HEALTH INFORMATICS

I. INTRODUCTION

The study of patient data from a variety of sources and modalities, including electronic health records, results of diagnostic tests, and medical scans, is the goal of the science and engineering field of health informatics. The health domain offers a very wide range of problems that can be solved using computational techniques.

Health informatics is a broad category of multidisciplinary disciplines that involves research into the conception, creation, and use of computational breakthroughs for bettering healthcare. The involved disciplines combine the fields of medicine and computing, specifically 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, lets apprehend the importance of computer in NURSING.

1. Maintaining patient history accurately, so that it helps in diagnosis and timely treatment to patient.
2. Efficient record keeping for easier and secure access to required medical data.
3. Admission, discharge and transfer system allows nurses to obtain basic biographical information on clients before they arrive to the unit.
4. 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.
5. Medical imaging during surgical procedure also required computers.
6. Computers is also helpful for effective inventory management in hospitals.

II. WHAT IS COMPUTER

“A device that can store, retrieve, and process data and is typically electronic”.
Mr. Merriam
"An electronic device capable of handling and storing large amounts of information."
Collins Dictionaries

The following five fundamental tasks are carried out by all computer systems to transform raw input data into valuable information and display it to a user.

- **Inputting:** is the process of putting information and commands into a computer system.

- **Storing:** This is the process of keeping information and instructions so they are easily accessible for initial or follow-up processing as needed.

- **Processing:** Converting data into usable information involves performing arithmetic operations (add, subtract, multiply, divide, etc.) or logical operations (comparisons like equal to, less than, greater than, etc.).

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- **Outputting:** Producing information or results that are helpful to a user, such as printed reports or visual displays, is known as the output process.

- **Control:** Choosing the course of action.

The five units line up with the five fundamental tasks that all computer systems must complete. Additionally, each of these units' functions are listed below.

1. **Input Device:** This task is carried out by the input unit, which connects a computer with the surrounding environment. Through an input, data and instructions enter a computer in a format that relies on the input device being utilised.

   Data entry using a keyboard, which is akin to typing, is one example. This is different from data entry using a scanner, another sort of input device.An input unit serves the following purposes, in brief:

   - It accepts guidance and information from the outside environment.
   - It transforms data and instructions into computer-acceptable formats. units known as input

2. **Production Unit:** An output unit operates in the opposite manner from an input unit. It provides the outer world with information gathered through data processing. As a result, it connects a computer to its surroundings. The results produced by computers, which use binary code, are also in binary format. Therefore, the system must convert the results into an acceptable form before sending them to the outside world.

   An output unit serves the following purposes, in brief:

   - It accepts the outcomes that were generated and were coded from. The results that are coded are difficult to grasp.
   - It transforms these coded results into a format that humans can use.
   - It supplies the converted results to outside worlds.

3. **A Storage Space:** Before actual processing can begin, data and instructions entered into a computer system through input devices must be stored there. Similar to this, computer processing results need to be stored somewhere inside the computer system before being sent to an output device. A computer must also store intermediate outcoresults.

   - The information and instructions needed for processing (received from input units), in brief.
   - Processing intermediate results.
   - Processing findings that have been finalised before being released to an output unit by the system.mes for further processing. All of these requirements are met by a computer system's storage unit. It offers room for the storage of data and instructions, as well as results for output and interim

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III. 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**.**
- **Data Storage Capacity:** A computer is capable of holding a significant amount of data, which can then be retrieved by the user as needed**.**
- **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.

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

- **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:** The computer's intangible component is its software.. It is the set of programs that makes instructions for hardware to follow**.**

IV. 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.

2. **Nursing Prctice**

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- **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.

3. 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 .

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- **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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