MULTIMEDIA BASED MEDICAL INFORMATION SYSTEM FOR MANAGEMENT OF CHRONIC HEART DISEASE IN RURAL WOMEN

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Abstract—Chronic diseases are becoming the major and growing Global burden of disease. Multimedia Platform encourages a new way of looking at Medical Information Process and Medical Decision Making. Currently most of the Multimedia history has been with Medical Education and not Medical Decision Making. The future of Multimedia in Medical Information Systems has tremendous potential. To improve the Quality of Life (Q.O.L.) of industrial/operational rural women workers suffering from Chronic Heart Disease, a Multimedia Based Medical Information System for the Management of Chronic Heart Disease (CHD- MMMIS), will be designed and developed with symbiotic approach to achieve the aim of furnishing the query support and information exchange support functions, necessary for retrieving extensive global medical information resources, through appropriate Principal Medical Information Processing Modules, for real life interaction among Medical Professionals, General Practitioners and Internists, Healthcare Workers, Research Communities and Super Specialists, to enable them to make speedy information communication and medical decision management.

Index Terms—CBR, chronic disease,CVD,high blood pressure,low blood pressure,medical information system,Q.O.L.

1 INTRODUCTION

Coronary heart disease has assumed epidemic proportions in India and many other developing countries. The disease is more prevalent in urban populations and there is a clear gradient in its prevalence from rural to semi-urban to urban populations in epidemiological studies. Although the disease has a low prevalence among the rural Indian populations it is progressively increasing and in terms of absolute numbers the burden of coronary heart disease in these subjects is large. The disease occurs at a younger age in rural subjects as compared to those in urban populations. There is a strong positive correlation of increase in coronary heart disease in rural subjects with primordial risk factors of faulty diet, tobacco consumption, and sedentary lifestyle. Women in rural India live in lower status (except in a few states) and experience more episodes of illness than males and also are less likely to access health care facilities before the illness is well advanced. This situation is directly linked to poverty; a vast majority of poor women caught in this vicious circle are the young mothers in the reproductive age, who are deprived of their basic right to be healthy. Precise studies are not available to estimate reproductive health related disease burden in India to help proper area specific public health interventions. Reliable data on mortality and morbidity during pregnancy are scarce, and for female morbidity in general, they are almost nonexistent in rural areas.

The majority of patients with Chronic Heart Diseases are managed by Medical Professionals, General Practitioners and Internists, Healthcare Workers, Research Communities and Super Specialists. This puts high demands on Medical Professionals, General Practitioners and Internists, Healthcare Workers, Research Communities and Super Specialists regarding effectiveness in handling information about recommendations and relevant research findings within the broad field of Medicine. As Medical Professionals, General Practitioners and Internists, Healthcare Workers, Research Communities and Super Specialists have to make several decisions during each patients encounter; there is need for Medical Information System for the Management of Chronic Heart Disease. Medical Information System has drawn increase attention as one of the emerging decision service delivery vehicles running on the information highway

.2 IMPROVING CARDIOVASCULAR HEALTHS IN RURAL INDIA

Two strategies could, if implemented, improve the cardiovascular health of women who live in rural India. While the strategies are interrelated, they can be viewed as distinct in a logical framework, each requiring their own set initiatives, infrastructure, and skill base.

2.1 Broad-Based Prevention

To identify and treat secondary (metabolic) causes of CVD including hypertension, diabetes, and dyslipidemia, it is necessary to address issues affecting access to high-quality health care. Insurance coverage; sufficient numbers of local health care providers, including CVD specialists; transportation; and continued education among providers and in the community must be offered in a gender specific and culturally appropriate manner. Intervention regarding primary causes of CVD, such as over nutrition (related to overweight and obesity) and cigarette smoking, is also essential.

2.2 Policy Adjustments

Lack of insurance coverage is a major barrier to access, and creating policy to remove this barrier and improve access is crucial for the well-being of the rural populace. Given the variable employment patterns and less employer-based insurance in rural communities, state high-risk insurance plans to provide coverage to the rural residents would be an asset. Since

1997, active insurance pools have operated in 26 states, and 7 states have provided an alternative to private insurance through BlueCross BlueShield associations.

3. HIGH BLOOD PRESSURE

Blood pressure is the pressure of the blood in our arteries – the tubes that take the blood away from our heart to the rest of our body. High blood pressure develops if the walls of the larger arteries lose their natural elasticity and become rigid, and the smaller blood vessels become narrower (constrict)..Blood pressure is measured in millimeters of mercury (shortened to 'mmHg'). A blood-pressure reading gives two numbers. The first number is the systolic pressure and the second is the diastolic pressure. (For information on how a blood-pressure measurement is taken) Our target is to have a blood pressure below140/85mmHg (140 systolic and 85 diastolic). If one have diabetes, kidney disease, or disease of the heart and circulation, our target is below 130/80mmHg. There is no fixed dividing line between normal blood pressure and slightly raised blood pressure. However, the British Hypertension Society suggests that the ideal blood pressure is 120/80mmHg, normal is less than 130/80mmHg, and 'high- normal' is 130/80 to 139/89mmHg.

4. LOW BLOOD PRESSURE:

People with low blood pressure tend to live longer than people with high or even 'normal' blood pressure. Low blood pressure is sometimes discovered during routine examination. Most people with low blood pressure don't have any noticeable symptoms. However, in some people who have blood pressure below 90/60mmHg,it can cause dizziness or even fainting when they get up after bending over or lying down, especially in older people. If you have low blood pressure, simple measures may help, such as making sure you are taking enough fluid and possibly using well-fitting support stockings. Some people with low blood pressure may be encouraged to add more salt to their diet as this may help improve their blood pressure. (However, it is important to remember that having too much salt in the diet can lead to high blood pressure.) Low blood pressure can also be a side effect of drug treatment for high blood pressure, heart disease or depression.

5. MEDICAL INFORMATION SYSTEM

All the Medical Information systems in the world have a Common goal: to support healthcare professionals in improving overall efficiency, cost effectiveness and ultimately the quality of patient care. However, they differ widely in the implementation. The growing trend towards shared care requires that these systems be able to share their data. The objective of this project is to propose a generic system that will provide integrated access to all the information and knowledge necessary to treat industrial/operational rural women workers suffering from Chronic Heart Disease. The technologies which will be integrated include the Electronic Patient Record (EPR), simulation tools, case-based reasoning and generic patient management software. These technologies have been applied, but in a fragmented manner, reducing their effectiveness. Central to these technologies is the EPR. Traditional EPRs exist in a variety of heterogeneous information systems and have been used as archives. In contrast, this EPR will be a multimedia report eventually incorporating genomic data, which will then be integrated with the Medical Information systems, triggering alarms when necessary. The EPR will serve different people like medical staff, researchers and insurers, each of which have different data requirements. This project will address these and other issues like security, privacy and confidentiality.

5.1 Features

The universal features that EPRs should have are lifelong Records for every person, online access to patient records for practitioners and genuinely seamless care resulting from the above two features.

Medical Information systems integrates information from many sources; from E.C.G. monitors, heart rate monitors, blood pressure monitors to complex imaging systems and provides a single access point for relevant, concise, accurate and active data about a patient to authorized users in different locations. These records may be available for:

1. Patient care
2. Administration
3. Clinical Audit
4. Financial Audit
5. Research
6. Education

The UI features are easily configurable to meet the varying demands of each medical practitioner.

5.2 Evaluation

Six steps are used to plan evaluation for Medical Information systems: Agree why an evaluation is needed, agree when to evaluate, agree what to evaluate, agree how to evaluate, analyze and report, assess recommendations and decide on actions. An evaluation framework that addresses structure, processes and outcomes, along five dimensions (strategy, operational, human, financial and technical) can be outlined.For each dimension some example evaluation questions can be given. The Information systems should be evaluated by highly experienced users. Users should be trained that the Medical Information System is present for suggesting options, not as an 'auto-pilot'. One should check whether multimedia is consistent over the multiple platforms that will no doubt exist. Audits should be done to see if the system has enough information to ensure traceability.

5.3 Design:

Traditional approaches to Medical Information Systems are Ad-hoc, domain specific and are generally not saleable or customizable. One can address these limitations by linking the EPR directly to the computer simulation with the end goal of delivering support to clinicians on their desktops. Expert systems technology is a product of the eighties [1]. Since 1981, however the emerging field of expert and knowledge- based systems has changed dramatically [2]. Expert system can be defined as those AI systems that solve complex systems in specialized area by emphasizing the domain – specific knowledge that underlies human expertise in those areas, rather than any domain-independent formal reasoning methods [3]. The three major components of ES are: Knowledge base (KB), inference

engine (IE), and user interface (UI). The medical information technology for emulation of human reasoning process and human expert problem solving is knowledge-based system.
The use of artificial Intelligence (AI) technique i.e. Case Based Reasoning (CBR), in the development of medical information and support system has a relatively young history, arose out of the research in cognitive science. [4] [5]. Figure 1 shows an overview of the Information Architecture of the system. Support tools are not integrated with patient-specific information. In the design of the Information system, there are three fundamental challenges to be met:[M. Habibullah Pagarkar]

• To develop a generic approach to integrate the various components to provide information support, using the existing medical information systems, imaging systems, case bases, clinical guidelines and protocols, and modeling and simulation tools
• To do this in a manner that enables a clinician to dynamically adapt and customize it
• To provide feedback mechanisms to optimize the modeling and simulation, to update the case bases, to improve the evidence base, and refine the clinical guidelines based on actual clinical outcomes

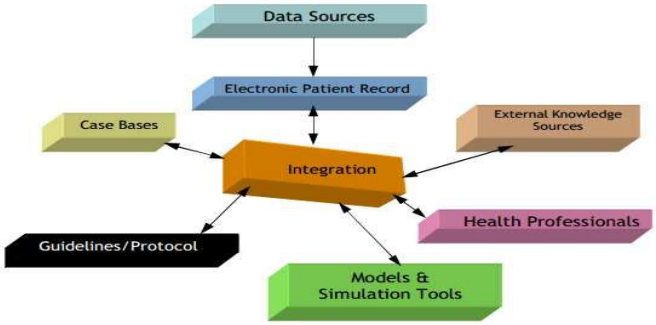

Figure 1: Information Architecture of the system

6. LITERATURE REVIEW

Computer Supported Collaborative Learning (CSCL) is an important model of practice teaching for the training of the application-oriented talents.Computer Supported Collaborative Learning is introduced to break the shackles of the traditional practice teaching. [6] The structure of computer decision-making support system for power distribution network planning is introduced. Distribution modeling can be done in the different kinds of data preparation. [7] In agile production the computer based information support systems are a promising, accurate and fast way to produce the needed information in the production line. [8] Many modern systems are controlled by Computer-Based Systems (CBS). [9]Web-based RSS (WRSS) assist scientists in the research process on the Web platform. WRSS are based on the assembling, integration, and adaptation of existing compute technology and information systems for the purpose of research support. A framework of WRSS is presented by focusing on research activities a phases, as well as the technology support needed. The emphasis is on the conceptual formulation of WRSS. [10] "Management information systems" and "management inquiry systems," providing information and data as input to functional management for tactical planning. [11] Computerized information systems are coming to play an essential role in business operations, and the hardware and-software technology for supporting information systems is in a period of rapid technical progress. [12] Patient information models that supply the distinctions necessary for decision support based on HL7 RIM. To overcome mismatches between the data content and form of a patient information model and those of a local clinical information system. [13] Extensible Markup Language (XML) Web services are introduced for patient's personal medical information management. [14] A neonatology management system was selected to show the application of a usability engineering process.[15] Wireless patient management system (WPMS) using open software that can be accessed via a personal digital assistance (PDA) or a cell phone.[16] Semantic Web technologies can be utilized to keep patients informed on the latest research on chronic diseas such as diabetes,by gathering online informatio published by both government and corporate sources.[17] Intelligent multimedia patient's information systems (IMPIS is aimed to be used by medical professionals at different organizational levels within a hospital, as well as hospital administrative executives for management support purposes.[18]Electronic Patient Record(EPR): three-tier architecture, this separates the presentation for the user, the rationale and the database; XML(extensible Markup Language), which standardizes the transmission of the medical data of the patient among the systems. At this first stage, for the construction of an ERP we have focused our studies on the particularities of the oncology. [19]In wirless telecardiology application, ECG signal is widely used to monitor cardiac activities of patients.[20] Medical information systems capture the decisions and actions of health care providers. Such systems will soon see widespread use in direct patient care. [21]A web based telecardiology framework for the diagnosis of cardiac patients in rural areas. Rural health centers, a centralized server and expert cardiologists constitute the framework. [22] Multi Media based Medical Decision Support System (MM-MDSS) for diagnosis of occupational chronic lung diseases.[25] Multimedia (MM) is an increasingly important tool in training and development for high-technology medical techniques and education. The Medical Multimedia based Decision Support System (MM-MDSS) using the case based reasoning (CBR) methodology of Artificial Intelligence (AI) presents a foundation for a new technology of building intelligent computer aided diagnosis systems.[23]

7. PROPOSED WORK

To improve the Quality of Life (Q.O.L.) of industrial/operational rural women workers suffering from Chronic Heart Disease, a Multimedia Based Medical Information System for the Management of Chronic Heart Disease (CHD-MMMIS), will be designed and developed with symbiotic approach to achieve the aim of furnishing the query support and information exchange support functions, necessary for retrieving extensive global medical information resources, through appropriate Principal Medical Information Processing

Modules, for real life interaction among Medical ProfessionalsThe proposed CHD-MMMIS will have quick information-communication capability,instant content support, medical decision management ability, exhaustive information resource content and information exchange support functions. A CHD-MMMIS can help retrieve, analyze and display structured medical data from large multi- dimensional or relational databases, provide access to medical informatics modules, provide access to graphics, audio, video and facilitate information communication and medicaldecision management.The proposed Multimedia Based Medical Information System for the Management of Chronic Heart Disease (CHD-MMMIS) will contain heart diseases data consisting of disease-feature, feature-disease and feature- feature links; structures for pooling, communicating and applying medical evidence to make in time information and to Systematize and codify user's need, values and preferences;and will help Patients, Medical Professionals, General Practitioners and Internists, Healthcare Workers, Research Communities and Super Specialists in speedy information communication and medical decision management.

The best designed Medical Information System will always be a work in progress as it has to be continuously updated to provide the best service. Experts working in the various medical sub-domains can chose the appropriate methods by which their knowledge can be expressed. Therefore the concept of EPR is vitally important. The patient records have to be populated before one applies methods to develop knowledge. The problem with the EPR is that it is not homogenous. It is taken from a multitude of sources. The data which feeds or populates the EPR already resides in a variety of highly heterogeneous and autonomous information systems and simply integrating this data does not necessarily result in a valid EPR. Clinical data may be entered using a multiplicity of methods such as keyboard, voice recognition software, touch screens, scanners or from medical instrumentation such as blood pressure monitors, ECG machines, laboratory analyzers or imaging devices. A middle-ware client-server component-based approach, acting as an intermediary will be developed. From the variety of knowledge-based approaches to information and decision support, case-based reasoning is the most promising approaches for complex data rich domains such as health. CBR involves matching the current problem against ones that have already been encountered in the past and applying the solutions of the past problems in the current context. This basic philosophy has been applied in two quite different ways. The obvious strategy is to accumulate cases as they occur and add them to the case-base - in this way the case-base comprises a history and competence increases over time. The alternative strategy is to manually build a case-base of hand-crafted cases that will provide good problem coverage. This second approach is the more popular because it is easier to implement. However, it loses the potential of CBR to accumulate experience and improve over time.The proposed structure of Multimedia Based Medical Information System for the Management of Chronic Heart Disease (CHD-MMMIS) will constitute total seven Medical Informatics Modules: Subject Case-Base (SCB) Informatics Module, Symptoms (Sym) Informatics Module, Risk Factors (RF) Informatics Module, Diagnosis and Tests (DT) Informatics Module, Lifestyle and Home Remedies (LHR) Informatics Module, and Treatments and Drugs Informatics (TD) Module. These Informatics Modules will aid in designing Chronic Heart Disease Care Protocols and Medical Practice, Diagnosis, Treatment, Prevention and Screening Guidelines.

7.1 Measuring Parameters

The following parameters of the subjects will be measured:

1. Age Group: The age group will be classified in two groups
   Group 1: 15-25 years Group 2: 25-45 years
2. Marital Status: Married / Unmarried
3. Income Group: On the basis of subjects' income:
   - Upper Middle Class
   - Lower Middle Class
   - Lower Class
4. On the basis of Genetics

Subjects for Diagnosis will be classified in two groups: Group 1. General subjects
Group 2. Cooperative subjects

General subjects will be diagnosed once but Cooperative subjects will be diagnosed twice or thrice. So our result gets more accuracy for the diagnosis process. Although Chronic Heart Disease is often thought of as a problem for men, more women than men die of Chronic Heart Disease each year. One challenge is that the Chronic Heart Disease symptoms in women can be different from symptoms in men. Fortunately, women can take steps to understand their unique symptoms of Chronic Heart Disease and to begin to reduce their risk of Chronic Heart Disease. The details of the symptoms will be collected from the users or female patients. Figure 4 depicts the application overview of Multimedia Based Medical Information System for the Management of Chronic Heart Disease (CHD-MMMIS).

7.2 SOFTWARE TECHNICAL REQUIREMENTS

The ASP.NET 2005 Platform will be used as a front-end application for the development of CHD-MMMIS. The SQL Server 2005 will be used as a back-end application for preparing the database. The CHD-MMMIS will be developed employing Microsoft Visual Basic .NET 2005 environment with the advantage of Object Oriented Programming technology.

8. CONCLUSION

In this dissertation, a Multimedia Based Medical Information System for the Management of Chronic Heart Disease (CHD-MMMIS), will be designed and developed to improve the Quality of Life (Q.O.L.) of industrial / operational rural women workers suffering from Chronic Heart Disease, with symbiotic approach to achieve the aim of furnishing the query support and information exchange support functions, necessary for retrieving extensive global medical information resources, for real life interaction among Medical Professionals, General Practitioners and Internists, Healthcare Workers, Research Communities and Super Specialists, to enable them to make speedy information communication and medical decision management.

The proposed system has the following advantages:

A.ECG waveforms are displayed for easy diagnosis by expert cardiologists

B. 'Patients' post diagnostic information is stored in the "CHD-MMMIS" software for future reference. Implementation of this framework by hospitals/ health centers in rural areas can change the way health care is delivered in cardiology for rural patients.

C.Improved quality of life of rural women workers.

D.Rural development.

E. Provide more medical facility in rural area.

F.Increase in the awareness of rural women about the disease and diagnostic equipments.

G.Decrease in diseases rate.

9. FUTURE SCOPE

This research topic has good transparency between doctors and patients. Such Multimedia Based Medical Information System can also be developed for the Management of many other diseases like Asthma, Cancer, AIDS and TB etc. This research work can also be extended in designing and developing Clinical Support System.

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10. REFERENCES

[1] Amar Gupta, BandreddiE.Prasad, "Microcomputer based Expert Systems", Edited by, IEEE Press, ISBN 0-87942, pp.221-12.

[2] Frederick Hayes Roth, 1984"knowledge Based Expert Systems" IEEE computer, vol, 17,Pp.265-273.

[3] Hayes-Roth, R.., D.A. Waterman, and D.B. Lenat (eds.), 1983, "Building expert systems", Addition-Wesley.

4. R. Schank and R. Abelson (eds.), 1977, Scripts, Plans, Goals and

Understanding, Lawrence Erlbaum Associates, Hillsdale, NJ.

5. R. Schank, 1982, Dynamic Memory: A Theory Of Reminding and Learning in Computers And People, Cambridge University Press, New York.

6. Information Management and Information System's practice teaching designing based on the Computer Supported Collaborative Learning Weiwei Wu; Jiahua Wan; Yiwen Zhang; Xiuming Chen Electrical and Control Engineering (ICECE), 2011 International Conference on Digital Object

Identifier: 10.1109/ICECENG.2011.6056794

Publication Year: 2011, Page(s): 6625 – 6628

7. Computer decision-making support system for power distribution network planning based on geographical information system

Fu-Sheng Yao; Xiao-Quing Zhang; Yuan Zhang; Tian-Hua Wang Electricity Distribution, 2008. CICED 2008. China International Conference on

Digital Object Identifier: 10.1109/CICED.2008.5211676

Publication Year: 2008, Page(s): 1 – 6

8. Different modalities in assembly support system user interface Repokari, L.; Nieminen, M.; Hailikari, M.; Kasvi, J.; Vartiainen, M.; Pulkkis, A.; Kari, I.Multimedia and Expo, 2000. ICME 2000. 2000 IEEE International

Conference on Volume: 2

Digital Object Identifier: 10.1109/ICME.2000.871509

Publication Year: 2000, Page(s): 921 - 924 vol.2

9. Engineering of computer based-systems enhancement courses- proposed course outlinesLavi, J.Z.; Gonzales, R.M.; Mannion, M.; Sveda, M.Engineering of Computer-Based Systems, 1999. Proceedings. ECBS

'99. IEEE Conference and Workshop on Digital Object Identifier: 10.1109/ECBS.1999.755900 Publication Year: 1999, Page(s): 336 - 343

10. A framework for Web-based research support systemsYao, Y.Y.Computer Software and Applications Conference, 2003. COMPSAC 2003. Proceedings. 27th Annual InternationalDigital Object Identifier: 10.1109/CMPSAC.2003.1245402

Publication Year: 2003, Page(s): 601 - 606

11. Enterprise information analysis: Cost-benefit analysis and the data-managed system Parker, M. M.IBM Systems Journal Volume: 21, Issue: 1

Digital Object Identifier: 10.1147/sj.211.0108 Publication Year: 1982, Page(s): 108 – 123

12. Data structures and accessing in data-base systems, I: Evolution of information systems Senko, M. E.; Altman, E. B.; Astrahan, M. M.; Fehder, P. L. IBM Systems Journal Volume: 12, Issue: 1 Digital Object Identifier: 10.1147/sj.121.0030 Publication Year: 1973, Page(s): 30 – 44

13. Heterogeneous Patient Information Acquisition and Normalization for Shareable, Executable Clinical Decision Support System Xiaorong Wu; Shan Nan; Xudong Lu; Huilong Duan Bioinformatics and Biomedical Engineering, (iCBBE) 2011 5th International Conference on Digital Object Identifier: 10.1109/icbbe.2011.5780008 Publication Year: 2011 , Page(s): 1 –4

14. Design For a Patient-Centric Medical Information System Using XML Web Services D'Mello, Elridge; Rozenblit, Jerzy Information Technology, 2007. ITNG '07. Fourth International Conference on Digital Object Identifier: 10.1109/ITNG.2007.69 Publication Year: 2007, Page(s): 562 – 567

15. Usability engineering in patients follow-up medical information systems Valero, M.A.; Arredondo, M.T.; Sanz, M.F.; Del Pozo, F. Engineering in Medicine and Biology Society, 1996. Bridging Disciplines for Biomedicine. Proceedings of the 18th Annual International Conference of the IEEE Volume: 5 Digital Object Identifier: 10.1109/IEMBS.1996.646547 Publication Year: 1996, Page(s): 2307 - 2308 vol.5

16. Wireless information system for patient health care management Kumar, A.; Kumar, R.; Agarwal, S. SoutheastCon, 2007. Proceedings. IEEE

Digital Object Identifier: 10.1109/SECON.2007.342926 Publication Year: 2007, Page(s): 364 – 369

17. Intelligent health information system to empower patients with chronic diseases Islam, S.; Freytag, G.; Shankar, R.Information Reuse and Integration (IRI), 2012 IEEE 13th International Conference on Digital Object Identifier: 10.1109/IRI.2012.6303085 Publication Year: 2012, Page(s): 734 – 737

18. An intelligent multimedia patients information system: design problems and solutions Au, G.; Ching Kwong Kwok; Heung Wing Lee System Sciences, 1995. Vol. III. Proceedings of the Twenty-Eighth Hawaii International Conference on Volume: 3 Digital Object Identifier: 10.1109/HICSS.1995.375628 Publication Year: 1995, Page(s): 451 - 460 vol.3

19. The medical information management system (SIGIM) - elaboration of an electronic patient record Vilar, G.; Boudoux, C.Engineering in Medicine and Biology, 2002. 24th Annual Conference and the Annual Fall Meeting of the Biomedical Engineering Society EMBS/BMES Conference, 2002. Proceedings of the Second Joint Volume: 3 Digital Object Identifier: 10.1109/IEMBS.2002.1053112 Publication Year: 2002, Page(s): 1956 vol.3

20. Embedding patients confidential data in ECG signal for healthcare information systems Ibaida, A.; Khalil, I.; Al-Shammary, D.Engineering in Medicine and Biology Society (EMBC), 2010 Annual International Conference of the IEEE Digital Object Identifier: 10.1109/IEMBS.2010.5627671 Publication Year: 2010, Page(s): 3891 – 3894

21. Information Systems for Patient Care Estrin, T.; Uzgalis, R.C. Computer

Volume: 12, Issue: 11 Digital Object Identifier: 10.1109/MC.1979.1658526 Publication Year: 1979, Page(s): 4 – 7

22. Telecardiology for Rural Health Care V.Mahesh, A.Kandaswamy, and R.Venkatesan Dept of Information Technology, PSG College of Technology, Coimbatore, Dept of Biomedical Engineering, PSG College of Technology, Coimbatore, India Email: kandaswamya@hotmail.com, ramanvenkatesan@yahoo.com

23. A medical multimedia based DSS for heart diseases diagnosis and training Prem Pal Singh Tomar1, Ranjit Singh1, P K Saxena (Rtd.) 1, B K Sharma2 1, Faculty of Engineering, Dayalbagh Educational Institute, Agra, India 2, ACET, Aligarh, India

24. Abdul Hamid M. Ragab, Khalid Abdullah Fakeeh AND Mohamed Ismail Roushdy KING ABDULAZIZ, 2004. "A Medical Multimedia Expert System for Heart Diseases Diagnosis & Training", Proc. 2nd Saudi Sci. Conf., Fac. Sci., KAU, 15-17 March,

Part IV, 31-45.

25. P.P.S. Tomar, R. Singh & P. K. Saxena, 2011, Multimedia Based MDSS For Chronic Lung Diseases Diagnosis Using Rule-based Technique, Afr J. of Comp & ICTs, Vol 4, No. 3. Issue 2, pp. 1-6