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**ABSTRACT**

An expert computerized diagnosis system is a software system designed for use in the diagnosis and analysis of diseases. The system is an expert system with a database .containing an expert knowledge. The user only uses it to determine whether he or she has any of the diseases within its domain.

The aim of this study is to improve accuracy and efficiency in the diagnosis of diseases. The objectives of this study are to produce a computerized diagnosis system that can provide a complementary medical service, such as medical disease diagnosis and how it can be treated , in places where accessibility is a problem as well as health care facilities and where medical experts are lacking.

The methodology used in the implementation of the software is the Waterfall Model of System Development Life Cycle, which allows room for scalability as time goes on. This project made use of the Object oriented programming Design and analysis in software design. This software is implemented in visual basic programming environment . Information used in the implementation of the project were gathered through oral interviews and studying of existing systems.

Effective implementation of this software will take care of the basic requirement of diagnosis diseases because it is capable of providing easy and effective storage of information related to the diseases. With these, the objectives of the system design will be achieved.

**CHAPTER ONE**

**1.0 INTRODUCTION**

Increasing computer-based methods improve the quality of medical services. Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviors that humans consider intelligent (R.A. Soltan, M. Z. Rashad, B.El-Desouky,2013). One of the most important

areas of Artificial Intelligence (AI) is an Expert system.

The proposed system is an expert system. An expert system is a computer system that emulates the decision-making ability of a human expert.

Most important fields area of expert system is in medicine and is use in detection, diagnosing symptoms and treatment of diseases. The user can interact with a computer to solve a certain problem by expert system. This is because the expert system can store heuristic knowledge.

This proposed expert system has been designed to be interactive with the user, in which the user responds if they have symptoms of the diseases. The user response helps the expert system to determine the level at which the disease is present. The user is further advised on what next to do. This system is based on the IF-THEN rules.

1.1 **Purpose of study**

This study was carried out in other to provide lasting solution to the problem allocated with the existing system. The solution will be automatic, easy and comprehensive.

**1.2 STATEMENT OF THE PROBLEM**

Disease diagnosis and treatment constitute the major work of physicians. Some of the time, diagnosis is wrongly done leading to error in drug prescription and further complications in the patient’s health. It has also been noticed that much time is spent in physical examination and interview of patients before treatment commences. The clinical decision support system (CDSS) shall address these problems by effectively providing quality diagnosis in real-time.

Health care facility should be accessible by all at all times. But at times emergency happens maybe in a place where health centers is not accessible, where necessary diagnosis facilities are lacking, in the middle of the night , In view of the foregoing, it would be of great necessity to provide a computerized system that will provide a complementary medical service, such as medical disease diagnosis in places where accessibility is a problem as well as health care facilities where qualified experts are lacking.

Hence this topic, Expert System or electronic diagnosis system on some medical illness and disease.

**1.3 OBJECTIVES OF THE STUDY**

The major objective of this work is to develop an expert system on diagnosis of non-communicable diseases.

It also targets towards contributing to academic research work.

• To develop modern interactive diagnostic software that will aid clinicians in diagnostic procedures.

• To offer prescription of medication.

• To enable flexibility in access to information through the World Wide Web or comprehensive knowledge bases.

• It is also to ascertain whether the diseases could be diagnosed based on signs and symptoms.

• It will also examine a patient based on simple clinical signs, and to improve family and community health

**1.4 SIGNIFICANCE OF THE STUDY**

If this prototype is fully developed will be very useful in many areas such as:

a. It will help to retain the skill of an expert medical doctor in case of any eventuality;

b. It can support academic development;

c. It can be useful in many hospitals, both private and government, cases where the expert is not on seat;

d. It can also be used in the laboratory for quick research work.

1.5 **LIMITATION OF THE STUDY**

**A** limitation of this medical expert is hat only symptoms entered by the programmer is displayed and is possible the user is having other symptoms not displayed by the system. The system is also only built to handle only a few non communicable diseases.

**1.6 DEFINITION OF TERMS**

1. **Medical:**  Relating to medicine, physical examination to determine health: a physical examination by a doctor to check.
2. **Diagnose:** The identifying of an illness or disorder in a patient through physical examination, medical tests, or other procedures
3. Expert: a person who has special skills or knowledge in some particular field; a specialist.
4. System: A system is a regularly interacting or interdependent group of items forming a unified whole. Physical component of a computer used to perform a certain task.
5. Expert system: An expert system is a computer system that emulates the decision-making ability of a human expert.
6. **Computer:-**Computer is an electronic device that accepts information (in the form of digitalized data) as Input, processes data and gives out information as output to the user. It has the ability to store, retrieve, and process data.
7. **Data**: information in raw or unorganized form that refer to or represent ideas
8. **Information**: information is knowledge about a particular subject , issue, event or process. A meaning full material derived from computer data by organizing it and interpreting it in a specified way.
9. **Input**: Data entered into a computer for storage or processing.
10. **Output**: Information produced from a computer after processing.
11. **Information System**: A set of interrelated components that collect (or retrieve), process, store and distribute information to support decision making and control in an organization.
12. **Software:-**Software is set of related programs that are designed by the manufacturer to control the hardware and to enable the computer perform a given task.
13. **Hardware: -** Hardware is a physical part of a computer that can be touched, seen, feel which are been control by the software to perform a given task.
14. **Database: -** Database is the collection of related data in an organized form to be easily accessed, managed and updated. .
15. **Programming: -** Programming is the process of developing and implementing various sets of instruction to enable a computer do a certain task. programming is a set of coded instruction which the computers understands and obey.
16. **Algorithm :** A detailed set of logic rules or instructions for carrying out an operation or solving a problem.
17. **Application:** A program or software designed to fulfill a particular purpose
18. **Knowledge-based:**  Information system that store wealth of one’s knowledge
19. **Symptoms:**  Signs of an ill health.
20. **Electronic diagnosis**: is any electronic device used in the diagnosis or detection of an ailment.
21. **Analysis of disease**: is the process of studying about a particular diseases on how its contacted, how to avoid it, medications to take when having the illness etc.
22. **Domain** :
23. **Interactive system**: A system that allows dialog between the computer and the user.
24. **Visual basic**: VB is programming environment from Microsoft in which a programmer uses a graphical user interface (GUI) to choose and modify preselected sections of code written in the BASIC programming language.

**CHAPTER TWO**

**LITERATURE REVIEW**

**2.0 INTRODUCTION**

The development of computer-aids to medical diagnosis has been enhanced by the fact that the computer has several inherent capabilities which seem ideally fitted to medical problem-solving. Paraphrasing Gorry and Barnett (1968), the principal advantages of the computer are its ability to: store large quantities of data without distortion over long periods of time; recall data exactly as stored; perform complex logical and mathematical operations at very high speed; and display many diagnostic possibilities in an orderly fashion. A computer-aided diagnostic system have features that could offset limitations experienced by human diagnostic problem solvers. The limitations of man as an effective problem solver have been repeatedly demonstrated (Streufert, 1970; Newell and Simon, 1972; Janis and Mann, 1977). Newell and Simon (1972) found the limited capacity of short term memory to be a major deterrent to effective problem solving.

Janis and Mann (1977) have discussed the problems encountered by man as'... a reluctant decision maker—beset by conflict, doubts, and worry, struggling with incongruous longings, antipathies, and loyalties...'.

In view of these limitations it will be worthwhile to create an expert diagnosis system that can offset some of these limitations and aid physicians in their decision making.

**2.1 CLINICAL DIAGNOSTIC SUPPORT SYSTEMS**

Medical diagnostic systems according to Wikipedia—the online encyclopedia are interactive computer programs designed to assist healthcare professionals with decision making tasks. Bankman, 2000, elucidates further by asserting that Clinical Decision Support (CDS) systems aim to codify and strategically manage biomedical knowledge to handle challenges in clinical practice using mathematical modeling tools, medical data processing techniques and Artificial Intelligence (AI) methods. In other words, CDSS are active knowledge systems which use two or more items of patient data to generate case-specific advice (Wyatt and Spiegelhalter, 1991)

This kind of software uses relevant knowledge rules within a knowledge base and relevant patient and clinical data to improve clinical decision. These kinds of decision-support systems allow the clinicians to spot and choose the most appropriate treatment.

However, Delaney, Fitzmaurice et al. 1991; Pearson, Moxey et al. 2009) warns that ―regardless of how we choose to define CDS systems, we have to accept that the field of CDSS is rapidly advancing and unregulated. ―it has a potential for harm if systems are poorly designed and inadequately evaluated, as well as a huge potential to harm , especially in health care provider performance, quality of care and patient outcomes.

CDS system is one of the areas addressed by the clinical information systems (CIS). Clinical information systems provide a clinical data repository that stores clinical data such as the patient’s history of illness, diagnosis proffered, treatment as well as interactions with care providers.

Knowledge used in decision making process must be accurate and current. It is a major importance that the deciding clinician has a broad spectrum of medical knowledge and access to information resources, where it is possible to constantly revise and validate that knowledge.

. Designing CDSS without understanding the cognitive processes underlying medical reasoning and decision analysis is pliable for ineffectiveness and failure for implementation into clinical workflow (Patel, Kaufman et al. 2002).

**2.2 SUCCESS FACTORS OF CDS SYSTEMS**

Despite the fact that the computerized CDS systems were continuously in development since the 1970s, their impact on routine clinical practice has not been as strong as expected. The potential benefits of using electronic decision support systems in clinical practice fall into three broad categories (Coiera 2003):

1. Improved patient safety (reduced medication errors and unwanted adverse events, refined ordering of medication and tests);

2. Improved quality of care (increasing clinicians’ time allocated directly to patient care, increased application of clinical pathways and guidelines, accelerate and encourage the use of latest clinical findings, improved clinical documentation and patient satisfaction);

3. Improved efficiency of health-care (reducing costs through faster order processing, reductions in test duplication, decreased adverse events, and changed patterns of drug prescribing, favoring cheaper but equally effective generic brands).

Developing CDSSs is a challenging process, which may lead to a failure despite our theoretical knowledge about the topic. Understanding the underlying causes, which lead either to success or either to failure, may help to improve the efficiency of CDSS development and deployment in day-to-day practice. Failures can originate from various developmental and implementation phases: failure to technically complete an appropriate system, failure to get the system accepted by the users and failure to integrate the system in the organizational or user environment (Brender, Ammenwerth et al. 2006).

There is an estimation that 45% of computerized medical information systems fail because of user resistance, even though these systems are technologically coherent. Some reasons for such a high percentage of failure may derive from insufficient computer ability, lack of awareness of long-term benefits of CDSS-use and lack of desire to change the daily workflow (Zheng, Padman et al. 2005).

Despite the problems and failures that might accompany CDSSs, these systems have still been proven to improve drug selection and dosing suggestions, reduce serious medication errors by flagging potential drug reactions, drug allergies and identifying duplication of therapy, they enhance the delivery of preventive care services and improve adherence to recommended care standards.

supporting these prompts is expanded and includes institution-specific data.

**2.2 EXAMPLES OF CDSS IN PRACTICE**

There have been multiple attempts through history to construct a computer or program, which would assist clinicians with their decisions concerning diagnosis and therapy. Ledley and Lusted published the first article evolving around this idea in 1959. The first really functional CDSS didn’t appear until the 1970s.

Some of them are reviewed below: Leeds abdominal pain, MYCIN, HELP and Internist-

**2.2**.**1. Leeds abdominal pain**

F. T. de Dombal and his co-workers at University of Leeds developed Leeds abdominal pain. It used Bayesian reasoning on basis of surgical and pathological diagnoses. These pieces of information were gathered from thousands of patients and put into systems’ database. The Leeds abdominal pain system used sensitivity, specificity and disease prevalence data for various signs, symptoms and test results. With help of Bayes’ theorem it calculated the probability of seven possible diagnoses resulting in acute abdominal pain: appendicitis, diverticulitis, perforated ulcer, cholecystitis, small-bowel obstruction, pancreatitis, and nonspecific abdominal pain. The system assumed that each patient with abdominal pain had one of these seven conditions, thus selected the most likely diagnose on the basis of recorded observations. Evaluation of the system was done by de Dombal et al. in 1972. It showed that the clinicians’ diagnoses were correct in only 65 to 80 percent of the 304 cases, whereas the program’s diagnoses were correct in 91.8 percent of cases. Surprisingly, the system has never achieved similar results of diagnostic accuracy in practice outside the Leeds University. The most likely reason for that is the variation of data that clinicians entered into the system for acquiring correct diagnoses (de Dombal, Leaper et al. 1972).

**2.2.2 MYCIN**

This was a consultation system that emphasized appropriate management of patients who had infections rather than just finding their diagnosis. The developers of this system formed production rules (IF-THEN rules), on basis of current knowledge about infectious diseases. The MYCIN program determined which rules to use and how to chain them together in order to make decisions about a specific case. System developers could update the system's knowledge structure rapidly by removing, altering, or adding rules, without reprogramming or restructuring other parts of the system (Shortliffe 1976).

2.2.3 **The HELP System**

The HELP system is actually an integrated hospital information system with the ability to generate alerts when data abnormalities in the patient record are noted. It can output data either automatically, in form of printed reports, or it can display specific information, if so requested. Furthermore, the system has an event-driven mechanism for generation of specialized warnings, alerts and reports (Burke, Classen et al. 1991).

**2**.**3 SELECTED CONTEMPORARY EXAMPLES OF CDSS**

**ATHENA**

The Athena decision support system was deployed in 2002 as a tool to implement guidelines for hypertension. It encourages blood pressure control and issues recommendations about a suitable choice of therapy, concordant with latest guidelines. also considers co-morbidities of the specific patient in question.

(Goldstein, Coleman et al. 2004; Lai, Goldstein et al. 2004).

ISABEL

Isabel is a web-based diagnosis decision support system that was created in 2001 by physicians. It offers diagnosis decision support at the point of care. The system is eligible for all aged patients, from neonates to geriatrics. Its database covers major specialties like Internal Medicine, Surgery, Gynecology & Obstetrics, Pediatrics, Geriatrics, Oncology, Toxicology and Bioterrorism. Isabel produces an instant list of likely diagnoses for a given set of clinical features (symptoms, signs, results of tests and investigations etc), followed by suggesting the administration of suitable drugs. This is executed by reconciling (i.e. pattern-matching technology) patient data sets with data sets as described in established medical literature.

LISA

LISA is a CDSS that consists of two main components. The first is a centralized Oracle database, holding all patient information about drug schedules, blood and toxicity results, doses prescribed etc. The database is accessible by health professionals from different sectors and locations. The second component represents a web-based decision support module, which is using the PROforma guideline(a well defined logical model of decision making and plans) development technology to provide advice about dose adjustments in treatment of acute childhood lymphoblastic leukemia.

Different types of equipment used by medical experts or medical technicians for diagnosis.

**Digital Mammographic X-ray System**

Digital Mammographic X-ray System, Brestige is a full field digital mammography system used for screening and diagnosing breast cancer.

**Medical Handpiece(For Dental Laboratory)**

MICRO-NX produces products that are used in clinic and dental laboratory. Their main product is Handpiece that is main material for making implant

**Thermometer:** The practical development of a thermometer suitable for measurement of body temperature dates back to 1625.

**2.4 BENEFIT OF THE PROPOSED SYSTEM**

It is expected that with the introduction of this system, a lot of positive changes will be noticed, providing the clinician with the necessary support in their decision making abilities.

The system will also significantly improve health workers’ performance and improve patient outcome thus affecting the gross quality of health care delivery.

The new system will be designed to provide the following benefits:

* The system would enhance User/System interactivity
* modern interactive diagnostic software that will aid clinicians in diagnostic procedures.
* Diagnosing and prescribing medical treatment in real time