

A Review on Clinical Decision Support System

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Abstract - Over the year's studies have concentrated on causative factors for lack of quality care and treatment practices without much attention to the important role of healthcare providers such as community-based practitioners that contribute to high mortality rate including poor health seeking behaviours, and unavailability of health care facilities or qualified health personnel. Community-based health practitioners' knowledge and practice are crucial to the provision of quality care. Decision making in health care practice is a difficult task because of the uncertainties at different stages of interventions. Most times Patients are unable to explain the problems with definite details and health worker on the other hand are unable to accurately diagnose the presenting symptoms. Several CDSS have been developed but not so much has been considered in the area of Knowledge representation and inferences in CDSS under uncertainties. Using CDSS uncertainty handling can be achieved when designed in a manner to help in diagnosing the symptom and to assist the CHW to handle patient's health related problems where patient's specific records are not available. This research reviewed CDSS in relation on how it is used in patient diagnosis.

Key Words: eHealth, Telemedicine, Telehealth, Mhealth, MHAs, CBR, CDSS

1. INTRODUCTION

The measure of quality of care is in This WHO in its guidelines on health policy and system support to optimize community health worker programmes in 2016, articulates that shortages of health professionals remains a threat to realising the health-related Sustainable Development Goals (SDG) and Universal Health Coverage (UHC). The situation necessitated the endorsements to revise current health policies to reflect a sustainable and responsive skills mix of available health professionals. Focus was made on community health workers (CHWs) as an important cadre within multidisciplinary primary healthcare teams since they are usually the first contact. CHWs are increasingly expected to take on additional tasks including identifying emergencies and should be able to stabilise patients before referral to the right

The adherence to standardised clinical practice using approved guidelines, and the adherence by clinicians to evidence-based guidelines in which the end product is usually associated with better health outcomes [1]. And sometimes, it may also include the use of technology by

health care professionals in their clinical practices such as clinical decision support systems. Most CDSS combine individual's health information in the form of Electronic Health record (EHR) with the health worker's knowledge and clinical protocols to assist health workers in making diagnosis and treatment decisions. Modern medical practice usually combines technology for the treatment of patients, like a CDSS which is a combination of knowledge, algorithm and equipment. In recent times CDSS is gradually being adapted in practice and is steadily increasing in such usage as a result of the storage of electronic health records. The implementation and use of clinical decision support would influence the outcome of treatments in years to come.

2. DECISION SUPPORT SYSTEM

DSS applications integrates knowledge-based into clinical decision-making process. The idea is to provide at the point of care relevant information to the care giver. [2] described a DSS implemented in PDAs in which a knowledge base is embedded to deliver the required knowledge and monitor given therapy plans for physicians in making diagnostic decisions at the point of care. Recent work on mobile clinical support systems addresses different decision support such as knowledge delivery on demand, medication consultant, therapy reminder [2], preliminary clinical assessment for classifying treatment categories [3] and providing alerts of potential drugs interactions and active linking to relevant medical conditions [4]. Studies has demonstrated that physician workstations, linked to a comprehensive electronic medical record, can be an efficient means for decreasing errors or omissions and improving adherence to practice guidelines.

Mobile technology shows potentials to improve the quality of services provided by community health workers. Efforts in studies are increasing that could lead to robust positive program outcomes. Scientific gaps will need to be addressed as the advancement of the use of mobile technology tools for community health workers gain momentum.

[5] alluded that Mobile technologies have the potential to bridge systemic gaps needed to improve access to and use of health services, particularly among underserved populations in resource poor countries. The use of mobile and/or electronic devices to support medical and public health practice and research is increasingly being appreciated worldwide. [6] concluded that mobile penetration coupled

with investments from technology companies can provide accessible platforms onto which innovations can establish and offer value-based products, provides opportunity for its use in providing service at the point of care. [7] in their publication are of the view that mobile phone innovations are cheap and so can provide fast solution especially in areas with poor healthcare infrastructure like our rural areas which have the potentials of improvements in health outcomes.

[8] in their paper Community Health Workers and Mobile Technology: A Systematic Review of the Literature concluded by saying programmatic efforts to strengthen health service delivery focus on improving adherence to standards and guidelines, community education and training, and programmatic leadership and management practices should be encouraged. They concluded that studies that evaluated program outcomes provided some evidence that mobile tools help community health workers to improve the quality of care provided, efficiency of services, and capacity for program monitoring is encouraged, we agree completely.

In 2020 the limitations to telemedicine was demystified by the COVID-19 pandemic after decades of research. COVID-19 imposed demands provided the motivation to solve regulatory and infrastructure demands that had previously been conceived and thought as insurmountable. During the period of lockdown, there was urgency to see patients which was very crucial especially those with terminal ailment, and in-person clinical care.

2.1. CLINICAL DECISION SUPPORT SYSTEM (CDSS)

[9], in their part says CDSS are Systems that provide clinicians with knowledge, intelligently filtered or presented at appropriate times, to enhance health and health care, offering an effective pathway to improve patient safety and reduce errors of clinical practice. [10] defined CDSS as a system providing diagnostic decision support as a computer-based algorithm that assists a clinician with one or more component steps of the diagnostic process. [11] defined CDSSs as “software that designed to be a direct aid to clinical decision-making, in which the characteristics of an individual patient are matched to a computerized clinical knowledge base and patient specific assessments or recommendations are then presented to the clinician or the patient for a decision”

[12] noted that in the last decade, more mobile and electronic information tools have been developed, tested and implemented with CHWs to support their work roles. The tools help the CHWs in surmounting challenges such as lack of appropriate work tools and inadequate supportive supervision and training. [13] believes that tools in CDSS is instrumental in improving access to care by marginalised population groups subjected to stigma and those in hard-to-reach areas by reducing both time and cost of travel. As such, research on CHWs’ use of mHealth tools is important. Several

pilot projects, using multiple designs and measures have been implemented. Several projects have reported improvements in services rendered by CHWs and the related health outcomes for communities. Most of the interventions demonstrated improvements in the CHWs’ delivery in maternal, new-born and child health, tuberculosis and sexual and reproductive health services, among others.

[14] said that clinical decision support system (CDSS) is intended to improve healthcare delivery by enhancing medical decisions with targeted clinical knowledge, patient information, and other health information. A CDSS comprises of software designed to be a direct aid to clinical-decision making. Usually, the characteristics or symptoms of an individual patient are matched to a computerized clinical knowledge base and patient-specific assessments or recommendations are then presented to the clinician for a decision. The intended CDSS to be developed will primarily be used at the point-of-care, for the clinician to combine their knowledge with information or suggestions to be provided by the CDSS.

[15] outlined aspects of CDSS for models and frameworks, summarizing the literature. These aspects include the adaptation of CDSS to hospital workflow, construction of its components, interoperability and sharing of data, considerations of reasoning, health systems priorities, quality improvement outcomes, and CDS effectiveness evaluation. It is recognize that these aspects address several different layers of data, analysis, and decisions, including organizational, interoperability, and modelling aspects.

[16] said the optimal use of CDSSs have the potential to improve healthcare processes and outcomes by ensuring compliance with the most up to date guidelines, reduce clinical errors, and reduce cost without compromising care. A CDSS should be viewed as supportive tool available to the clinician to facilitate their task, and definitely not as her substitute.

Fig1 depicts the three principle elements generally required for a CDSS, which are: the knowledge base contains in a computer interpretable format the rules, associations, and clinical know-how for the task at hand (e.g. screening, diagnosis, treatment, prognosis); the algorithms determine how to combine the knowledge base to an instance of patient specific data, which is supplied to the system in order to generate an actionable recommendation or assessment of the patient; the communication mechanism is the manner in which the system inputs the patient specific data and outputs the recommendations or assessments to the clinician.

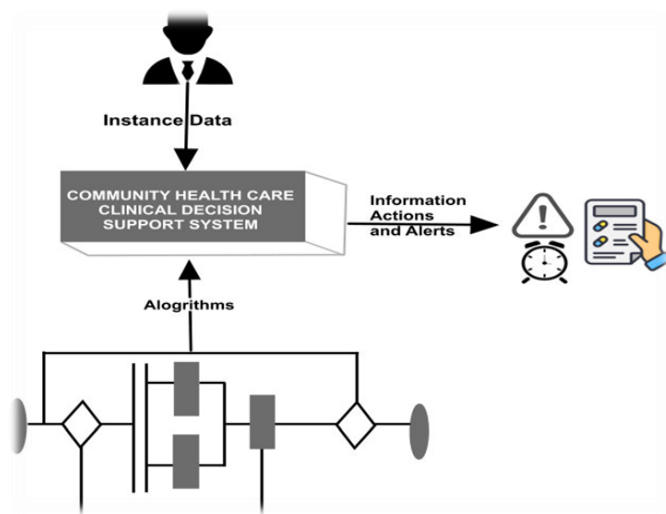


Fig -1: Elements of clinical decision support system

2.2. CDSS ADVANTAGES

Clinical decision support systems have the potential to improve patient care in a many ways. A CDSS help in the reducing medical errors and reducing of adverse drug effects on patients, it ensures comprehensive treatment for patient illnesses and conditions, It encourage adherence to guidelines, and shorten the length of stay of patient. A successful CDSS that can effectively operate and achieve outcomes will potentially decrease the expenses. Studies on CDSS confirm its use with medication administration and health prevention decision support will results in improved quality of patient care. Clinical decision support systems provide enhanced communication across disciplines, it improves accessibility to references on best practice, improves adherence to care guidelines, and a more consistent quality of patient care resulting in better patient outcomes. A CDSS alerts and reminders encourages continuous learning for CHW at the novice level and reinforce already known knowledge in nurses who are experts. The prompt delivery of care options to the users aids in expediting the decision-making process regarding patient care [17].

3. CDSS Ethical Issues

Issues bordering on ethics are of great concern when it comes to CDSSs, the risk of patient harm if the tool is not developed or used correctly is very important and care must be taken in making sure that it works correctly every time [18]. The Software Engineer Code of Ethics and Professional Practice guarantees that the system being developed should be beneficial to the user and should cause no harm. Great care must be taken in developing CDSSs because any errors that are not caught prior to implementation can become a detrimental errors that can affect a patient.

The ethical consideration that relates to CDSSs includes the standards of care, the proper utilization, suitability to

users, and effect on relationships between professionals in the clinics. It is particularly important for users to be vigilant and not excessively rely on the CDSS, but to also make sure they use their own common sense and critical-thinking skills during the early stages of implementation. Users are expected to be competent and knowledgeable in their fields and be capable of making logical and safe decisions that prioritize patient safety.

For additional protection and safety of the patient, it is expected that the development of CDSS should be done by all members of the clinical team that will be using it. No one speciality should profoundly influence the design. The CDSS should encourage multi-discipline usage. The users should feel comfortable with the design as it has incorporated all disciplines, these will lead to the safe delivery of quality care. The users should be well-trained on the CDSS so that they take appropriate actions to preserve patient safety when prompted.

A major concern in the decrease of professional relationships may be traced to the overdependence on CDSSs. The resulting quality of care that the patient receives becomes an ethical concern. To overcome this it is important for the users to have regular meetings to share their experiences on the use of the CDSS for future improvement and to incorporate new ideas this would in turn provide the patients with the best of care.

4. CONCLUSIONS

The aim of CDSS is to better the safety and quality of patient care, improve patient treatments and quality of care, decrease the over dependence on memory, reduce error rates, and improve response time. It is a software that interprets specific patient information that is entered into the system in order to provide assistance in making the most appropriate and safe decision when providing patient care. It supports users with the detection and prevention of possible risks to patient safety and encourages the appropriate usage of evidence-based practice and guidelines. It support caregivers in making the best decision regarding patient care by gathering all pertinent data and information needed so that it is easily accessible to the user in one place. A CDSS takes the information entered and processes it with the utilization of organizational models, algorithms, in order to achieve a variety of potential action options based on the unique circumstances of the individual patient. The information that is gathered by a CDSS about a specific patient is presented with prompts, alerts, or recommendations to the correct user at the most appropriate time [19], [20] and [21].

CDSS's are designed to be of direct aid to clinical decision-making [22], [23] in which the characteristics of an individual patient (symptom) are matched to a computerized clinical knowledgebase, and patient-specific assessments or

recommendations are then presented to the clinician and/or the patient for a decision" [24], [25]. It can also be said that a CDSS is like a job aid that helps clinicians at the point of care to make the right decisions.

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