2. INTRODUCTION
2. INTRODUCTION

The vertigo has been said to be the greatest heart sink symptom in medicine. The main reason for this problem is not the symptom but the doctor. It has been said that labyrinthine vertigo can change, in seconds, a healthy and active individual into a helpless invalid, and a rational physician into a babbling idiot. The most important step towards reaching a diagnosis is full clinical history.191

The main components of Information technology namely computers, communications, and structured data have undergone a sea change. There is increasing appreciation of the role that Information Technology (IT) can play in improving the overall health delivery systems in urban and rural areas27. The role of computers in medicine has been expanded rapidly and continuing at the same pace5. Most computer programs available for clinical practice offer only accounting, scheduling, patient monitoring, record keeping, or bibliographic retrieval capabilities. Too little attention has been given to providing diagnostic assistance to practicing clinicians25. The new developments have lead to the arrival of Knowledge-Based Systems (KBS) and Expert Systems (ES), which help in the understanding of complex processes in medical decision-making.10

Expert system (ES) is a new tool for information processing developed by the artificial intelligence (AI), which is a branch of computer science. ES is capable of solving problems in a given domain by using the knowledge and emulating the behavior of specialists.73 An applied symbolic reasoning and its various techniques have been developed by computer scientists in an attempt to model the humans’ thought processes and problem solving methods. ES can be used as powerful tools for education since they make the underlying reasoning explicit.27

The survey of 2201 respondents was commissioned by the Isabel Medical Foundation, which showed that 35% of people have experienced a medical mistake over the last 5 years. Fifty percent of the mistakes were misdiagnosis, 24% were medication and 18% were operative. One in 6 of the USA adult population has experience of misdiagnosis (Survey of Medical mistakes in the USA November 2005 by YouGov (http://www.isabelhealthcare.com/info/images/USsurveyrelease-Final.pdf)
The human brain is unsurpassed in its ability to perceive, focus, think, analyze, imagine and create, but it is greatly limited in its ability to store a large collection of facts permanently, to recall the facts instantaneously and precisely, and to handle multiple variables at a time. The rapid evolution of technology and clinical research makes it difficult even for the specialist to keep up. In the light of this 'Information Explosion', it has been demonstrated that physicians do not always make optimal decisions.104, 204

Humans have only a limited ability to incorporate information in decision-making. In certain situations, the mismatch between this limitation and the availability of extensive information contributes to the varying performance and high error rate of clinical decision makers.241 Computerized protocols used to deliver decision support can be configured to contain much more detail than textual guidelines or paper-based flow diagrams. Such protocols can generate patient-specific instructions for therapy that can be carried out with little interclinician variability; however, clinicians must be willing to modify personal styles of clinical management.241

The KBS or ES used in medical and healthcare management are usually called as Computer-Aided Diagnosis (CAD), Computer-based Clinical Decision Support Systems (CDSS) or Computer-Assisted Medical Decision-Making (CMD).

Medical decision support systems, which are more difficult to develop and implement help clinicians in constructing differential diagnoses or selecting therapeutic options. The knowledge base and algorithms of these computer programs provide expert-level decision-making assistance. The suitable man-machine interfaces make such programs easy and attractive to the practicing clinicians.229

The work on entire range of patient monitoring systems and computer-assisted medical decision making is progressing rapidly.42 It can be used simultaneously with the doctor-patient consultation. A user-friendly interface is constructed with a comprehensive set of clinical terms. In majority of the cases the correct diagnosis appears in the differential diagnoses list. The system is designed to meet the knowledge gaps of the individual physician with specific patient problems. In the present era of IT, it can be a boon to the Rural Health Centers because the General Medical Practitioners can also operate the system.28

Dizziness is the ninth most common clinical symptom, rising to third among aged 65 to 75 years and becoming first among those aged more than 75 years.195 Computer-
Assisted Medical Decision-Making (CMD), which is an interactive computer system, has the potential to directly assist doctors or other health care professionals with clinical decision-making tasks in cases of dizziness. The symptoms of dizziness can be difficult for the physicians to categorize. Patients may use different terms to describe their sensations of dizziness such as disequilibrium, unsteadiness, vertigo and lightheadedness. A seemingly endless number of disorders can result in symptoms of dizziness and dysequilibrium\(^\text{163}\).

It has been found that 5% of all patients going to the general practitioner (GP) and 10% of patients going to the ENT specialist or neurologist suffer from balance disorder. Dizziness is one of the most common complaints heard in the doctor's chamber. Exact figure of prevalence of dizziness in India is not available\(^\text{45}\).

American National Institute of Health Statistics has reported that 42% of the nation's population goes to the physician with dizziness sometime in their lives. Dizziness is the ninth most common clinical symptom, rising to third among aged 65 to 75 years and becoming first among those aged more than 75 years\(^\text{196}\). The American National Institute of Health Statistics has reported that balance related falls account for 50% of accidental deaths in the population above 65 years\(^\text{116}\).

Dizziness has a prevalence of 23% in the UK population\(^\text{347}\). Between 0.8% and 1% of the population, consult the general practitioners for the symptoms of dizziness. Most of the patients are managed at the level of general practitioner but 9% -13% of these patients are referred to the specialists such as neurologists, cardiologists and otolaryngologists\(^\text{168}\).

Despite the obvious public health significance, dizzy patients typically have great difficulty accessing good quality health care and are generally perceived by otolaryngologists to represent one of the most frustrating and frustrated groups, of patients\(^\text{207}\).

In UK vertiginous patients who were referred by their GP were offered appointments at hospital ENT clinics. The audit of this time revealed that the mean waiting time between referral and effective management exceeded 24 weeks (22 to 27 weeks). Patients initially waited an average of 13 weeks for an ENT appointment, a further five weeks for vestibular assessment, and another six weeks to be re-reviewed at the ENT clinic with vestibular testing results, with subsequent referral for vestibular rehabilitation if required\(^\text{207}\). To reduce the waiting time they instituted a pre-ENT balance
clinic, conducted on a weekly basis. Primary assessment consisted of a 45-minute for
history taking, clinical balance function testing and videonystagmography.

The choice of specialty is not always clear as multiple pathologies are estimated to
occur in high percentage of patients. Majority of the patients with dizziness are referred
to otolaryngologists because most commonly the cause lies in the inner ear.\cite{35}

CMD cannot replace doctors but just complement their natural abilities to make
judgments with computer's vast memory, reliability and processing capabilities.
Traditional continuing medical education is designed to meet the knowledge gaps of
groups rather than individual physician with specific patient problems.\cite{95}

The developers of computer-aided medical decision systems should keep in mind
the ethical and legal concerns especially during the process of program validation.\cite{229} Is
there the need of users certification before the use of system, which provide patient
specific advice? Who will be held legally responsible when system's advice is faulty? Is a
physician who does not use such system liable if that system's advice might have
prevented an adverse outcome?\cite{25}

Wolf and others\cite{344} examined the degree to which attending physicians, residents,
and medical students stated desire for a computer based consultation on difficult-to-
diagnose patient. They studied the changes in diagnostic decision-making based on
perceptions of need and helpfulness.

In addition to the causes and evaluation of dizziness now I will review some
knowledge base computer systems in medicine with especial emphasis on different
available tools and various modalities of knowledge acquisition and representation.