**HEALTH INFORMATICS**

**INTRODUCTION**

Health informatics is the field of science and engineering that aims at developing methods and technologies for the acquisition, processing and study of patient data, which can come from different sources and modalities, such as electronic health records, diagnostic test results, medical scans, the health domain provides an extremely wide variety of problems that can be tackled using computational techniques.

Health informatics is a spectrum of multidisciplinary fields that includes study of the design, development and application of computational innovations to improve health care. The disciplines involved combines medicine field with computing fields, in particular computer engineering, software engineering, information engineering, bioinformatics, bio-inspired computing, theoretical computer science, information system data science, information technology, autonomic computing and behaviour information.

Before we begin on what is a computer, we need to understand its importance also in this case, let’s apprehend the importance of computer in NURSING:

* Maintaining patient history accurately, so that it helps in diagnosis and timely treatment to patient.
* Efficient record keeping for easier and secure access to required medical data.
* Admission, discharge and transfer system allows nurses to obtain basic biographical information on clients before they arrive to the unit.
* Nursing documentation: nursing assessments, clients care plan, medication administration records, nursing notes and discharge plan are some of the forms of nursing administration that are computerized.
* Medical imaging during surgical procedure also required computers.
* Computers is also helpful for effective inventory management in hospitals.
* Computer is also helpful in teaching-learning process like instructing the students using PowerPoint slides, world documents or web pages .

WHAT IS COMPUTER

“A Programmable usually electronic device that can store, retrieve, and process data.”

‒ Merriam Webster

“ An electronic machine that can store and deal with large amounts of information.”

‒‒‒ Collins Dictionary

* All computer systems perform the following five basic functions for converting raw input data into useful information and presenting it to a user.

1. **Inputting:** it is a process of entering data and instructions into a computer system.
2. **Storing** : its is a process of saving data and instructions to make them readily available for initial or additional processing as and when required.
3. **Processing**: Performing arithmetic operations (add, subtract, multiply, divide, etc.) , or logical operations (comparisons like equal to, less than, greater then, etc.) on data to convert them into useful information is known as processing.
4. **Outputting**: It is the process of producing useful information or results for a user, such as printed repot or visual display.
5. **Controlling**: Directing the manner and sequence in which the above operations are performed is known as controlling.

* The five units correspond to the five basic operations performed by all computer systems. And the functions of each of these units are described below.

1. **Input unit**

Input unit is that which links a computer with its external environment performs this task. Data and instructions enter a compute through an input in a form that depends upon the input device used.

For example: data can be entered using a keyboard in manner similar to typing and this differs from the way in which data is entered through a scanner, another type of input device.

In short, an input unit performs following functions:

1. It accepts instructions and data from outside world.
2. It converts instructions and data in computer acceptable form. Units called input interfaces accomplish this task.
3. It supplies the converted instructions and data to the storage unit for storage and further processing.
4. **Output Unit**

An output unit performs the reverse operation of that of input unit. It supplies information obtained from data processing to outside world. So, it links a computer with its external environment. As computer work with binary code, results produced are also in binary form. Therefore, before supplying the results to outside world, the system must convert them acceptable form.

In short, an output unit performs following functions:

1. It accepts the produced results, which are in coded from. We cannot understand the coded results easily.
2. It converts these coded results to human acceptable form.
3. It supplies the converted results to outside worlds.
4. **Storage unit**

Data and instructions entered into a computer system through input units have to be stored inside the computer before actual processing starts. Similarly, results produced by a computer after processing have to be kept somewhere inside the computer system before being passed on to an output unit. Moreover, a computer must also preserve intermediate results for ongoing processing. Storage unit of a computer system caters to all these needs. It provides space for storing data and instructions, intermediate results, and results for output.

In short, a storage unit holds :

1. The data and instructions required for processing ( received from input units).
2. Intermediate results of processing.
3. Final results of processing, before the system releases them to an output unit.

**Characteristics of computers**

The wide application of computers across various fields can be attributed to its characteristics.

* **Speed:** A computer is able to execute million instructions per second. This is way greater than what a normal human being can process.
* **Diligence:** computers can perform all tasks diligently and with consistency.
* **Accuracy:** computers work accurately, basis the given data and instructions into in the system. The chance of error is minimal and can be attributed to human inaccuracy of either wrong data or faulty instruction**.**
* **Storage capability:** A computer can store huge amounts of data and this information can be retrieved as and when once requires by the user**.**
* **Versatility:** A computer can perform several tasks, and is not only limited to processing data, computers are widely used for simulation, entertainment, business purposes etc.
* **No feelings:** computer is a machine free from emotions and feelings. The computer makes decisions based on instructions, and not emotions.

**Structure of computer**

Every computer consists of multiple devices that operate together in an integrated ecosystems. The components of computer include hardware and software.

**Hardware**

* Hardware components refer to the physical elements of the computer. A computer needs to have input, processes on its using the instructions, stores the result and gives the output to user.

**Software**

* Software is non-tangible component of the computer. It is the set of programs that makes instructions for hardware to follow**.**

**USE OF COMPUTER IN TEACHING, LEARNING, RESEARCH AND NURSING PRACTICE**

* The use of computers help nurses beyond electronic record-keeping and helps them in providing quality health care to patients.
* Nurse can record patient health history and ongoing treatment procedures.
* Not only do computers allow nurses to quickly access information about patient but also gather required medical information about the disease .
* Computers also helps nurses and doctors to collaborate efficiently and avoid miscommunication.

Basic uses of computers in the field of nursing are listed below:

1. **RESEARCH**

Computers is very useful tool for conducting nursing research work. Nurses can keep themselves updated by surfing online databases, websites and applications for relevant information. Computers also gives them a competitive edge for professional growth.

1. **NURSING PRCTICE**

* **DIAGNOSIS**

Nurses can use these electronic records anywhere and anytime for diagnosis. Electronic records are also more convenient to record, handle and transfer. This also gives an easy access to nurses for patient’s medical history that has been previously used by doctors.

Computers also help reduce diagnosis time and errors as the nurses can refer to online resources and medical references even for medical devices being used, the manuals can be accessed online.

An electronic health record can be created by taking and saving readings in the patient’s history.

* TELEMEDICINE

Nurses can establish communication using application with patients where it is difficult to schedule physical visits. For example in the case of a differently abled person, where frequent visits could cause inconvenience to the patient, the patient can establish contact via teleconferencing with the hospital/nursing staff.

Telemedicine is also frequently used to take expert opinion in hospitals located in rural areas or where shortage of medical staff.

* INVENTORY MANAGEMENT

Nurses use computers to keep a record of medicines in the stock. This helps maintain accurate stocks. Several applications can also be used to analyse the stock movement. Computers can also help to maintain reports for drugs their arrangement and usage.

Computers play a vital role in teaching and testing as covered in the subsequent topic.

1. TEACHING/LEARNING

* COMPUTER AIDED TEACHING AND LEARNING

The COVID pandemic in 2019 caused a disruptive change in the education industry where the entire system is moved online. Virtual education involves use of a computer or a smartphone for both teacher and student. The digitization in education industry also helps teachers employ visualization techniques for student’s benefits.

* COMPUTER AIDED TEACHING

The purpose of computer aided teaching is to increase the productivity, develop better understanding and learning for the students and improve effectiveness of teaching.

Features of CAT are :

* CAT makes classes engaging and effective, as it employs a combination a multimedia.
* CAT helps in developing a broad perspective and gain better understanding of fundamental concepts displayed via graphics that are easy to visualized and understand.
* It helps overcome misguided judgements thereby improving the learning experience.
* CAT also involves online courses and supplemental course materials, which opens a broad horizons for students to expand their knowledge in the area of their interest.
* COMPUTER ASSISTED TRANSLATION

Computer can help in translation from one language to another in order to facilitate students to learn and understand in their native languages. This helps improve self-learning among the students .

* TEACHING THROUGH PRESENTATION

Presentations can be made using PowerPoint, that has option for including text and media as well as animations and transition effects to make an effective deck. Presentations are an important tool to introduce topics and go through complex topics one by one in the classroom setting. Presentations are also used by students to present upon their projects findings and results.

* ONLINE/E-LEARNING

Computer aided online learning can either be concurrent learning or non-concurrent learning. Concurrent learning means engaging the students vis a teleconferencing app and interacting with them and non-concurrent learning included the use of online course material. The students can use to study it at their own pace and take occasional assessments. Non – concurrent learning also includes web links, research papers, medical journals and other published resources.

* COMPUTER ASSISTED TESTING

It refers to using computers to test and evaluate students learning with the help of computers. The students are given questions and their responses are evaluated using a particular application. It also helps to generate statistics report, such as performance of the class, most incorrectly answered questions, average time per question, etc.

There are some features of computer assisted teaching:

* Increase in accuracy and decrease in chances of bias while evaluating.
* Lesser evaluation time as compare to manually checking the answer sheet.
* Reduction in paperwork.
* Easy retrieval of questions and student’s performance as and when required.
* CHALLENGES

The challenges in computer aided teaching and testing are:

* **Cost** : computer aided teaching and testing requires computer system and working internet connection for online courses and research. For classroom system, the system can be expensive to be set up for each classroom. And for developing an effective online course also requires intensive money.
* Difficult implementation : the implementation of computer aided teaching can be difficult in some areas because of lack of infrastructure also due to lack of fuds available in the institution.
* Isolation among students : the virtual education is different than warm teacher-student professional relationships. The students may feel isolated if they taking up courses online. There may be also be language barrier in which course material is prepared and the student will not be able to understand and it may cause and unpleasant feeling among them.
* Mismatch with the teaching objectives: the prepared course material may not always align with teacher’s objectives for a particular class.

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