

## **GRAND BARRIER IN CLINICAL DECISION SUPPORT SYSTEM**

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**Abstract:** For the assistant of the physician for taking the effective and efficient decision about the patient, there is a immense requirement for designing, development and implementation of the higher quality decision support system. We have been identified the grand challenges that been faced during the designing and the development of the CDSS. CDSS 's are automated ,intelligent expert system that used the computer knowledge and information about the patients for the prediction of the disease at early stage to provide the treatment guidelines along with the alerts. Organization which are familiar with the potential of the CDSS and ready to adopt the CDSS , can overcomes the barriers with ease of this study. CDSS has multiple facets from registration, consultation to follow up by the diagnosis. Cloud based CDSS support to formed an EHR (electronic health record) data repository that can be accessible at anytime from anywhere to make the quick decision about patient .In the field of the healthcare ,CDSS has prominent role. Major objective of this paper is to provide the guidelines to the researchers, developers ,organization and policy makers , who are planning to move towards in domain of CDSS.

**Keywords:** Clinical decision support; Clinical information systems, EHR(electronic health records), interoperability.

### **1. INTRODUCTION**

In the field of healthcare, many initiative at national and international level[1] has encouraged the small scale to large scale hospitals to automate the CIS(clinical Information system) for exchanging and sharing the patient information to improve the quality of patient assistance health issues[2,3]. Prime objective of the aimed is to provide the interoperability among the EHR(electronic health record) system to improve the quality of health care by minimizing the waste reduce. However ,uncertainty still exist to achieve the said aims. Pioneering and researchers provide the suggestion that Clinical decision support system(CDSS) will play the central role to achieved these said aims[4,8]. Presently many EHR's along with the CDS not providing the robust guidelines, functionality and the decision support. Foremost goal about gathering "complex genomic profiling data toward the goal of personalized medicine" [5] the patient data in unstructured format if achieved , then the mining the structured data to perform the decision and responsiveness increased exponentially. Conclusion is that there is immense requirement of the higher quality automate decision support system to assist the physician, patients and clients. CDSS generated the computer oriented[6] patient knowledge, appropriately filtered that information to provide the corrective decision in diminutive time domain to provide the assistance to the patient ,clinician .

Potential of the instant care delivery make available by the CDSS has been recognized by many organization.[7].In spite of this , to date the adoptability and the implementation is quite less of such CDSS's that can provide and sustain the expected functionalities and the outcomes as per the requirements, while in specific domain they have success of arrays[8].Various reasons following the dispersion of such system although the success of system has not been replicated. Few conclude that " social aspects in the adaptability of health care along with lack of awareness, technical issues in delivering the automated decision, interoperability issues among the clinic and the intellectual barrier in collecting the medical knowledge etc.".To prepare and identify the list of key challenges and describe them appropriately , we performed as well as studied the number of existing CDSS and created the list of top barriers in the domain of the CDSS. We then shared this documentary information with various physician and the developers to rank the barriers from most important(rank 1) to least important (rank 10).

Objective of this barriers ranking is to elucidate the various unrequited challenges discussed in earlier in the year of 1994[9] and efforts have been made to re-stimulate as well as addressing the most significant barriers to unlock the potential of the CDSS. Ranking of the challenges has been made as per their importance once the health centre and the patients understands the benefits and potential of the automate CDSS. Catalog of the challenges surely edify and encourage the vendors along with the physician to adopt the medical informatics technology in their regular routine to explore the fruitful outcomes. Association of these challenges has been resonate along the various objectives of the CDSS[3] that has been delineate by the panel of the experts.

### **2. RANKED CHALLENGES OF THE CLINICAL DECISION SUPPORT SYSTEM**

We have been categories the challenges of the CDSS among three wide category:

1. Improvement in the effectiveness of the user- interference in CDSS.
- 2.Suggested advanced CDSS based interventions.

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3. Promulgate the suggested interventions and the existing information of the CDSS.

Among these wide categories, various striking challenges have been identified which we have tried to discuss them briefly by step.

#### *2.1 Improvement in the effectiveness of the user- interference in CDSS.*

##### *2.1.1 Enhance User-System Interface*

In the current scenario, there is a requirement of automate clinical decision support system once the interaction among the user and system has been get completed as per the requirements, the workflow of the clinical decision should not be interrupted (solicited and unsolicited) so that system can provide the appropriate decision and recommendation. In fact the CDSS should efficiently and effectively provide the reminders, correctness and modernize about the parameters that have been overlooked unintentionally, correct information of the data and the knowledge along with the corrective decision at the primary situation [10,11]. Presently, due to multiple of reasons the unsolicited reminders and CDSS alters are overridden [12], human-computer poor interface is one of the major cause among that. General awareness to the users are required and we should improve the paradigm of HCI (human/computer interface) by initiating the appropriate actions. New HCI should be developed that can facilitate the physician as well as the users with the progression of the CDSS so that put off of both the mistakes of omission and commission. By escalating the design of human/computer interface number of overcomes will be improve. Improved design of human/computer interface include the repository of data, knowledge and other basic requirements that are basic necessity for the current scenario of the clinic, provide the right information with better clarity within few seconds, provision to mapped the important information and above all provide the correct/quick information to clinician about the patient to assist them to make the effective and right decision.

##### *2.1.2 Preview patient-level information :*

Manually to retain and process the data of the complicated patient is not an easier task, to provide present conclusion the clinician must go through the past facts and information about the patient. Paper based data is a time consuming process. On other side the CDSS provide the clinical data more elegantly and automatically in digital form to overcome the barriers of the paper based data. With the ease of CDSS it can generate the report of the patient past medicinal history, present circumstances, present history of the medication, treatment going on along with the parameters of philology etc. Report can be customize as per the requirement of the physician. Electronic detailed report is quite adequate for the physician to understand the current condition of the patient. The main purpose of these summarize is to provide the key data to all the decision makers, unlike summarize can be accessible for the complicated patients, can provide the different perspective and workflows of different physician [13,14]. These summaries automatically provide the appropriate information to the CDSS based application to make the correct decision.

##### *2.1.3 Precedence and filter suggestions/recommendations to the client :*

Particularly, a consistent, automate and robust Knowledge based CDSS is required that can provide the value based interference. Utility model holds the number of multi attribute like demographics parameters (age, occupation etc), smoking habits, daily life routine, cost value individual or association with respect to laboratory test /therapy, how much client abide provided suggestion, inherited and genomic consideration, coverage of insurance policies, location of the clinic, past history of patients and many more factors. Expert CDSS automatically considered as well as prioritize utility model's parameters and provide the recommendations to the client to reduce the expected mortality, preferences of the clients as per their life style, locality of clinic along with the cost effectiveness. The key challenge is the to keep the accountability of contending persuade and the ethics impacting the decision made by clinic, that's why the need of CDSS. Another challenge that is one of the cause of client dissatisfaction, is reduction of the "alerts-fatigue" among the patients or physician that arises due to computer automated generated alerts. System should generate the value based alerts by evaluating the rank in priority-wise of the recommendations provided by the clients. Main cause of this challenge arises from the result of both the patient and physicians, for example the patient has inadequate ability to handle too many medicated prescriptions, amend his/her life style at a time along with the lack of time as well as limited attention of the physician to individual patient.

##### *2.1.4 Practice to unite the recommendations and the co-morbidities :*

Majority of the aged patients can have various co-morbidities along with the medications as known to patient care taker only, mostly this part has been ignored and concentrate only on the current condition [15]. Physician provided the medication accordingly. as per the current condition. Challenge is that there should some mechanism to recognize and the removal of the superfluous, potentially contraindicated guide-line based suggestions for the patient who suffering from other co-morbidities or medication. Expert CDSS should provide a synthesize report of the guidelines to the physician by considering more than two- three guidelines. This is among the one of the several reasons, why in practice these clinical guidelines are under-utilized in daily practice since system don't sufficiently considered these co-morbidities issues in to the consideration [16]. Consider the scenario, a physician follow the guidelines for a type-1 diabetic mellitus patient, but unaware about that the patient is also suffering from heart disease along with COPD (chronic obstructive pulmonary disease) since the guideline has not addressed these facts. Recommended medication need to alter with respect to the existing medication and other co morbidities [17]. In view of this challenge, there is immense requirement of new coherent, combinational and advance

approaches based CDSS that has ability to unite and cross-verifying the recommended suggestions from more than two or three guidelines.

### *2.1.5 Utilize the free data information to propel CDSS:*

In the era of digitization, numerous clinical information is available on various EHR (electronic health record)'s free portions, so it is required to use some techniques to extracting that valuable information of the clinic and utilize this information for the CDSS. But make sure that the CDSS must be capable to identify the free information [18] accurately and categorized them as per the requirement. With the ease various data and text mining techniques, many automated intervention specific methods are available (i.e., patient oriented data sets, immensely customized alerts, recommendations or various other provisional proclamation etc.), that can be accessible and utilized for the logic of the existing CDSS. This is quite important, since as per some reports of the existing EHRs, considering that around 50% information related to the current stage of the patient along with therapies available on the free-text portion of electronic health records [EHR].

## *2.2 Prepare novel CDSS based interventions.*

### *2.2.1 Prioritize the designing and content implementation of CDSS:*

To improve the quality of healthcare services, need of designing, development and adaption of quality content based CDSS's are required, although the pragmatic priced based health-care system will acquire a few years. Designing and the implementation phase depends upon various factor, that need to be considered first like the chronic-disease management, improvements in patient safety counter measures or interventions related to health, which in turn depends upon various parameters like availability and accessibility of the legitimate data, demographic information about the patient, cost constraint related to health care, various barriers in the implementation, adaptability issues by the physician, patients and the other staff members. Deployment of the reliable and accurate CDSS, nationally the administration should take the initiative to facilitate the widespread benefits of the healthcare system among the nation to improve the, quality of healthcare services. With the period of time the present ad-hoc approach could supplant with the support of additional concentrated, systemized prioritize and execution approach.

### *2.2.2 Mine the enormous clinical database to formulate novel CDSS:*

Many of the CDSS has not been synthesized appropriately, since many of the valuable clinical based guidelines and interventions need to be developed and place in to the employ. Large amount of the clinical data available on the internet repository, there is need to develop novel techniques and algorithm to perform the mining on that existing clinical data repositories, which in return reduce the global funding and improve the healthcare outcomes. We must considered challenges related to creating, testing and implementation of the mining the researchers or developers facing to achieve the accessibility of huge medical database. Need to work in the direction how the interoperability among the medical boundaries can be performed. Also make the insurance of the patient identity along with the secure the information [20]. At present the system that can mine and parse the medical information that can be utilized for the development of the CDSS is quite helpful. Other words, we can articulate that the we must trained our system like that they are able to access the appropriate information from large database [21].

## *2.3 Disseminate the suggested interventions and the existing knowledge of the CDSS:*

### *2.3.1 Disseminate optimum ideal practices in design, development and implementation of CDSS :*

We have been studied and noted earlier, that few medical associations had a endure and prosperous experiences in the domain of the CDSS [8]. Being the studied of these CDSS designing, implementation and deployment, it has been found that the preliminary requirements, style of clinical practices, management practices etc. are common, since these knowledge not frequently available to organization that are seeking in the direction to develop the CDSS [22,23]. There is requirement for the initiatives [6,24] to make the efforts to prepare the repository of the information regarding designing, identification, evaluation, testing, implementation, cataloguing, synthesis's and maintenance steps etc. for the existing cdss. Need of various kind of the techniques and tools that are specifically quite useful for the to take the initiative in the field related to CDSS. Information related to catalogued of the cdss, issue of classification, edification, implementation process, platform information should be present on the dominant medical sites form where one can easily access the information. Best practices and the barrier related to cdss should also be available on sites along with suggestions to improve the system. For example, should system should prefer the reminder to remind the physician to provide the order for vaccination or standing order for helping staff would be effective [24]. Establishment of such kind of initiatives are very fruitful for the researchers and organization - that will hasten and refine the development novel interventions along with provide the highlights about the gaps and prospects' to make the improvements in the knowledge- itself. Recognition of the best approach for the CDSS, required a steady mechanism for the competence and the feedback process to evaluate the performance of the CDSS [25,26]. Also perform the performance comparisons among the various cdss that are using the same services and tools [27].

To achieve this challenge, there is necessitate to attain a standard nomenclature for the CDSS interventions and their outcomes that can precisely enlighten about the best approaches and comparison on the basis of the implementation outcome for the dissimilar system and across dissimilar organizations.

### 2.3.2 An architecture design for exchanging the executable components and services of CDSS :

Main objective is to create the standards of interface that can provide the facility of the interoperability so that any EHR able to utilize the services of the existing CDSS along with can able to amend new services with least efforts on the client end[3,28] Interoperability should able that the knowledge modules can easily to loaded in the CIS(clinical information system) or can provide the facility to handle the remote services also with the ease of the networking by utilizing the standards of interface[30]. To overcomes this challenge, need to identify the various kind of standards available to support the interface and the kind of the data format the various cdss supports. Main objective of this novel architecture is that it could be encapsulate the knowledge of the various existing cdss so that the different cdss can utilized this interface mechanism rather than to create a specific scheme for the knowledge representation .Alike the architecture should provide the detail knowledge about the key parameters that used and various techniques for the interventions like the alter, messages and ordered data set etc. and provide the facility of the customization as per the requirements of the user with the support of the wide guidelines Implementation and adaptability of the automate clinical decision support system is quite slow[31] . In future we can make the hypothesize of availability 'plug and play' cdss that will overcome all the barriers related to the implementation that creates key hurdles for the adaptability of the cdss extensively. Another assistance by designing such kind of architecture is the vastly and rapidly adoption of the cdss by spending least time spending on the explore verdict and the processing[32]. in future the organization, researchers and developer can easily get the information of the standards, can access the sharable knowledge module in the mode of standard format. .

### 2.3.3 Build internet - based clinical accessible repositories :

One of the major challenge is to prepared the internet based better-quality repositories that includes the cdss knowledge and evidence oriented -modules that can accessible to the end users. Services and all the interventions related to the cdss should be in easily downloaded, modified, maintainable at the user end and can be utilized for any kind of certification as well as for the EHR compatibility purpose also[33] by utilizing the architecture as ,mentioned in the challenge 2.3.2.These kind of the accessible repositories quite useful in the direction of sustainability. Central repositories must be maintained by some central body that provide the facility of deployment of the authentic and latest information related to health along with the online responds to the currently available upgrades. All the procedures and the processes for the formulization of such type of system should also available to the users. These kind of repositories quite essential that create the assets of the knowledge which quite useful for the organization to maintain the consistency in the direction of the information that have been gathered from the diverse platform and available on single forum. Aggregate ruled information related to the various issues like how to manage the quality and maintain the integrity , interventions rules and deployment of the system provide a appropriate and effective guidance. Locally when performed the customization process or the steps related to the implementation , the errors or any conflicts does not arises from the bigoted knowledge based elements or engineering. Repositories like this are vital such that all the health centre follow the common practice guidelines and not prepared their own rules as well as the error\_ prone processes. Knowledge in the repository should be included from various medium like AHRQ a national level guidelines[35], others can be from the viable vendors , some can be from the developer end and local health care organization can be provide the facility of upload.

## 3. DISCUSSION

Through this paper we have been tried to highlight and discussed various challenges related to the clinical decision support system and we have strong believe that if addressed these challenges it will surely unlock the significant potential of cdss. Unquestionably , there may be some other important challenges also be there, but these challenges clearly characterize the pivotal set. May be addressing to these challenges is a time consuming process and solution likely to differ to some extent, but considering these point will surely move the things ahead. Physician, hospital management and patients certainly acquire the a range of benefits along with the improvement in quality of care if adapt the cdss. keeping this in our view we have formulated the ranking of the challenges according to their importance. For the ranking from most to least we took the help from physician and various of our colleagues. In the table-1 we been prepared the aggregate of these ranking, although it's not a apparent consensus. With the support of the standard deviation , illustrate the better results Limitation of the study is that may be some other challenges also exist but we have not considered all of them.

## 4. SUMMARY

During the development process of the clinical decision support system ,we have acknowledged and countenance a range of challenges . Basic objective of the preparing the list of challenges to edify and to encourage the researchers, vendors and the funders , with the anticipation of additional dialog and efforts in this significant domain. Resolution of these challenges should be vital if we want to attain the full benefits of clinical decision support system.

## 5. REFERNCE

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