A REVIEW PAPER ON COMPUTER'S ROLE IN PHARMACY

[1]Manpreet Kaur, [2]Neha Thakur

[1]Assistant professor
Chandigarh College of Pharmacy
Chandigarh Group of Colleges
Landran, Sahibzada AjitSingh Naga
Punjab140307, India.
Corresponding Author: **Er. Manpreet Kaur**

***Abstract*- In our technologically advanced era, computers have become essential in various fields, including pharmacy and related disciplines. The main focus of this assessment is the extensive utilization of computer programs, applications, and technology in pharmacies. Computer science and technology play a significant role in numerous sectors within the pharmaceutical companies, pharmacy industry, such as pharmacy schools, hospital pharmacies, research facilities, and various other settings. Computers play a vital role in minimizing the time, costs, and human effort required for various activities. The development of numerous software applications has greatly simplified the management of large volumes of data. In essence, computers are indispensable in the pharmaceutical industry as they significantly expedite and economize pharmacy research processes.**

Keywords: **Computer science, software, pharmacy, research, computer applications, and pharmaceutical industries**

INTRODUCTION:

The pharmacy profession is essential to patient care. It is a huge field which is present globally. The pharmacy industry needs a lot of management and manpower to run professionally and effectively. However the use of computers in the pharmacy industry today has reduced the labour and time needs.

Computers are almost related to every corner of pharmacy field. These are used in computer-assisted learning at pharmacy colleges, hospital and clinical pharmacies, retail pharmacies, clinical research facilities, drug storage, crude drug identification, and business management.

Since 1980, computers have been used effectively in the field of pharmacy. Since then, the need for computers in the pharmacy industry is enormous.

Computers provide several benefits, including time savings, accuracy, reduced labour requirements, speed, ability to multitask without becoming fatigued, large amounts of memory, data storage, and many more.[1]

INTERNET USE IN PHARMACY

The internet serves as an extensive repository of data, readily accessible with just a single click. It proves to be a valuable tool for literature review, giving access to a broad range of resources including books. Furthermore, accessing academic journals online is a straightforward process.[2]

Several websites exist that agreement with the pharmacy industry. These are a few of these websites:[3]

1. Phrma.org

Information on drug development, business news, and health resources are provided by the organisation that represents American pharmaceutical research businesses.

2. HealthcareForums.com

Intended to improve communication between healthcare experts on specific subjects, such as case discussion, research, and other pertinent issues.

3. www.astra.com

This is the official website of ASTRA Pharmaceuticals, which creates drugs to treat pain and disorders of the digestive system, cardiovascular system, and respiratory tract.

consists of press releases.

4. Biogen, Inc.

The company's main activity is the development of human medications with genetic engineering. including information about drugs and job advice.

5. www.gene.com

The primary focus of this endeavor is the development of pharmaceuticals aimed at effectively managing genetic disorders. This comprehensive compilation comprises a list of key medications along with their specific applications.

6: www.genzyme.com

a business that specialises in biotechnology and medical supplies. with information on jobs, goods, and services.

7. www.pfizer.com/main.html

Gain further insights into the research initiatives and employment prospects available within this pharmaceutical company, Pfizer. The provided information encompasses a dedicated section on pharmaceutical guidance and health education.
8. www.roche.com
Drugs and other items are produced by Roche to treat condition like HIV, heart disease and obesity. Also reveals corporate information and news.
9. www.pharmweb.net/pwmirror/pwk/pharmwebk.html
10. http://www.druginfonet.com
information on medications, diseases, Consult an expert, Information about the pharmaceutical manufacturer Health-related news and data, medical libraries, and references.

COMPUTER USE IN RETAIL PHARMACY STORES

Community chemists use computers for a variety of tasks. Some accounting tasks include creating prescription labels, giving patients receipts, creating hard copies of transaction records, calculating prescription costs, automatically placing orders for low-quantity products using electronic transfers, and creating annual withholding payrolls.
The development of different sales analyses for a day, month, year, and to date for the quantity of prescriptions handled and amounts in cash are managerial functions. determination of the number of prescriptions handled per unit of time, estimation of earnings, and study of financial ratios. [4, 5]
Drug Bank database is a cutting-edge bioinformatics and cheminformatics resource that combines substantial drug target (structure, sequence, and route) information with comprehensive drug (medicinal, chemical, and pharmacological) data. The database has 6826 drug entries, including 83 nutraceuticals, 133 biotech (protein/peptide) pharmaceuticals, and 1431 small molecule drugs with FDA approval.Furthermore, these medication entries are connected to 4435 non-redundant protein sequences, such as drug targets, enzymes, transporters, and carriers.[6]
A computerised biomedical bibliographic retrieval system is called MEDLARS (Medical Literature Analysis and Retrieval System). The National Library of Medicine introduced it in 1964, making it the first comprehensive computer-based retroactive search tool open to the general public. A digital edition known as MEDLINE ("MEDLARS Online") became accessible in 1971.
Along with this, the chemist can keep track of all the patient's information, including his or her history, state of health, and drug interactions, which will be helpful to the chemist the next time they dispense medication to that patient.

PHARMACY IN THE CLINICAL AND HOSPITAL

The hospital pharmacy is a department that keeps an eye on the distribution of medications, professional supplies, and medicines, stores them, and administers them to inpatients and outpatients. It may also include a manufacturing extension that produces parenteral and pharmaceuticals in large quantities.
The area of pharmacy known as clinical pharmacy is where chemists and pharmacologists offer patient care that encourages health, wellness, and disease prevention while optimising the use of medications.[2]
In hospitals, maintaining patient records is a crucial task however, with the aid of computers; data can be simply preserved and routinely updated. Stock maintenance entails that computerization of inventory control is extremely effective. Periodic or perpetual inventory control systems can be modified for this purpose. Computers can perform various tasks,[2, 7]
1.To identify the goods that have achieved the minimum order level,
2. to create a list of the items that need to be purchased and how much of each.
3.To reduce duplication and to produce purchase orders for suppliers.
4.To locate the infrequently bought goods so they can be perhaps returned or removed from the pharmacy's drug supply.
5.To provide recurring summaries as well as statistics
6. inventory management and purchasing.
7. Upkeep of the patient's medical file.
8. Drug information services. 8. Patient monitoring.

COMPUTERS IN EDUCATION

Information technology, including computers, has become crucial to pharmacy field instruction and education. Many methods are being incorporated into the teaching process. The "Display and deliver" technique is replacing the "Chalk to Talk" approach. At both the graduate and undergraduate levels, the use of multimedia packages, web-based learning, hypertext video chats, multimedia-based learning, intelligent tutoring systems, digital libraries, simulation labs, and tele-education is becoming more prevalent every day.
It has been proven to be appealing and enjoyable to use computers wisely to educate pharmacy students. The concept of "Computer Aided Learning" (CAL) is increasingly prevalent in the educational system.[8] The CAL system has the following significant advantages;
1. It is nicely structured, which means the user can easily access the content and it is neatly organised.
2. Because the CAL system is personalised, users can work independently and without interruption.
3. An beautiful way to deliver information using visuals and animation.
4. Quick responses to user inquiries.
5. It is fun since it gets around the traditional blackboard approach and, most of the time, one-way communication.
6. Because it can be utilised numerous times, user pleasure can be attained.
7. It is practical because it may be used at home or at the office.
8. Dynamic material may be readily updated and adjusted based on the most recent information.

9. It is mathematically prudent, resource-efficient, dependable, simulative, and self-evaluative.
Along with CAL, other significant uses of computers in education include distance learning, digital libraries, and e-learning.
E-learning:
E-learning is the term used to describe the intentional use of networked information and communications technologies in teaching and learning. E-learning is also referred to by a number of other names, including online learning, virtual learning, distributed learning, network learning, and web-based learning as shown in Fig. 1.

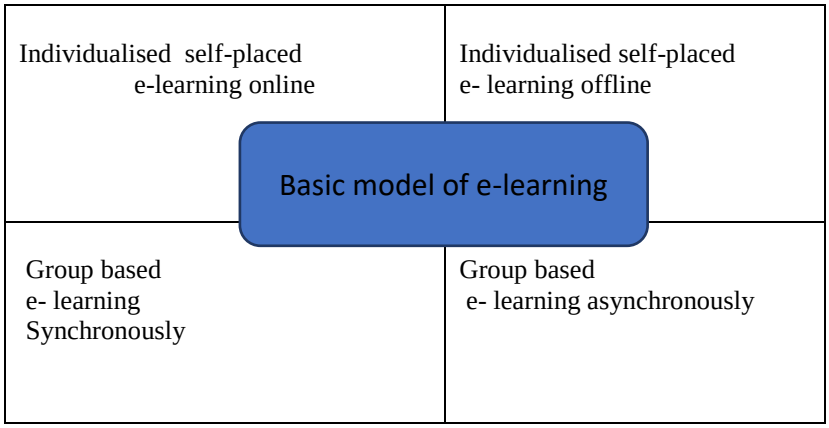

Fig.1 Models for e-learning.

The following are the four fundamental models for online learning:
a. Individualised self-paced online e-learning describes circumstances in which a single learner uses an Intranet to access learning resources like a database or course content. A typical illustration of this is a student working alone while researching on the Internet or a local network.
b. Individualised self-paced e-learning offline describes circumstances in which a learner is using learning materials like a database or a computer-aided learning package without an Intranet connection (i.e., offline). An illustration of this is a student working independently from a hard drive, CD, or DVD.
c. Synchronous group-based e-learning describes circumstances in which groups of students collaborate in real time across an Intranet. One-way or two-way audio and video conferencing as well as text-based conferencing may be used. Students participating in a live chat or an audio-video conference are two examples of this.
d. Group-based e-learning that is asynchronous describes circumstances in which learners are working in groups across an Intranet and exchanges take place after a delay (rather than immediately). Online talks conducted through electronic email lists and text-based conferences held within learning management systems are typical instances of this type of engagement.
Electronic libraries [9, 10]
An electronic collection of physical or digital resources known as a "digital library" is accessible from anywhere in the globe, both online and offline. The ability to access digital information from anywhere in the globe has generated a lot of interest in digital libraries in recent years. They are now frequently used and even preferred information sources in a variety of fields, including science and education. The rapid growth of the Internet and the rising interest in developing technology and collections related to digital libraries have both contributed to the recent acceleration of the digitalization of printed texts.
Digital libraries have a number of benefits, including:
1. Reducing storage space.
2. Reducing the expense of resource distribution and library upkeep.
3. Digital libraries with audio and video content can be used to offer information that cannot be supplied in paper.
4. Compact discs (CDs) and digital versatile discs (DVDs) are simple to distribute via the internet.
5. Searching for certain items takes less time, perhaps only a few seconds.
6. Numerous entrances.

COMPUTERS IN PHARMACEUTICAL ANALYSIS:

Table 1: Pharmaceuticals that were marketed and whose discovery was aided by computers

Generic name	Brand name	Year approved in United States	Discovery assisted by	Activity
Norfloxacin	Noroxin	1983	QSAR	Antibacterial
Losartan	Cozzar	1994	CADD	Anti-hyeprtensive
Dorzolamide	Truspot	1995	CADD/ SBDD	Antiglaucoma
Ritonavir	Norvir	1996	CADD	Antiviral
Indinavir	Crixivan	1996	CADD	Antivairal
Donepezil	Aricept	1997	QSAR	Anti-Alzheimer's
Zolmitriptan	Zomig	1997	CADD	Animigraine
Nelfinavir	Viracept	1997	SBDD	Antiviral
Amprenavir	Agenerase	1999	SBDD	Antiviral
Zanamavir	Relenza	1999	SBDD	Antiviral
Oseltamavir	Tamiflu	1999	SBDD	Antiviral
Lopinavir	Aluviran	2000	SBDD	Antiviral
Imatinib	Gleevec	2001	SBDD	Antineoplastic
Erlotinib	Tarceva	2004	SBDD	Anineoplastic
Ximelagatran	Exanta	2004	SBDD	Anticoagulant

Computers are mostly used in pharmaceutical analysis for data processing, data storage, and file searching. Additionally, a variety of equipment, including UV/VIS spectrophotometers, infrared instruments, HPLC, microscopes, and mass spectrometers, come with specific software. These programmes carry out all steps necessary for conducting analyses. Additionally, these programmes have built-in libraries that can be used to search for information about various chemical entities. For instance, if a mass spectrum of an unknown chemical is produced, the programme can be instructed to look for comparable mass spectra in its library, which will aid in the identification of the unidentified molecule

COMPUTER ADDED DRUG DESIGN :

The creative process of discovering novel pharmaceuticals based on the understanding of the biological target is known as drug design, also known as rational drug design. Computer programmes can help with this form of drug design. According to the input data, software will create a number of lead compounds, and among these, a chemical of interest can be developed and evaluated. Such a process will take a lot of time and effort to complete manually. But using a computer drastically cuts down on time. [12, 13] Molecular modelling and molecular visualisation have grown significantly and are now an essential component of the drug discovery process. The creation, manipulation, and depiction of molecules in three dimensions is known as molecular modelling. Computer graphics that depict the molecular structure are known as molecular graphics. Molecular models were utilised in the past by synthetic chemists, but computer modelling has improved the detailed depiction of molecular structures.[14]There is a wide range of software options available, including AutoDock from The Scripps Research Institute, CombiBUILD from Sandia National Labs, DockVision from the University of Alberta, HINT! from Virginia Commonwealth University, LIGPLOT from University College of London, DOCK from UCSF, SITUS from the Scripps Research Institute, Bio-Suite from Tata Consultancy Services Ltd., Maestro, Molecular Design Institute, Sanjeevani from the Indian Institute of Technology in New Delhi, Macro Model 5.5, and Delphi.

COMPUTERSINMANAGEMENTOFCLINICALTRIALS

Clinical trials are a crucial component of today's drug development because they reveal the risks and advantages of each given therapy. In clinical studies, data management and collecting are absolutely essential. Data collection and management for clinical trials have been significantly impacted by the astounding improvement in computer hardware and software technology. Clinical trials relied on either manual methods or a limited amount of computers prior to the boom of information technology. The trial database, data collection and entry, randomization, registration, research management tools, and statistical analysis can all be done using software.

It is crucial for volunteers and doctors to communicate. For communication purposes, a variety ofcomputer-aided techniques can be used, including e-mail, website, and video conferencing.

E-clinical applications:

E-clinical software consists of integrated suites of applications that serve the clinical research process. These applications provide numerous methods for data collecting; data entry, remote data capture, and batch data loading. E-clinical software example are as:

1. Oracle clinical V4i® from Oracle Corporation, which allows for quick and simple study design and clinical data collection.
2. Data LabsXC®, a product of Data labs, Inc.
3. Omnicomm Systems' Trial Master®.
4. Data management using Cliniplus® from DZC software solution, Inc.
5. Akaza research's Openclinica, Cambridge, Massachusetts

The statistical regression studies can be studied using NONLIN to determine the parameter values for linear, multivariate, polynomial, and general nonlinear functions. The regression analysis calculates the parameter values that result in the function fitting the observed data that you provide the best.Software called KINPAK is used to calculate peak plasma concentrations, peak plasma times, and area under the curve (AUC, Cmax, and tmax).Programmes like ESTRIP and STRIPACT are employed for mathematical analysis. These programmes aid in the patient's therapeutic drug monitoring. Regression analysis calculations are carried out using additional software, such as SAS, SAM, and BMDP.[6]

COMPUTERS IN PUBLICATION[16,17]

Publication of research findings is a crucial component in all fields, including pharmacy. An essential part of a researcher's professional life is publishing their study. But not all researchers enjoy writing, and it can be nerve-wracking to struggle to get a paper published. However, preparing and publishing an article is extremely simple and flexible when using computers for writing and editing.

At various phases, the author, publisher, and reviewer may need a need a computer.

The traditional methods for publishing articles are very laborious and time-consuming. But using a computer and the internet makes it incredibly simple. The list of available journals, their submission requirements, and their directions for authoring research papers are all available online with just one click. The internet can assist publishers in selecting the best magazine for their article's publication. When compared to sending an article via simple mail, which takes time, submitting an article online is a very simple, one-step process. The majority of journals today allow authors to submit papers electronically, sometimes known as "e-submitting," through the journal's website.

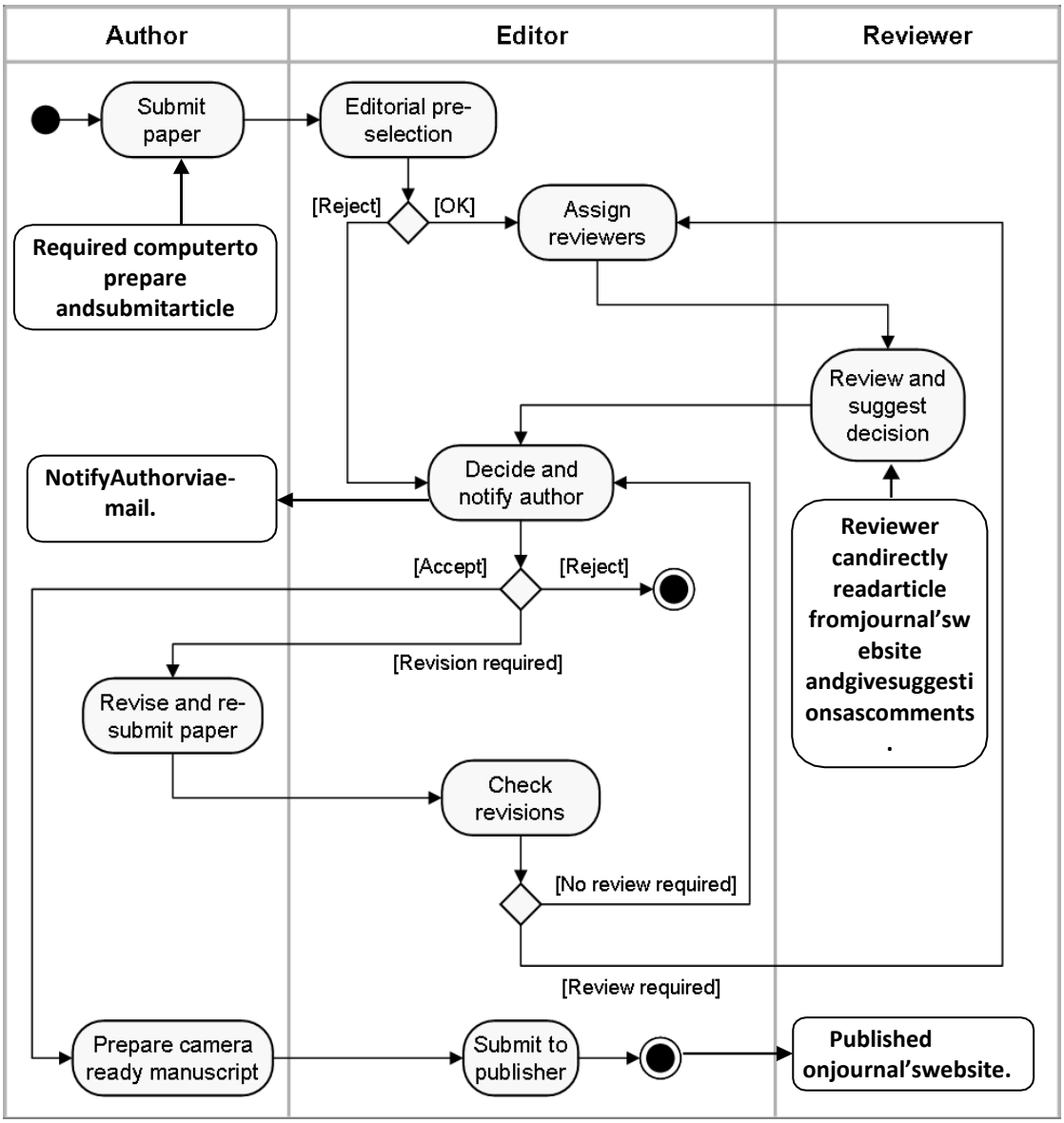

Fig.2 Computers in Publication

One click electronic submission is the quickest method for submitting papers. Publishers can also email articles back to the author for any necessary revisions. Publishers also post articles online for free public evaluation, and based on the quantity of reviews, publishers can also determine the article's ranking.

CONCLUSION:

Computers and its application in Pharmacy upon analysis is a critical factor which every last drug specialist should think about. The Computer has turned into an exceptionally basic device in every aspect of science and innovation. With the multiplication of the Internet and the improvements in Computer-Technology innovation and assembling, the proportion of cost to execution of Computer's keeps on diminishing. This has brought about the improvement of number of Computer applications.

Computers are the e□ective tools for easy and e□ective access to relevant knowledge space across disjoined and exponentially growing.

In the realm of biomedical research, computers serve as highly efficient tools that enable easy and effective access to a vast knowledge space encompassing disparate and rapidly expanding research sources. They have emerged as a critical success factor, as they facilitate the creation of web-based knowledge spaces with search capabilities that surpass those of conventional search engines. By harnessing the power of computers, various approaches can be envisioned that aim to accentuate the valuable features within datasets, thereby facilitating exploratory methods that guide search paths and uncover unexpected or previously unknown facts. Through continued exploration of the applications of computing technology, we have the potential to achieve remarkable advancements in pharmaceutical research, pushing the boundaries of what is possible.

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