Decision Support System for Rural Health Care and Diagnosing Services

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Abstract: The system integrates the input data from relevant sources into an autonomous data warehouse, while the client front- end ensures adequate output presentation to the user so as reveal significant details and dependencies. The healthcare industry generates massive amount of data. Information Technology (IT) is, therefore, used extensively to capture and transfer information. The article explains the role played by decision support system which is a "computer– based system that aids in the process of decision-making" in order to ensure correct diagnosis of any illness.

IndexTerms: *Decision Support System, Healthcare, Information Technology, Computer based system*.

I Introduction

Healthcare industry is growing fast by using IT to automate its many processes like transaction, inventory keeping and maintaining records, thus eliminating mundane and repetitive processes[1,2]. Healthcare is the management, prevention and the treatment of illness and the main aim is to provide clean and effective services that lead to the preservation of mental and physical well-being of humans and animals.

The medical diagnosis of an illness can be done in many ways; from the patients description, physical examination and/or laboratory tests. After the diagnosis is done by the doctor, treatment is given keeping in mind drug reactions and allergies. However there is always a chance of wrong diagnosis which may lead to drug reactions and allergies in a patient and may lead to life threatening situations. To address these points, one of the IT systems that help the healthcare professionals in problem solving during medical diagnosis is the Decision Support System (DSS).

DSS is also defined as "an interactive, flexible and adaptable computer-based information system" and is developed to provide solution for non- structured management problem. It utilizes data, provides an easy-to-use interface and allows for the decision-makers" own insights. In healthcare domain, DSSs are also commonly known as Clinical Decision Support System (CDSS) [3]. It is defined as a software that helps in clinical decision-making, in which the "characteristics of an individual patient are matched to a computerized clinical knowledge base and patient-specific assessment or recommendations are then presented to the clinical or the patient for a decision". The main advantage of this system is that it helps to improve patient care and efficiency of the healthcare providers.

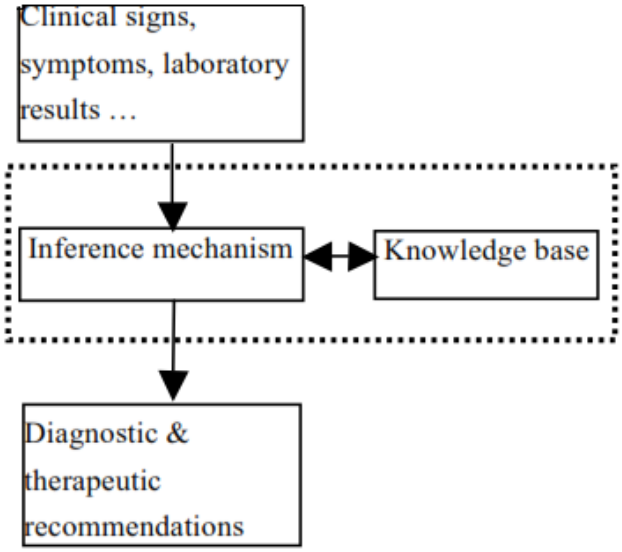
1.1 What are CDSSs

This section briefly describes some typical definitions of CDSSs and a general model of CDSSs which most researchers adopt in the literature of CDSSs.

1.2 Definition of CDSSs

In more recent studies, researchers have been trying to classify CDSSs in the literature so as to provide a holistic picture of CDSSs. For example, Berlin et al. [10] did research on a CDSS taxonomy to describe the technical, workflow, and contextual characteristics of CDSSs, and the research results are very useful for researchers to have a comprehensive understanding of various designs and functions of CDSSs. A general model of CDSSs [11,12] which has been discussed in the literature is shown in the following figure.

Figure 1: Decision Support System for Clinical Based Diagnosis.



As seen from figure there are inputs composed of clinical signs, symptoms, laboratory tests and so on to the system and outputs including diagnostic and therapeutic recommendations from the system. The system has two basic architectural components: a knowledge base and an inference (reasoning) mechanism. The knowledge base is a structured collection of expert medical knowledge used by the CDSS. The inference mechanism is a set of computer algorithms used to process clinical signs, symptoms and laboratory test results in relation to the knowledge base. According to the general CDSS model described in figure the system users interact with the CDSS in an iterative fashion, selectively entering clinical signs, symptoms and laboratory test results, and using the CDSS output recommendations to assist with the diagnostic and therapeutic decision-making processes.

II LITERATURE SURVEY

The domain of the term "Health" is as large and complex as the entire scope of human activities [13]. Healthcare may be viewed as the provision of a range of healthcare services by professional, technical, and supportive health workers, with in-patient, out-patient and home health facilities. The development of healthcare facilities is influenced not only by the opening of hospitals or healthcare centers, but more so by their proper administration and management.

Health care has been defined by the WHO as "A programme that should make available to the individual and thereby to the community, all facilities and allied sciences necessary to promote and maintain health of mind and body [14]. Health care remains one of the most important human endeavours to improve the quality of life. The main objective of any healthcare system is to facilitate the achievement of optimal level of health to the community through the delivery of services of appropriate quality and quantity. Increasing the availability, accessibility and awareness about the services and technological advances for the management of health problems, raising expectations of the people, and the ever-escalating cost of healthcare are some of the challenges that the healthcare systems have to cope up with. Health care delivery systems will have to gear up to taking up necessary preventive, curative, promotive and rehabilitative healthcare for the population. The challenge of building rural health services, state's responsibility in providing these and training paramedical personnel to carry out limited curative and preventive responsibilities were part of India's development thinking before and after independence. The rising expectations of healthcare users mean that the way the services are organized and delivered will become significant. It is therefore, essential to understand how best to organize and deliver healthcare services.

The concept of health centre was first brought by Lord Dawson in England during 1920. As early as 1928, Govt. of Mysore established the first health unit in the country at Mandya (in Karnataka). Establishment of health centers at Nazafgarh, Singur, Poonamallie, Trivandrum, Lucknow and at other places in collaboration with Rockefeller foundation and Govt. of India between 1931 to 1939 was an important landmark in the history of health care delivery system [15].

2.1 RURAL HEALTHCARE

Community based primary health care is the mainstay of health care delivery to persons in developing countries. In these countries, primary care must be accessible to the vast majority of the population as poor access to primary health care is associated with adverse pregnancy outcomes [16,17] infant mortality [18] and decreased vaccination coverage [19,20].

In accessibility of health care facilities may also affect adherence to treatment regime.Access to health services in the developing world is poor, but it gets significantly worse in the rural areas. World Health

Organization (2009) [21] in its study on increasing access to health workers in remote and rural health areas found that there is more a problem of geographical mal distribution rather than a lack of physicians. The movements of health workers in general, such as turnover rates, absenteeism, unemployment or dual employment has a correlation between the factors influencing the choices and decisions of health workers to practice in remote and rural areas and the categories of interventions that could respond to those factors. The deepest concerns of health workers when it comes to practicing in remote and rural areas are those related to the socio-economic environment, such as working and living conditions, access to education for children, availability of employment forspouses, insecurity, and work overload.

Lewando Hundt et al (2012) [22] found in their study that there are issues of accessibility in terms of distance, and of acceptability in relation to the lack of local and female staff, lack of cultural competencies and poor communication. Also they found that provision of accessible acceptable health care in rural areas poses a challenge to health care providers and these providers of health care have a developing partnership that could potentially address the challenge of provision to this rural area.

Frank Tanser (2006) [23] found out in their study that the population level increase in accessibility that would be achieved by the construction of the test clinic (location optimized by PHIT methodology) would be 3.6 times the increase in accessibility achieved by the construction of the newest clinic The corresponding ratio for increasing clinic coverage (% of population within 60 minutes of care) would be 4.7 and also develop a model through Person Hours of Travel Time (PHIT) methodology for health planners to identify potential localities for establishing new health care facilities by using GIS technology to efficiently to site new facilities to achieve the maximum population level increase in accessibility to primary health care.

Ray S.K. et al (2011) [24] found in their study that large no of patients did not avail any services when they fall sick especially in the tribal district where distance, poor knowledge about the availability of the services and non-availability of the medicine in addition to the cost of treatment and transport. Utilization of government health facilities was around 38% followed by unqualified Practitioners and Private Practitioners. Referral was mostly by self or by close relatives / families. Also attention is required with respect to the cleanliness of the premises, safe drinking water, face-lift of PHCs and SCs, clean toilet with privacy. Also they concluded that an attempt should be made to improve utilization by cordial behavior, providing more time for patient care by the doctor, and staff, explain their prescription and report, reducing time for registration as well as waiting and finally cost of medicine they can afford.

Srivastava R.K. et al (2009) [25] study revealed that the utilization of RCH services in the government facilities was higher among the backward classes than the general category; and higher the level of education the lower was the utilization of the government services. Also the users were not satisfied with the services provided by the governmental health facilities especially with the behaviour of medical officer and health workers and non-satisfaction was highest among SC category. Also authors concluded that all the health facilities need to be made functional according to the Indian Public Health Standards (IPHS) of National Rural Health Mission (NRHM).

Meenakshi Gautham et al (2011)[26] in their study found that most rural persons seek first level of curative healthcare close to home, and pay for a composite convenient service of consulting –cum-dispensing of medicines. Non Degree Allopathic Practitioners (NDAPs) fill a huge demand for primary curative care which the public system does not satisfy and are de facto first level access in most cases.

Kaveri Gill (2009) [27] in their study concluded that the National Rural Health Mission is on the right track of addressing the rural health care with the institutional changes it has brought within the health system. But there are problems in implementation, so that delivery is far from what it ought to be with respect to physical infrastructure, medicines and funding. Whereas with respect to human resources and to the extent these impact actual availability of services, structural issues of some complexity need careful resolving with a definite long term investment in the training and education of paramedical and medical staff.

Ager A. et al (2007) [28] in their study examined the patterns of service utilization across the rural population of four districts of Orissa, with special reference to perceptions of the availability and quality of state services at the primary care level. Despite emphasis on strengthening local health care provision, concern remains regarding the rates of utilization of state provided services. Households reported utilizing a wide range of health care providers, although hospitals constituted the most frequently--and primary health care centers (PHCs) the least frequently--accessed services. Private practitioners (qualified and unqualified) represented a major sector of provision. This included high rates of access by scheduled tribes and castes (running at approximately twice the rate of access to both local and PHC provision). Key factors guiding patterns of utilization were reputation of the provider, cost and physical accessibility. Local health provision through assistant nurse midwives and male health workers was generally perceived of poor quality, with the lowest rates of resolution of health problems of all service providers. The location of a sub-centre base for assistant nurse midwives within a village had no demonstrable impact on access to services. Acknowledging constraints on broader generalization, the implications of the findings for informing health policy and programming within Orissa are noted. This includes support for current efforts to strengthen the capacity of PHC and sub-centre level provision within the state, and acknowledgement of the potentially growing role of effectively regulated private provision in meeting the needs of the rural poor.

III CHALLENGES IN HEALTH SERVICES IN RURAL

A critical challenge for health services in developing countries is to find ways to make them more client-oriented. Indifferent treatment of patients, and inadequate provision of medicines and supplies are common, Assessing patient perspectives gives users a voice, which, if given systematic attention, offers the potential

to make services more responsive to people's needs and expectations, important elements of making health systems more effective [29]. Studies have shown that health care utilization, a long-standing concern for many developing countries, is sensitive to user perceptions of quality [29,30,31,32,33,34]. For these reasons, patient perceptions of health services are now an important part of quality assessment in health care. The few studies on user perceptions conducted in developing countries have shown that patients are able to evaluate structural, process, and outcome measures of quality [35,36]. Patient perceptions of quality have been a focus of research due to the increasing need to provide patient-centered care, with the expectation that such care would lead to better patient outcomes and continued use of care [37]. Patient satisfaction was associated with providers‟ responsiveness, assurance, communication, and discipline [38].

In developing countries, where quality is one of the major challenges to be met under the current health care reforms, the measurement of perceived quality is also justified by the powerful influence that these perceptions have on utilization of services. Several studies offer evidence on the growing interest in users‟ perception or satisfaction in developing countries. Surprisingly, little research has been done on patient perceptions of quality in India. Orna Baron-Epel et al. (2001) [39] found in their study that the degree to which expectations of the interaction were perceived as fulfilled were more strongly associated with the satisfaction especially attributes characterizing interactions and communication with the physician like "explanation and discussion", "answering questions", and "listening to problems". When the patient expectations are met with respect to these characteristics, patient satisfaction is greater. The perceived degree to which expectations with regards to other characteristics, such as "Medical Certificate Provision", "referral to specialist" or "test referral" were fulfilled may be less critical in determining the patient satisfaction.

Margaret S.W. et al. (2003) [40] study's findings provided support for Donabedian's Structure, Process and Outcome Model28 and they demonstrated that attributers ofproviders and settings are major components of patient‟s satisfaction and showed that the patients in poor general health were significantly less satisfied with organizational factors (like availability of a seat and toilet in the waiting area, and cleanliness) whereas the patients in good general health but poor in mental health were significantly less satisfied with the interpersonal quality of their care (like support, consideration, friendliness and encouragement.

Krishna D. Rao et al. (2006) [41] found in their study that better staff and physician interpersonal skills, facility infrastructure, and availability of drugs have the largest effect in improving patient satisfaction at public health facilities. Also in their study they concluded that, In India and many developing countries, the excessive emphasis on service coverage and inputs in the provision of health services has ignored the needs of the very people for whom these health services exist. Incorporating patient views into quality assessment offers one way of making health services more responsive to people's needs. It also gives users an opportunity to voice their opinion about their health services. While conducting this study, we found many instances in which patients were eager to record their concerns about the services they had received in the hope that some action would be taken. It is likely that the very act involving patients in evaluating their health services will make providers more sensitive and alert to patient needs.

Upali W. Jayasinghe et al. (2007) [42] in their study showed that patient assessments of quality of care and patient-centeredness were strongly associated with practice and patient characteristics. Patients from smaller practices reported better access to care compared with larger practices. Also patients from urban areas were more satisfied with patient-centeredness than those from rural areas. Also females were more satisfied with patient-centeredness.

3.1 QUESTIONNAIRE

A survey is done in the area of Mangalagiri, Guntur District, by taking respondent of 71. The following details are furnished.

S.NO	REF.NO	AGE	GENDER	Weight	Veg/Non Veg	Pulse Rate	BP	MAJOR CLINICAL FINDINGS
1	K001	80	M	58	N	61	120/83	High Grade Fever
2	K002	50	M	72	N	64	115/80	Fever
3	K003	30	M	58	V	74	110/77	Fatigue
4	K004	17	F	35	N	78	105/73	Fever
5	K005	19	F	32	N	80	106/75	Fever
6	K006	35	M	41	N	79	111/78	Generalised Weakness
7	K007	29	M	40	N	82	109/76	Fever
8	K008	30	F	45	V	84	110/77	Fever
9	K009	55	M	50	N	76	120/80	Easy Fatigability Bleeding
10	K010	65	F	60	N	61	140/91	

11	K011	48	F	62	N	72	112/77	
12	K012	23	F	38	N	86	109/76	
13	K013	45	F	52	V	72	115/80	Painabdomin
14	K014	35	M	70	N	76	111/77	Fever
15	K015	33	M	59	N	79	110/77	Sudden Loss Of Vision Of One Eye And Dic
16	K016	53	M	60	V	65	140/90	Generalised Weakness
17	K017	67	M	63	V	67	130/87	Fever
18	K018	52	M	57	V	75	110/77	Fever , Loose Stools
19	K019	50	M	45	N	78	120/83	Fever,
20	K020	6	M	15	N	86	-	Fever, Generalised Body Pains
21	K021	56	M	60	N	69	120/84	Headache
22	K022	22	M	33	N	76	105/73	Black Colour Stools
23	K023	6	M	14	N	89	-	Fever & Vomtings
24	K024	75	M	59	V	63	140/90	Fever(Malaria)
25	K025	60	M	50	V	69	130	
26	K026	17	M	35	N	80	104/71	Abdominal Discomfort
27	K027	19	F	40	N	82	106/73	
28	K028	3	M	8	V	84	-	Fever & Generalised
29	K029	11	F	9	N	85	-	Fever Bone Pain
30	K030	27	M	36	N	79	104/75	Fever Loose Stools,Bleeding Gums And Jaundice
31	K031	24	M	35	N	75	110/77	
32	K032	20	M	40	N	80	104/73	Fever, Loss Of APP, Body Pains
33	K033	11	M	22	N	84	-	
34	K034	68	M	55	N	69	120/83	
35	K035	9	F	20	N	82	-	Fever
36	K036	45	F	50	V	70	140/90	Pain Abdomen Vomiting
37	K037	25	F	46	N	81	114/80	Fever, Joint Pain
38	K038	11	M	21	N	84	-	Fever
39	K039	27	F	45	N	79	104/77	
40	K040	62	F	49	V	63	140/90	Fever, Chills & Vigor
41	K041	28	F	65	N	75	103/76	Fever, Loose Stools
42	K042	60	M	50	N	64	120/83	Pain & Abdomin Distension
43	K043	31	M	70	N	79	111/78	Fever Chills
44	K044	40	M	58	V	74	112/79	Bleeding In Gums
45	K045	68	M	59	V	60	116/80	Fever Weakness
46	K046	45	M	58	N	72	119/80	General Weakness
47	K047	54	M	65	V	69	110/77	Vomtings & Motions
48	K048	70	F	50	V	65	120/80	Fever
49	K049	30	F	49	N	75	104/73	
50	K050	55	M	65	N	62	119/81	
51	K051	57	M	62	V	65	120/83	Gastric
52	K052	7	M	16	N	84	-	
53	K053	34	M	45	N	75	114/79	
54	K054	72	M	59	V	61	140/90	Joint Pains

55	K055	59	F	62	N	65	130/87	Gastric
56	K056	53	M	60	N	62	120/83	
57	K057	23	F	45	N	80	105/75	Headache
58	K058	56	M	60	N	74	110/72	
59	K059	19	M	39	N	84	106/72	
60	K060	7	M	14	N	86	-	General Weakness
61	K061	53	M	61	V	72	109/74	
62	K062	13	F	25	V	82	-	
63	K063	38	M	61	N	75	104/77	
64	K064	40	M	69	N	76	119/75	
65	K065	33	M	79	N	78	105/73	Fever
66	K066	77	F	56	N	65	138/85	
67	K067	34	M	59	V	82	111/78	
68	K068	72	M	55	V	65	120/80	
69	K069	24	F	46	N	81	104/74	
70	K070	8	M	16	N	84	-	
71	K071	61	M	59	V	62	112/75	

The analysis was done based on the questionnaire and most of the patients were suffering from common diseases like fever and gastric problems.

IV CONCLUSION

The therapeutic choice emotionally supportive network is a standout amongst the most encouraging fields, and new advancements are being intended for its simple usage. In this paper, we portrayed a way to deal with theoretical diagnosis plan which oversees and organizes therapeutic usage. The proposed choice emotionally supportive network gives a great deal of data on the study of disease transmission and general wellbeing, about different sicknesses. It indicates age classes, periods, and territories influenced by a particular illness and so forth. We have given an intriguing arrangement at numerous dimensions (financial, social, specialized, political...), it will be the help for information investigations for choice taking for wellbeing part advancement in outer parts of Vijayawada .Notwithstanding, expanding this arrangement at the national dimension will give better outcomes. In addition, because of the delicate idea of restorative information, it is essential to consider their own security strategies issues.

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