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Computer Assisted Medical Health System for the Benefit of Hard-to Reach Rural Area

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Abstract -- It is a known fact that medical practitioners seldom prefer to work in rural areas. For providing medical help to rural population more particularly to people from hard to reach areas computer assisted medical health system is developed. This paper discusses the method for fast clinical assistance in hard to reach places & its applicability.

Keywords -- EHealth, Health and medical informatics, Analysis, Management of Healthcare, IT & HIS, Knowledge Management

I. INTRODUCTION

Health and medical informatics is the application of principles of computer and information science to the effective organization, analysis, management, and use of information in health care. With evolving health care transformation, the development, implementation, evaluation, and management of information technology solutions are critical, and core technologies and standards must be addressed.Due to medical and technical progress as well as the on-going demographic shift, the healthcare sector has become an increasingly important part of our economy. As a consequence, the healthcare services' quality and efficiency receive broader attention. However, interfering objectives such as the patient's well-being and economic targets pose major challenges to a clear definition of as well as measuring service quality and productivity. Decision making by the clinician in the management of his patients is a highly intellectual activity which involves:

- His skill in gathering and evaluating new information about the patient,
- His ability to readily recapitulate the information he has already logged in the patients record and,
- His ability to effectively utilize the large body of medical knowledge which expresses the relationship between the data describing each individual patient and the diagnostic, prognostic and therapeutic options available for managing the patients problems optimally. [1]

To carry out this intellectual activity medical professionals are not available in rural areas. Unavailability of health care in rural areas is the outcome of paucity of medical professionals.

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Even the Government is unable to retain Doctors for rural areas. A national level workshop was held in July 2011 to identify implementation research priorities. Following important questions emerged as highest priorities (2).

1. How can doctors, nurses and technicians be attracted in rural and hard to reach areas?
2. How can mothers, newborns and children needing health care be reached in hard to reach places?
3. How can quality of health care received by mothers, newborns and children in health facilities be improved?

Using Information Communication Technology all the three questions can be solved. In this paper a Computer Assisted Medical Health System (CAMH) for fast clinical assistance in Gynecology and Obstetrics in the hard to reach places is described which may be extended across most of the disciplines of medical sciences. Not only government but private medical practitioners and hospitals may get involved in this activity and therefore success on implementation of the method is guaranteed.

II. DIFFERENT APPROACHES ADHERED BY THE CAMH:

The Computer Assisted Medical Decision Making System (CAMH) adheres to the following approaches:

- Categorical Approaches: Deterministic, algorithmic, flow-chart or protocol-based. They provide clear cut guides to action based on clear cut criteria. Indeed the concept of a protocol as a clinical algorithm arose out of the experience of research workers with computers and information science.
- Probabilistic Approaches: Statistical decision approaches and statistical inference, Bayesian approaches, discriminate analysis, Multivariate analysis; Clinical analysis-case based reasoning and exploratory analysis etc. The entire above are derived from the same perspective-to develop predictive power through the analysis of past data to support future decisions.
- Artificial Intelligence Approaches: Production rule systems based on first order predicate calculus-conditional rules, IF/THEN; Cognitive models based on generalized set covering (GSC) theory; Frame descriptions; Semantic networks; Hypothesis and test (abduction); and Artificial Neural Networks (ANNs). Out of the above approaches, two simple and easily useable by the computer scientists for preparing software tools are described below.

III. GENERAL MODEL OF CAMH

Dr. James Reggia [2] has described a general model of CMD system as depicted below in diagram.

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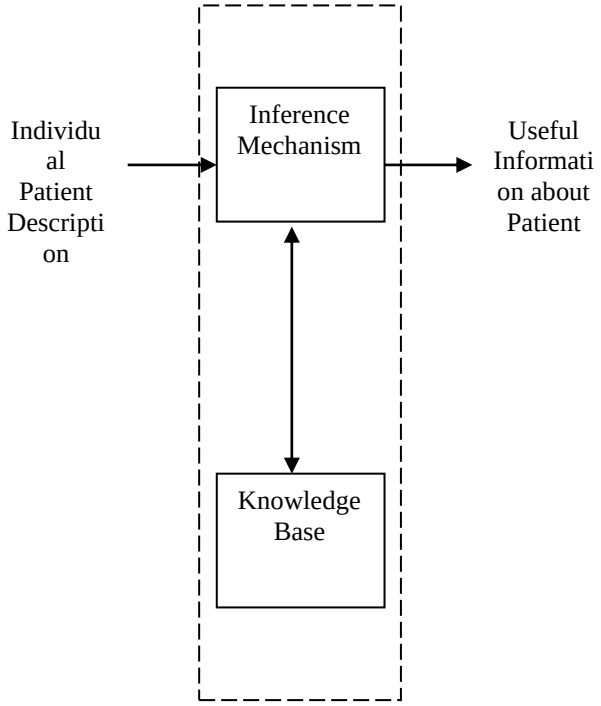


Input is typically a description of some specific patient (age, symptoms and signs, past medical history etc.) and the output is useful information about that patient (e.g. appropriate screening tests, diagnosis, therapy plan etc). The CAMH system itself contains two basic components:

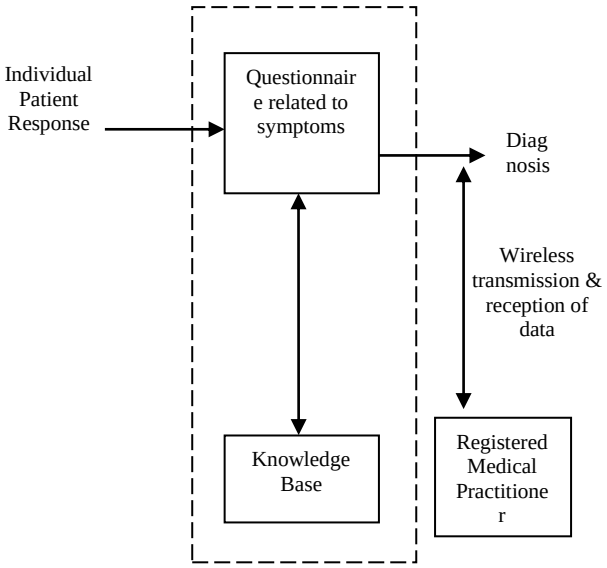
1. A knowledge base and
2. An inference mechanism.

IV. KNOWLEDGE MANAGEMENT IN HEALTHCARE

Healthcare is knowledge-rich; yet healthcare knowledge is largely under-utilized at the point-of-care and point-of-need. Healthcare is experiencing an exponential growth in the scientific understanding of diseases, treatments and care pathways. As a consequence, healthcare knowledge is in flux—new healthcare knowledge is being generated at a rapid pace; its utilization can profoundly impact patient care and health outcomes. But, this growth of knowledge is not congruent with our ability to effectively disseminate, translate and apply current healthcare knowledge in clinical practice. The state-of-affairs is that the large volume of healthcare knowledge, dispersed across different mediums, is making it extremely difficult for healthcare professionals to be aware of and to apply relevant knowledge to make the 'best' patient care decisions. Recent research has shown that the inability of physicians to access the current and relevant knowledge healthcare leads to the delivery of suboptimal care to patients [3]. Subsequently the Information Communication Technology has bought a drastic change in the delivery of the healthcare information, many of the clinicians are aware of the technical advances but the IT Managers who are working with these people often tend to over implement the software paradigms; that becomes quite obnoxious for the healthcare deliverer to opt for the appropriate right decision making solution. This Healthcare Knowledge Framework, its applications will focus on the underutilized information to be disseminated to the healthcare deliverer and will bridge the gap between the healthcare operator as well as the healthcare receiver.

V. CAMH MODEL

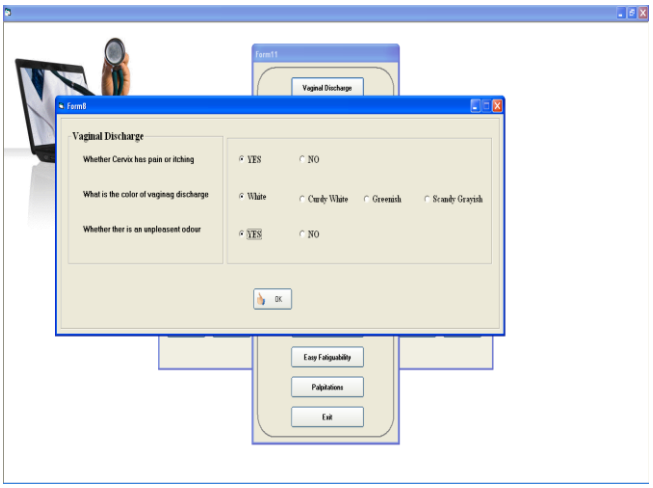
Fig. depicts CAMH model used in the development of computer programme to record patient – Para-medico dialogue and diagnosis.



For our system the knowledge base is a collection of encoded knowledge that is needed to solve problems in some particular medical area (Gynecology). The inference mechanism is a program that, given a case description, uses the information in the knowledge base to generate decision. Medical experts have provided the knowledge for design and development of the supporting software for the CAMH system for being used by the health care service personnel.

VI. CONTENT OF THE ICT BASED COMPUTER ASSISTED MEDICAL HEALTH CARE SYSTEM:

The front end shows a questionnaire of yes/no type for each of the complaints related to Gynecology and Obstetrics. Screen shots show the patients data, symptomatic questionnaire, diagnosis and report of the patient. The back end will have medical knowledge data related to the complaint



Screen Shot - Gynecological Problem's Symptoms

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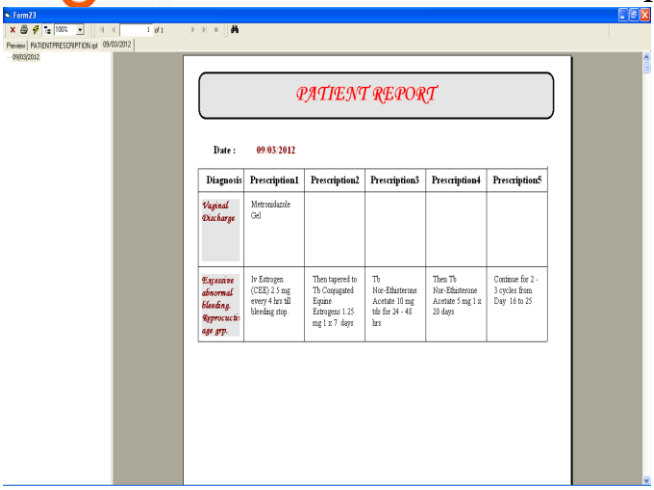

Screen Shot - Patient Report

VII. CONCLUSION

It is concluded that the CAMH model used in developing computer programme can be extremely useful in providing medical help to people of hard to reach area. The system can be handled by the semiskilled/paramedics so that the patients get immediate medical assistance. Doctor based in the city area will offer diagnosis and treatment to the patient. Such a system can be extended across all specialties of medical sciences.

VIII. ACKNOWLEDGEMENT

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