health and Social Care industry now very much relies on the use of Information Technology to assist medical practices. Health and Social Care industry correspondingly need to deliver low-cost, high quality services that focuses on improvement of medical condition of their patient. Investment in Health and Social Care system will provide better integrated patient data and medical research practices which will be helpful for practitioner such as physicians and nurses to make decision on certain medical practices issues. Thus, the interest for an integrated Health and Social Care system has been increase over the past few years.

Nowadays, there are hospitals and clinics invest in such a system to assist their day to day job. One of the leading investor in Health and Social Care is United Kingdom. They has invested huge amount of money on a project called “The Health and Social Care Information Centre” (HSCIC) that was set up in April 2013 (UK Department of Health, 2013). The system mainly focuses on Health and Social Care across United Kingdom by helping other Health and Social Care organizations to improve the quality of medical data that have collected. Those data is then collected to build a library that is useful for any practitioner and for organization to measure the quality of Health and Social Care services provided to the public.

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2. The Role of Knowledge Management in Health & Social Care

The combination of information and experience can be considered as valuable knowledge for an industry. Those valuable knowledge can be important for other parties if it is being shared in proper medium that is accessible by everyone. The concept of knowledge management provides individuals and organizations with practices and methodologies that utilize a combination of intellectual, business process, and information technology solution to provide industry with more efficient and effective use of knowledge (Chen, 2013). With the help of information technology, knowledge management can be used to learn from past medical practices errors or events. Thus, practitioner able to formulate a better innovative solutions not only to share within the organization but among the Health and Social Care societies.

The general knowledge distinct can be divided into two categories that are explicit knowledge and tacit knowledge (Fernandez and Sabherwal, 2010). Explicit knowledge is information that is easy to capture, structure, and share with individual. This type of knowledge is expressed into words and numbers that can be shared formally and easily understood (Fernandez and Sabherwal, 2010). The medical documentations of policies, procedures and clinic diagnostic methodologies can be considered as explicit knowledge (Chen, 2013).

Tacit knowledge is a knowledge related to individual experience that is acquired overtime and has been applied to a problem (Fernandez and Sabherwal, 2010). This type of knowledge is difficult to express in written format and even to formalize them. Thus, tacit knowledge is difficulty to capture, structure, and transfer to other individuals. Due to the degree of complexity, objectivity, and subjectivity, tacit knowledge is difficult to capture and transfer without dedicating significant resources to collect the knowledge into an explicit form that can be utilized by

others (Chen, 2013). Knowledge such as medical surgery practices can be considered as tacit knowledge. In Health and Social Care environment, different part of the world may require different medical practice for a particular health issue, thus this make the complexity of knowledge become even greater.

3. Methodology

This article compiled a list of 20 Health and Social Care systems based on the literature review that has been retrieved from internet search engines and informational websites such as Google, Google Scholar, Science Direct, Open Clinical, Cone Health, UBI Care and Information Week. Keywords such as “Knowledge Management in Health Care”, “KM Tools”, “Type of KM in Health Care” and other related keywords is respectively used to gather sufficient information. System that were chosen is based on the criteria such as popularity, version, complicity of knowledge hub, and organization based knowledge management tools. Systems that were selected dated from the year of 2010 and above. Articles or systems was reviewed by going through the abstract, method, medium of knowledge sharing, type of system used and type of user involved in the knowledge sharing system. Systems that were found related to knowledge management application in the area of Health and Social Care is categorize into three type of knowledge contributor.

4. The Type of Knowledge Contributor

In Health and Social Care industry, there will be various knowledge contributor related to their role. Chen (2013) has mention in his writing, in Health and Social Care industry the role of knowledge contributor can be classify into three. The first is, practitioner knowledge. Practitioner knowledge could be from doctors, nurses, researchers or any personal that is expert in the area of medical practice. Medical professional in this capacity possess both explicit and tacit knowledge. For example, doctors are required to understand standard

medical information that is easily comprehended from reference materials like text books (Chen, 2013). The second classification is patient knowledge. This type of information is considered as patient own knowledge in their current and historical medical condition that practitioners do not know. However, such knowledge is vital for practitioner to know, especially when it comes to the diagnoses and prescription treatments for illnesses (Chen, 2013). The last knowledge classification is organization knowledge. Organization knowledge is from medical institutions resources that are available for patients and doctors to access. This domain of knowledge can offer variety of knowledge of medical diagnostic systems, text-based materials, and symptom checker. Moreover, this domain could contain knowledge on medical treatment process that is approved or recommended by an institutions or medical society (Chen, 2013).

5. Health and Social Care systems

Health and Social Care is a term that related to integrated services that are available from Health and Social Care providers (UK Department of Health, 2013). Health and Social Care offers variety of systems which includes and not limited to the area of healthcare. Other knowledge that can be retrieve from the systems provider such as biology, nutrition, law and social policy, ethics, and social and educational activities (UK Department of Health, 2013).

Based on the literature review, the collected Health and Social Care systems that encourage knowledge management practice are listed as follows (see Appendix A for a summarize table on Health and Social Care systems).

Burns (2011) explain in his finding that the UbiCare provides a platform for researchers and Health Care providers to deliver important health information to patients via social media. As of 2011, more than 700 hospitals had already started using Facebook and other web services medium. This allow public to receive credible health information through

social networks. Health topics that is covered in the system are: Autism, Cancer, Diabetes, Heart Disease, and Obesity (Burns, 2011).

The National Adult Social Care Intelligence Service (NASCIS) is a social care information resources for United Kingdom. The system offer health care resources that meet the needs for planners, managers, researchers, policy makers and others. Furthermore, an analytical function embedded with the systems allows effective and timely analysis of Health and Social Care data to assist activities such as planning, performance management and service improvement (NASCIS, 2013).

US National Library of Medicine (n.d.) created a system called PubMed which is a free search engine accessing primarily the MEDLINE database of references and abstracts on life sciences and biomedical topics. There are more than 23 million citations for biomedical literature stored in the system that is retrieve from MEDLINE, life science journals, and online books. As for end of 2013, PubMed has over 23 million records going back to 1966, selectively to the year 1865 and about 500,000 new records are added each year (US National Library of Medicine, n.d.).

ConeHealth (2011) is one of the member of Health Care Network has deploy a system called Healthwise health care system that provide a better healthcare decision. In their website, they mention a formula for making a better health care decisions:

“The best formula for making health decisions is to combine the most reliable medical facts with your personal feelings. Medical Information + Your Information = Better Health Decisions.” (ConeHealth, 2011)

In the system, they have included interactive tools such as easy-to-use personal calculators, a quiz to learn important facts that can help to make smart decisions about your health. For example, the patient can find out if they were at risk for a heart attack or stroke by using the tools. Other great feature such as to discover

the costs of smoking or how many calories can be burn by regular exercise routines (ConeHealth, 2011).

Health & Social Care Information Centre (2013) created a system called the 'Child Protection - Information Sharing' project that will improve Health and Social Care services across United Kingdom to protect vulnerable children. Local authority systems will send information about children who are subject to child protection plans or who have looked after a child status to the system (HSCIC, 2013).

Another system from Health & Social Care Information Centre is called Summary Care Records that store all the health records in computer based system. All the practitioner have be given the access to reliable information about the patient treatment (HSCIC, 2013). This encourage healthcare staff to provide good health care services by able to see and share up-to-date, accurate information about patient to help them make decisions and to prevent mistakes in medical practices. For example, they will be able to make better decisions about what medicine to give to patient if the practitioner knew what has been taken by the patient, or if the patient had any bad reaction to a medicine in the past.

Patient care information is made available by Novant Health library services to help physicians and other healthcare professionals with an important piece of information for patient care (NOVANT, 2013). They offer print and electronic books & journals; online databases; and point of care tools, as well as reference assistance related to health care.

Massachusetts General Hospital Laboratory of Computer Science (2010) has developed a system called DXplain. The system is a clinical decision support system that perform a diagnoses based on user input of patient signs and symptoms, laboratory results, and other clinical findings. Furthermore, the system will be able to justify what type of disease it might be and will be able to suggest what further

information is useful to be collected to list the type of clinical symptom.

Another system developed by Massachusetts General Hospital Laboratory of Computer Science (2010) is called iHealthSpace. This system is used to support the patient in the assessment of their current state of health, to manage problems appropriately and to prevent future medical complications. Patient, family, friends and care providers are connected to a virtual space and they all provide support by contribute to the patient health care routine. When the patient connected to iHealthSpace, they will be able to: manage medicines, renew prescriptions, review recent test results, communicate with care team, look up upcoming appointments, create health and wellness goals and track progress with the care team and browse patient resources authored or inspected by the doctors.

Murphy (2012) is a Research Computing's Medical Director that is in charge of the Research Patient Data Registry (RPDR) system. The system host clinical data registry that is gather from various hospital legacy systems. Researchers that are given access to the system will able to retrieve appropriate data from the Query Tools. They will be able to obtain detailed clinical data using the Query Tools. The data integrity was also maintained by controlling and auditing the distribution of patient data (Murphy, 2012).

GetWellNetwork's is expert in developing an interactive patient care has developed a system called GetWell Town that is an interactive entertainment, education, and clinical-care tools for young patients and their families (McGee, 2011). Features in the system enable staff to play kid-friendly education videos, available through an exclusive partnership with KidsHealth that specifically cover a child's condition. Furthermore, the systems allow families to find critical medication information, and view profiles of their caregivers, to help develop a personal connection with them (McGee, 2011).

Dossia Health Management System was built in web based infrastructure that store user personal health information from a variety of sources, including pharmacies, labs, and medical practices (McGee, 2011). One of the interesting tools embedded with the system is medical terminology translation engine that help patients to better understand confusing terms and content that appear in their medical records and reports (McGee, 2011).

Swarm Interactive has developed a Web-based patient education system called ViewMedica (McGee, 2011). The purpose of this system is to help doctors to inform their patients and potential patients about their medical services. The system has a animations library that equip with procedures of certain type conditions in orthopedics, neurological care, cardiovascular surgery, ENT, pain management, ophthalmology, complementary medicine, and others (McGee, 2011).

Digital-Eyes has been developed by American Academy of Ophthalmology that provide animation for practitioner to consult with patients regarding eye health. For instance, the animations can help doctors to study cataract in the patient's eye and how their vision problems can be corrected with surgery (McGee, 2011).

Zygote Media Group's uses Google Body project to develop their own 3D Human Anatomy tools that can be used in many different ways to understand human body parts (McGee, 2011). The high resolution 3-D models has been used in the development of medical devices, applications, and medical illustrations. The application viewer provides a standard way to create and view 3D models in a web browser with multiple layers and instant search. This interesting features of optimized data also allows educational products to be developed for mobile devices and online applications (McGee, 2011).

CollabRx Therapy Finder - Lung is a free web-based decision-support system that help cancer patients learn about their lung cancer by understanding the best tests, treatments,

and clinical trials for early stage and advance stage of lung cancer (McGee, 2011).

SymCAT is symptom checker for Symptom based on Computer Assisted Triage. The system uses data-driven diagnosis to search through hundreds of thousands of patient data records to calculate likely diagnoses for a list of symptoms. Furthermore, the system uses a disease calculator to go through hundreds of thousands of patient records to estimate probability of disease (SymCAT, n.d.).

Isabel Healthcare specialize in diagnostic decision support has developed a web-based checklist to help clinicians process any symptoms and test results to achieve higher accurate diagnosis rate. The system offer decision possibilities that are so uncommon that will be helpful for physician to make decision (Versel, 2011).

National Library of Medicine (NLM) under supervision of National Institutes of Health of United States has provided a free health care system service called MedlinePlus. The system is available for patients and their families and friends or anyone that have an internet access. The system brings information about diseases, conditions, and wellness issues. Furthermore, the system offers reliable and up-to-date health information (National Library of Medicine, n.d.).

Another system supervise by National Institutes of Health of United States is called DailyMed. The system provides information about marketed drugs including FDA (Food and Drug Administration) labels. Furthermore, the system provide health information to the public with a standard, comprehensive, up-to-date, look-up and downloads resource of medication content and medical packages label (National Library of Medicine, n.d.).

Those are the review on 20 Health and Social Care systems currently in-use by many knowledge seeker and contributor to encourage knowledge management practices in Health and Social Care industry. Most of the systems has their own criteria or special

knowledge domain and offers different functionality based on the special knowledge domain area that there are trying to cover. This may happen because of the diverse level of knowledge in Health and Social Care practices which lead to a wide area of knowledge in Health and Social Care that can be captured and shared. This review is intended to give a view of various systems that is available for researchers, practitioner and even the patient to use and gain the benefit for betterment of the Health and Social Care industry.

6. Conclusion

Overall, the implementation of knowledge management practices in Health and Social Care systems is a topic of great interest amongst the healthcare community and the business world (Chen, 2013). This paper outline definition and example of Health & Social care systems. The main aim of this review is to give an understanding of Health and Social Care systems that practices knowledge management. Thus, this article discuss variety of system used by health industry from various organization and country. Some of the new system in the market has not been review by any researchers. Furthermore, a majority of the studies and other resources about knowledge management in Health and Social Care appear to focus on the theories and practices that have not been implemented or deploy to an actual system (Chen, 2013). Based on the literate review, it can be assume that Health and Social Care industry is into adopting knowledge management practices using IT-based solutions in an effort to maintain operational efficiencies and to operate collaboratively to share information and knowledge with partners and patients. The vast development of information technology has been the important key in encouraging sharing of medical knowledge with a wide range of communities. Online knowledge repositories such as PubMed have been helpful for visitors such as medical researches and doctors to understand explicit knowledge easily. Overall, Health and

Social Care knowledge management system enable doctors, nurses and patient to spend less time interacting with manual medical processes and focuses more in clinical information stored in the system, thus facilitating increase information density with instantaneous reduce in total study time of any medical issue. As a conclusion, it is hope, this review will be helpful for any researchers to conduct further study on various knowledge management practices in Health and Social Care industry.

References

Burns, J. (2011). UbiCare. *TPR Media family*, Available: <http://www.ubicare.com> [Accessed: Dec. 7, 2013].

Chen, E. T., (2013). Knowledge Management Implementation in the Healthcare Industry. *The 2013 Northeast Decision Sciences Institute Annual Meeting Proceedings*. Northeast Decision Sciences Institute, Available: www.nedsi.org/proc/2013/proc/p121026003.pdf [Accessed: Dec. 7, 2013].

ConeHealth (2011). Healthwise Health Library. *Cone Health Network*, Available: <http://www.conehealth.com/community/health-library/> [Accessed: Dec. 7, 2013].

Fernandez, I. B. and Sabherwal, R. (2010). Knowledge Management: Systems and Processes. Publisher: M E Sharpe Inc, Page 25-26

HSCIC (2013). Child Protection – Information sharing project (CP-IS). *Health & Social Care Information Centre*, Available: <http://systems.hscic.gov.uk/cpis> [Accessed: Dec. 7, 2013].

HSCIC (2013). Summary Care Records (SCR). *Health & Social Care Information Centre*, Available: <http://systems.hscic.gov.uk/scr> [Accessed: Dec. 7, 2013].

Massachusetts General Hospital Laboratory of Computer Science, (2010). DXplain. *Using Decision Support to help Explain Clinical Manifestations of Disease*, Available: <http://lcs.mgh.harvard.edu/projects/dxplain.html> [Accessed: Dec. 8, 2013].

Massachusetts General Hospital Laboratory of Computer Science, (2011). iHealthSpace. *Redefining Patient Health Literacy through Community and Communication*, Available: <https://www.ihealthspace.org> [Accessed: Dec. 8, 2013].

McGee, M. K. (2011). 7 Health Education Tools for Patients. *InformationWeek HealthCare*, Available: <http://www.informationweek.com/healthcare/patient-tools/7-health-education-tools-for-patients/d/d-id/1101358?> [Accessed: Jan. 27, 2014].

Murphy, S. (2012). The Research Patient Data Registry (RPDR). *Research Information Services & Computing*, Available: <http://rc.partners.org/rpdr> [Accessed: Dec. 8, 2013].

NASCIS (2013). Health Library. *National Adult Social Care Intelligence Service*, Available: <https://nascis.hscic.gov.uk/Portal/Library.aspx> [Accessed: Dec. 7, 2013].

NOVANT (2013). Health Library. *Novant Health*, Available: <http://www.novanthealth.org/ProgramsServices/HealthServices/HealthLibrary.aspx> [Accessed: Dec. 8, 2013].

SymCAT (n.d.). Symptom-based, Computer Assisted Triage, Available: <http://www.symcat.com/> [Accessed: Jan. 27, 2014].

UK Department of Health (2013). Guidance: The Health and care system explained, Available: <https://www.gov.uk/government/publications/the-health-and-care-system-explained/the-health-and-care-system-explained> [Accessed: Jan. 27, 2014].

US National Library of Medicine (n.d.). DailyMed. *US National Institutes of Health*, Available: <http://dailymed.nlm.nih.gov/dailymed/> [Accessed: Jan. 28, 2014].

US National Library of Medicine (n.d.). MedlinePlus. *US National Institutes of Health*, Available: <http://www.ncbi.nlm.nih.gov/medlineplus/> [Accessed: Jan. 28, 2014].

US National Library of Medicine (n.d.). PubMed. *US National Institutes of Health*, Available: <http://www.nlm.nih.gov/pubmed/> [Accessed: Dec. 7, 2013].

Versel, N. (2011). 10 Innovative Clinical Decision Support Programs. *InformationWeek HealthCare*, Available: <http://www.informationweek.com/healthcare/clinical-information-systems/10-innovative-clinical-decision-support-programs/d/d-id/1101834> [Accessed: Dec. 9, 2013].

Appendix A

A summary of Health & Social Care systems is presented in table below:

Table 1. Summary of Health and Social Care System

Author (Year)	
Health and Social Care System – Type of System	
Description	Knowledge Contributor
Burns (2011)	
UbiCare – Health Care and Social Care	
Provides a platform for researchers and health care providers to deliver important health information to patients via social media. Health topics they cover include: Autism, Cancer, Diabetes, Heart Disease, and Obesity.	Practitioner Knowledge Organizational Knowledge
NASCIS (2013)	
The National Adult Social Care Intelligence Service (NASCIS) – Health Care and Social Care	
National resource of social care information for England. The system offer health care resources that meet the needs for planners, managers, researchers, policy makers and others.	Organizational Knowledge
US National Library of Medicine (2011)	
PubMed – Health Care	
A free search engine accessing primarily the MEDLINE database of references and abstracts on life sciences and biomedical topics.	Organizational Knowledge Practitioner Knowledge
ConeHealth (2011)	
Healthwise Health Library – Health Care	
Healthwise library information is used to take an active role in their health. In the system, they have included interactive tools such as easy-to-use personal	Practitioner Knowledge Patient Knowledge

calculators, a quiz to learn important facts that can help to make smart decisions about your health. as well as the quality and cost of your care.

HSCIC (2013)

Child Protection Information Sharing – Social Care

This project will improve the way that health and social care services work together across England to protect vulnerable children. Local authority systems will send information about children who are subject to child protection plans or who have looked after child status to a secure central data store.

HSCIC (2013)

Summary Care Records – Health Care

The system store all the health records in computer system, and all the practitioner have be given the access to reliable information about the patient treatment. This encourage healthcare staff to provide good health care services by able to see and share up-to-date, accurate information about patient to help them make decisions and to prevent mistakes.

NOVANT (2013)

Novant Health Library – Health Care

This services help physicians and other healthcare professionals locate the most accurate, accessible, up-to-date information for medical use in patient care.

Massachusetts General Hospital Laboratory of Computer Science (2010)

DXplain – Health Care

The system is a clinical decision support system that

perform a diagnoses based on user input of patient signs and symptoms, laboratory results, and other clinical findings. The system will be able to justify what type of disease it might be and the system will suggest what further information is useful to be collected and then the system will list type of clinical symptom	Practitioner Knowledge	system enable staff to play kid-friendly education videos, available through an exclusive partnership with KidsHealth, that specifically cover a child's condition.	
<hr/>		<hr/>	
Massachusetts General Hospital Laboratory of Computer Science (2010)		McGee (2011)	
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iHealthSpace – Health Care and Social Care		Dossia Health Management System – Health Care	
This system is used to support the patient in the assessment of their current state of health, to manage problems appropriately and to prevent future medical complications. Patient connected to a virtual space and they can contribute to their health care routine with the support of their family, friends and with their care providers.	Patient Knowledge Practitioner Knowledge	A system that store user personal health information from a variety of sources, including pharmacies, labs, and medical practices. One of the interesting tools embedded with the system is medical terminology translation engine that help patients to better understand confusing terms and content that appear in their medical records and reports	Patient Knowledge
<hr/>		<hr/>	
Murphy (2012)		McGee (2011)	
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Research Patient Data Registry (RPDR) – Health Care		ViewMedica – Health Care	
The system hosted clinical data registry that is gather from various hospital legacy systems. Researchers that are given access to the system will able to retrieve appropriate data from the Query Tools. They will be able to obtain detailed clinical data using the Query Tools.	Organizational Knowledge Practitioner Knowledge	System is used to help doctors to inform their patients and potential patients about their medical services. The system animations library equip with procedures and certain type conditions in orthopedics, neurological care, cardiovascular surgery, ENT, pain management, ophthalmology, complementary medicine, and more	Organizational Knowledge
<hr/>		<hr/>	
McGee (2011)		McGee (2011)	
<hr/>		<hr/>	
GetWell Town – Health Care and Social Care		Digital-Eyes – Health Care	
GetWell Town that is an interactive entertainment, education, and clinical-care tools for young patients and their families. Features in the	Organizational Knowledge Practitioner Knowledge	Provide animation for practitioner to consult with patients regarding eye health. For instance, the animations can help doctors to study cataract in the patient’s eye and how their vision problems can be corrected with surgery.	Organizational Knowledge
<hr/>		<hr/>	
		McGee (2011)	

<u>3D Human Anatomy – Health Care</u>	
3D Human Anatomy tools that can be used in many different ways to understand human body parts. The high resolution 3-D models has been used in the development of medical devices, applications, and medical illustrations.	Organizational Knowledge
<u>McGee (2011)</u>	
<u>CollabRx Therapy Finder-Lung – Health Care</u>	
Web-based decision-support system that helps cancer patients learn about their lung cancer by understanding the best tests, treatments, and clinical trials for early stage and advance stage of lung cancer	Organizational Knowledge
<u>SymCAT (n.d.)</u>	
<u>SymCAT, Symptom-based, Computer Assisted Triage – Health Care and Social Care</u>	
The system uses data-driven diagnosis to search through hundreds of thousands of patient data records to calculate likely diagnoses for a list of symptoms.	Organizational Knowledge
<u>Versel (2011)</u>	
<u>Isabel Healthcare Diagnostic decision – Health Care</u>	
A Web-based checklist to help clinicians process any symptoms and test results to be at a higher accurate diagnosis rate. The system offer decision possibilities that are so uncommon that will be helpful for physician to make decision	Organizational Knowledge
<u>US National Library of Medicine (n.d.)</u>	
<u>MedlinePlus – Health Care and Social Care</u>	
The system is available for patients and their families and friends or anyone that have an internet access via Web site medium. The system brings information	Organizational Knowledge
<u>about diseases, conditions, and wellness issues.</u>	
<u>US National Library of Medicine (n.d.)</u>	
<u>DailyMed – Health Care</u>	
The system provide information about marketed drugs including FDA (Food and Drug Administration) labels.	Organizational Knowledge