

DETERMINANTS OF CLINICAL DECISION SUPPORT SYSTEMS USAGE IN HOSPITALS: A CASE OF SELECTED HOSPITALS IN NAKURU COUNTY

BY

**YEGON GILBERT, MBA (MIS)
SCHOOL OF BUSINESS KENYATTA UNIVERSITY
P.O BOX 43844-00100 NAIROBI**

Tel:

Email:

**Dr. David Nzuki,
Lecturer of Information Systems,
Management Science Department, Kenyatta University,
Email: nzuki.david@ku.ac.ke
Tel: +254 715 219 920**

ABSTRACT

Health institutions in Kenya are increasingly adopting the utilization of systems to enhance its effectiveness that encompasses human effort in achieving its target. This study focused on the determinants of clinical decision support systems usage in hospitals in the Nakuru County. The study was seeking to achieve the following objectives: To establish the extent to which hospital management influences the adoption of clinical decision support system; To determine how individual characteristics affects the usage of clinical decision support systems; To determine how technological factors influences the usage of clinical decision support systems in hospitals. The study adopted qualitative and quantitative survey research design and was guided by the systems theory that utilized the survey study research design. The target population included was physicians, patients and caregivers. The study sample composed of 10 selected public and private hospitals within the county, with the target of 23 medical officers and 50 user's selected through stratified random sampling. This formed 40% of the total number of hospitals in the Nakuru County. Data was collected using questionnaires, and interview guide. It was then analyzed descriptively using frequencies, percentages, and inferential statistics. A regression model was also computed, and the results presented using tables and charts. It is hoped that the findings of the study be used by the policy makers in formulating a health need's policy.

1. Introduction

Haynes et al (2005) defines Clinical decision support systems as “an information technology based systems design to improve clinical decision making” in hospitals. Multiple local, regional, and national initiatives have encouraged health care providers to implement state of the art clinical information systems, targeting practice groups ranging from single physician practices create interoperable, longitudinal electronic health records (EHRs) for all patients to improve the quality of care and reduce waste. However, whether these efforts to achieve these aims is uncertain. Due to

a pressing need for high-quality, effective means of designing, developing, presenting, implementing, evaluating, and maintaining all types of clinical decision support capabilities for clinicians, patients and consumers. Clinical decision supports (CDSs) provides clinicians or patients with computer-generated clinical knowledge and patient-related information, intelligently filtered or presented at appropriate times, to enhance patient care.

Many recognize the potential value of providing advanced clinical decision support to participants in care delivery. Nonetheless, there are few CDS implementations to date in routine clinical use that have substantially delivered on the promise to improve healthcare processes and outcomes, though there have been an array of successes at specific sites in individual domains.

Yet even these successes have generally not been widely replicated. There are many reasons for the lack of diffusion of these systems. Some include "...the complexity that arises from the nature of decision making, the intellectual challenge of creating knowledge, technical dimensions of delivering CDS, and social aspects of incorporating changes into clinical care" (Seltzer, 2005,p. 50).

The researcher is provoked to do this study to fill the following gaps which exist in Kenya today, by carry out a study of effects of usage of CDSs in hospitals, through an evaluation of effectiveness and efficiency of the system, utilization of the system, privacy and confidentiality of patients data and safety of information. This study aims at exploring the significant effects of CDSs usage, whereas the resulting factors explores how the usage of CDSs have impacted the upshot in terms efficacy of service rendered by the hospitals personnel's in regard to the utilization and automation to its services to the patients. The risk factors were focused on the threats and the vulnerability of the system on its reliance on the knowledge data warehouse and in depth whether it has improved or jeopardizes the daily routines for clinicians' workflow.

2. LITERATURE REVIEW

Clinical Decision Support Systems (CDSS) are "computer-based healthcare applications used to integrate clinical and patient information to provide support for decision-making in patient care as well as to generate case-specific advices" (Bonney, 2009; Kotze & Brdaroska, 2004). CDSS facilitates decision making by the clinicians and any other users with an automated convey of the results in a timely manner through a structured means to various departments in regard to drug prescription, lab results and diagnosis of patients.

In this regard clinical decision support system are intelligent system whose repositories of knowledge is built in the data warehouse where mining of its data is guided with a semantic of rules that defines characteristics of various symptoms through a module called inference engine, this process will not be complete until the convey of results are done in a standardized format that will facilitate the user to understand it and by doing this has enable the system to complete its mandate of aiding the physician to improve their efficiency of service and maintaining the quality of care. All this functionality of CDSS is guided by the essence of system theory that guides that one part of the system input facilitates an understanding of other parts of the system thinking that is referred to an analysis of how systems relate to generate an output that is a constitute the input data that has been processed to give a reasonable meaning.

CDSS cannot meets its functionality unless data captured into the system reflects a true and accurate information, therefore electronic medical record system that captures the patients details through entry of data by users should be operational and this process feeds its data into the central database. As shown below.

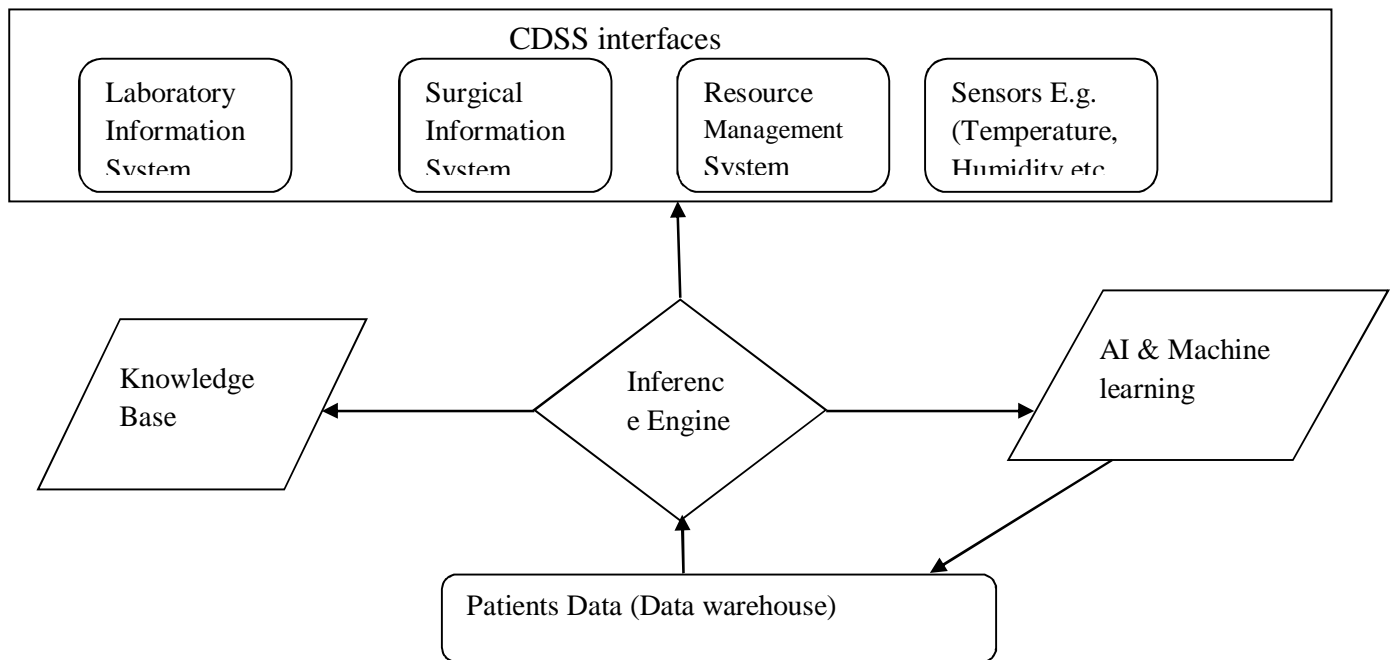


Figure 1: CDSS interfaces (Jamia, 2004).

3. Findings and Discussion

Utilization of clinical decision support system requires one to have at least a proficiency level of one to be able to operate system, this has prompted a researcher to determine ICT literacy level among the physicians since ICT usage in the health sector has become indispensable, among various industries Health has been lacking behind other bodies such as banking and airline industry (Raghupathi, 2003). Due to need and urge to boost the implementation of clinical decision support system hospitals has develop a need of training users if they are not ICT compliance for them to be standard.

Attitude amongst users is a determining factor, since users are expected to integrate and push for thorough implementation for this system. In the field of technology there are pushing forces that drives the sector to remain relevant, this was stipulated by (Burke et al., 2002) that in the health sector pushing forces are the one that drives hospitals on check. Therefore users should embrace the technology in apposite way of enhancing the services and not as a replacing factor to their daily scores or responsibilities.

Due to unprecedented pressure and competition in the field of Health sector, hospitals requirements undertakes some whose professional experience be valuable to the hospitals. This is supported by the fact that hospitals requires to give a quality health care to its patients and a need of reducing the medical errors they encounter. Therefore for this need to be successful need a thorough scrutiny of experts ought to be consulted and attached to hospitals to offer their assistance in line to the areas of professional (Corso and Gastaldi, 2009).

Hospital Management support

Clinical decision support system is an extensive system that requires all participants' parties to support the implementation of the system in one way or another, this phenomena cannot be realized without a commitment of hospital management support. Since the acquisition of this system demands lots of resources for its process to operate, such as integration of modules for various systems that whose functionality correlate to one another. This was reflected by the survey done by the (University of Chicago, 2012).

Therefore, acquisition of clinical decision support systems requires a lot of resources in terms of financial support to enable hospital to purchase it. Hence the availability of the infrastructure in place is going to determine the suitability of its environment being compatibility to the existing applications. However, location of the hospital is a key factor since if its locality is rural area meaning that the hospitals might be left out in term of key resources available in the urban areas such as the availability of internet connection point and fiber connection for fast accessed of the key resources (kawamoto, 2009). In his study of clinical decision support infrastructure he published that for one to reap full benefits of clinical systems infrastructure ought to be in place to support applications.

Technological Factors

Clinical decisions support system offers an opportunity to transform the adoption of the systems to facilitate the usage and utilization of IT optimization through day to day usage. With the integration of electronic medical record systems and clinical system that's acts as an application that extracts knowledge from the central repositories of data bank. Clinical decision support system has been designed to help physicians collect substantial information from patient's clinical data and EMR in order to resolve problems and to make clinical decisions that is quality to clients and free from medical errors (Bates & Gawande, 2003).

The cost of acquiring and maintaining this system is very expensive to hospitals, especially those that are funded by the government because of constraint budgets they work on. This phenomena has been a big challenge since its acquisition requires hospitals to have well-structured infrastructure that can support the installation and running of the system. Since for any systems that carries patients data, compliance of the legal requirement ought to be maintain so that the security of the information is maintain in a consistence way, and this practice comes with an added costs of facilitating the storage and archiving of the records through the data bank cost (Jao et al.,2008).

Complexity of the systems has proven to offer resistance by the physician to integrate the system into their workflow. Clinical pathways are an important aspect for enhancing the system into the workflow for the physicians since pathways are well established standards and guidelines for one to follow. Therefore, due to clinical processes that involves frequent deviations, and hence there is a need for considerable flexibility of the system to fit into the current workflow.

Benefits

Guidelines, procedures and standards when one is prescribing patients with drugs have to maintain in all levels as a practioners need to stick to quality of service they offer. Therefore analysis of the results especially crucial analysis that requires the support of high tech machines to assist in testing the samples extracted from the patients is a key factor when one is performing analysis.

Therefore for any therapy that patients may be required to undergo clinical decisions support system supports most of these practices, according to Randolph et al., 1999 planning of complex operation

such as surgical operation of brain, heart and internal organs requires the support of this high level systems.

Information retrieval for the patients through the use of electronic medical records has been of great improvement. Systems knowledge mechanism is an efficient way of keeping data. Users are required to capture patients data during the registration process thereafter its data is keyed in accurately as this is the synthesis of capturing the data, for any system to process data accurately they should consistence way of capturing the data.

In this regard clinical systems function as an open system where the input data be passed through a process analyzed the results that will eventually convey a meaning to the user. Therefore knowledge base has to be able to relate the requested analysis through the inference engine of rules and tabulates its result in standardized format that's acceptable by the Health sector.

Efficiency in hospitals has been a key challenge to hospitals since due to high work load and the pressure that is required from the medical practionners efficiency of services to patients be compromised in one way or another. According to Pomerleau (2008) study he noted that "...the use of CDSS allow nurses to have information and unit policies at their fingertips, which help them adhere to standards while at the bedside" (p. 154), in the current scenario of one utilizing the use of CDSS one no need to carry hand booklet for referrals since the standard and guidelines has been incorporated in the system therefore one need to refer in the system for further references.

Successful implementation of clinical decision support system and a proper procedure of integration into the workflow into current day to day activities promotes the usage of CDSS which improves the efficiency of services to patients, and this provides quality service to patients at a minimal time and cost.

Medication errors is one of the critical problems patients do encounter when one prescribing drugs is not an expert in an area of specialization, in many cases it arises when one discharges his/her duties reckless therefore patients do become the victims of circumstances which could lead to paralyses or even death. According to Ajami and Amini (2013), the rate of medication errors occur at a rate of about one per patient per day, he also found out that the study reveals that "...46% of medication errors occur on admission or discharge from a clinical unit/hospital when patient orders are written" in this regard this prompted need of utilization on usage of clinical decisions support systems in hospitals.

According to Hall (2009), medication errors are costly this is reveal in that if a patient has been diagnosed wrongly or the right procedure has been followed but the result tabulated gives false negative results then one will be treated and prescribed the wrong dosage. Therefore due to intelligence of clinical decisions support system, this norm of medication errors will be scaled down or minimized since machine compares the symptoms of patience to a certain diseases in its database with its capability of recommending the clinician to perform a certain tests.

Standards, procedures and guidelines has been a major fissure to physician since one is required to follow a certain procedure being guided by the standard to perform certain tasks, therefore clinician are required to keep revising medical practionners booklet to facilitate them prescribe the right medicine to the patients as per the symptoms. And one way of availing the guidelines to users is incorporating the use of clinical decision support system.

Due to extensive and a well verse of knowledge clinical decision support system it has a well defined procedures and a wide set of rules that enable physicians to choose the option of various prescription of certain drugs based on the recommendation that the systems has avails to the user.

Due to the current trend for shortage of doctors and nurses, a high demand of their service by patients, there is need for utilization of the available time that practionners have without exhausting

them. Therefore clinical decision support systems do enhance the utilization of the time since all the processes are correlated in one way or another.

Various approaches have been incorporated in the system in that whenever a user wants to refer to a certain guideline or documentation of a certain condition one needs to search the module of the stored procedures in the databases and this has been found to save much time one is required to research on certain conditions.

De la Rie et al (2006), in his study asserted that "...the orders are conveniently grouped to save time during the ordering process, this is a potentially useful method of implementing some types of guidelines" in this regard doctors can be able to manage their schedule of work in a timely manner since booking of patients to see the doctor can be managed appropriately by one being able to know how his/her schedule is.

From Payne's article he asserted that "computers can aid in decision making by simplifying access to data that is needed to make the decision", he also found out that CDSs have successfully given patients specific recommendations that are incorporated into the workflow of the clinics, offices and hospitals.

Medical practitioners use clinical decision support systems in their daily activities in one way or another. The system supports various departments including laboratory systems, pharmacy, surgical departments and registration section this interrelationship of this section has facilitated a good means of availing the information in a timely manner to clinicians therefore decision making by the physicians do improve sporadically.

According to the Chess (2000) study it shows that the results submitted through the system has various analysis in various forms such as graphical representation of the result combined together with the recommendations, therefore one is only required to make an informed choice based on the tabulated results from the test.

Challenges facing clinical decision support system

The cons for the implementation of clinical decision support systems outweigh the pros that are incurred in the development stages unto implementation stage, but limitation for any systems does face challenges in one way or another. Resistance to change by the key users has been found to be the major challenge to the system usage in that users should accept the system for them to prioritize the utilization and inbuilt into their workflow by not taking the system as a replacement to their key functions.

Health care institutions had to embrace technology as a mandatory factor for them to enjoy the benefit of current equipment that requires a high level of system to drive them and analyze the result henceforth cost attachment to the acquisition of the system and the equipment's is a challenge to them, since most hospitals depend on the donors to sponsor such projects. Also due to demanding needs of highly trained personnel's to operate this machine, the skill level for practitioners may not meet its intended mandate to operate this machine through utilization. Therefore hospitals choose the option of hiring consultancies to manage and maintain their equipment.

Clinical decision support systems are high level expert systems that have their own knowledge base of rules and guidelines one is required to familiarize his/herself to analyze the results. Therefore this has drawn a major hit back on the users, since they perceived as the system being a restrictive way of doing things in a certain way that is against one's culture of area of specialization.

When one is subcontracted to develop such system it is a requirement for one to be experience in the field of area of specialization to capture extensive terms of usage on prescription. Due to high level of accuracy data capturing one is required to have a team of professional in all areas that is supported by the system, therefore it takes time for a completion of the system.

As much we want to avail information to users concurrently setbacks do happen since the privacy for patient's data is breached in one way or another, therefore patients might not feel comfortable when systems can display their data without their prior knowledge. However, conveying of the result or reports to patients can have some negativity on the perception since notion of chunk languages physician do comments on the patients data can be easily read by others.

According to Sandell (2007), most of the Clinical decision support system are web based systems hence integrity, confidentiality and accountability of patient's data lapses. But as per the legal requirement for the hospitals patient's data should be treated to be preserved therefore hospitals are required to have a policy that is governing the period for data retention. However, much precaution hospitals do exercised infiltration to the data center by the hackers has become a major threat to the organizations.

4. Conclusion

Concerning the implementation and the support from the hospital management, the results shows that all the concern bodies have fully pledge to support the usage and utilization of the system since. This was shown by how efficient hospitals have got to track the historical records of patients to do the analysis and be able to carry out the preventive control of diseases.

Moreover the findings of the study have shown that there is an urgent need for local hospital to roll out the same systems by implementing the clinical decision support system through embracing the infrastructure boost. This will enhance the integration of the system to various departments smoothly.

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