REVIEW

IRJPS

GIVING LIFE TO YOUR WORK

Open Access

AN OVERVIEW ON THE UTILITY OF COMPUTER APPLICATION IN THE PHARMACY WORLD AND ITS SIGNIFICANCE

Anupam Saha[1*], Arun Chatterjee[2], Madhurima Ghosh[1]

[1]Nshm College of Pharmaceutical Technology, NSHM Knowledge Campus, Tollygunge, Kolkata, West Bengal
[2]Department of Information Technology, Bharat Technology, Uluberia, Howrah, West Bengal

ABSTRACT

The use of computer is an emerging field in the medical and allied sciences. Its broadness has developed a considerable measure and its proceeding to develop. Motivation behind this article is to feature the known and positive impact subjected to the computer application, principally concentrating on development and the subjects related to it in medical and allied health sciences. Previous research indicates that computer application has helped a lot in the pharmacy world for both clients and for the professionals. This article can be useful for educational and motivational effectiveness of participants and adequacy of members. The purpose of this article is to flare up the improved system with the analysis and the rational congruency of computer application and pharmacy world. The aim of this review work is to show development and innovation of technology with the restorative sciences.

KEY WORDS: Computer Application, Software and Technology, Pharmacy, Development and Innovation.

INTRODUCTION

Life is brimming with conceivable outcomes all what is required is to investigate them. It's one stage to plan and second to investigate and execute them. Computer Technology and innovation give the ideal condition to investigate the universe of boundless potential outcomes and art their own particular example of overcoming adversity over numerous bearings in the realm of Pharmacy. Today, Computers has earned an across the country and overall notoriety for its creative advancement and magnificent approach for learning. It offers the best help coordinated learning, top notch working programming, simple time administration, and numerous more information open offices to the Pharmacy hone. Presently wherever in the Pharmacy division Computers are given hypothetical and in addition down to earth learning supported with greetings tech web access and different offices. Proficient academic mood alongside a satisfying working modem and its capacity, guarantees improvements inside and outside the field of Pharmacy and Allied Health Sciences. It's enticing at times to get impartial and unsentimental about turning points. After all we are in an industry where process durations scarcely sit tight for the ink to dry hence, in spite of the fact that there are such a significant number of advancements in the medicinal sciences which are to be glad for however there shouldn't be that much to appreciate about points of interest that are subject to look bizarre by all accounts. But there is something to cheer among the tech to gloom.

Pharmacy field plays a crucial role in patient healthcare. It is a huge field which is present worldwide. To run pharmacy field professionally and efficiently, it requires huge management and manpower. But now a day's use of computers in pharmacy field reduced the manpower and time. Computers are almost related to every corner of pharmacy field. These are utilized in the drug design technique, retail pharmacy shop, clinical research centers, crude drug identification, drug storage and business management, hospital and clinical pharmacy, in pharmacy colleges for computer assisted learning[1]

Micro-processing revolutionized the desktop. Macro-Processing revolutionizes the server. Flexibility and adaptability is the key to success for today's e-business environment.[2] Still, such rapid change obviously puts a premium on some things. Since you can never be sure where your next arrival is coming from, the highest premium must surely be for longevity and sustained business leadership it implies.[2] In pharmaceutical field or the medical aspect, "the next arrival" aims towards the unsolved diagnosis of diseases on which drugs are yet to be formulated or discovered.

The day has come for Return on Relationships i.e., the day of the unsophisticated, un-uniform, easily led customers are over. Service, delivery method and price have become main reason influencing consumer decision making. In such a scenario, Customer relationship Management enables a return to win-win thinking, transforming information into services that can lower the buyer's cost without erasing the vendor's profit. Though the concept of buyer-seller relationship is not new and has been practiced in one form or the other since time immemorial, it is only in recent times that Customer Relationship Management has turned into a buzz world.[2] Computer science has also vastly altered the domain of biology, to make it ultimately the basis of modern medicine. Basic building blocks are emerging now as the great universalities o biology: as the processes of energetic and informatics. The former describes the flow of energy from the sun to flora and fauna, and the metabolic process common in all organisms, with the cell as the energy-processing unit. The latter process outlines the information flow among all beings with genes as unit of informatics.[2]

The computer has become a very common tool in all areas of science and technology. With the proliferation of the Internet and the developments in computer technology and manufacturing, the ratio of price to performance of computers continues to decrease. This has resulted in the development of number of computer applications. In Pharmacy field, effective use of computers started from 1980. Since then there is great demand of computers in pharmacy field. The field of pharmacy has immensely benefited by the use of computer and will continue to benefit as the pharmacist's gain more familiarity with computer. Some of the important areas where computers are useful are new drug discovery, drug design, analysis, manufacturing of drugs and hospital pharmacy. Other than these, computers helps pharmacist collaborate with other professionals, which is very essential in today's research work. It also provides solutions for

time consuming manual task. Various hardware and software have been developed without which drug discovery, designing, manufacturing and analyzing would become virtually impossible. Further development is still in progress which will make pharmacist's job easier. The more important fact is that they will enable us to discover new drugs for the complete care of dangerous of diseases like aids, cancer etc. and reduce the cost of production of drugs for diseases which are easily cured.[3]

Utility of Computer Application in The World of Pharmacy:

A computer is a device that can be programmed to carry out a set of arithmetic or logical operations automatically according to instructions written in a software.[3] The utility are as follows:

1. **Online Medicine Store** – Nowadays shopping is pretty much done in the palm of hand, and it is very astonishing to know medicines too can be ordered within a short span of time. Just to upload the prescription and the meds to be delivered at the doorstep. Technology has developed in such great extent. Few of the websites cum apps which are to be used to buy medicines as well as pharmaceutical products are:
   - Netmeds
   - Just relief
   - Buy Drug
   - RXpress
   - Medidart
   - Pharm Easy
   - Apollo Pharmacy
   - Sasta Sundar
   - Aermed
   - MChemist
   - Easy Medico
   - Practo
   - 1MG
   - Med Plus Mart

2. **In Colleges** – Computer knowledge is very essential which is pretty much clear when gone through the Introduction. Hence many Universities and Colleges including Pharma and other Allied Sciences are encouraging students with a subject to gain and sharpen the knowledge in Basic Electronics and Computer Application. Here students get the exposure of basic computer knowledge and develop IT skills. "Data Base Management" is a vital aspect and plays a pivotal role in the any field including pharmacy.

3. **Up-gradation of Medical Procedures and Accessing Journals –** Various journals world-wide could be accessed and calling in touch with the updated medical aspects. Distribution of research work is a vital angle in any field and drug store field isn't special case to it. Distributing research is an indispensable component of scientist's expert life. Be that as it may, composing isn't each scientist's coveted movement and the trouble of getting a paper distributed can be nerve-wracking. Electronic gathering of genuine or virtual assets known as computerized libraries which got to information anyplace on the planet currently generally acknowledged in every aspect of training. Worldwide extension of web and the expanding enthusiasm for advancement of computerized library related advances and gathering paced up the digitalization of printed reports in the previous couple of years. Anyway utilization of PCs in composing and altering makes it exceptionally easy and flexible to get ready and distribute article.

4. **Online Medical Consultation –** There are certain companies which acts as a modem to connect Patients to Doctors keeping commission in check. Via internet live consultation with doctors is possible, for further investigation the Doctor may summon the patient for check up or can refer to any other expertise. Along with that speech therapy, consultation with councilor is also done online. Emails, Voice E-Mails, Video Conferencing, accessing medical terminology, social media platforms, accessing websites are the communication medium.

5. **Prescription filling / Prescription Refilling / E-Prescribing / Prescription Processing:** Patient name, doctor name, drug name, quantity, prescription number; prints the label, calculates the price, discount, etc. Pharmacist enters data regarding the prescription if data not available to avoid any warning message appears if the prescription is out of data. E-prescriptions are computer-generated prescriptions created by healthcare provider and sent directly to pharmacy. E-prescriptions are sent electronically through a private, secure, and closed network. Pharmacist can update patient profile whenever a new prescription is filled. Also if the patient might have any symptoms like allergies, it should be added to patient profile [3]

6. **Computer added drug design** – Drug design, also sometimes referred to as rational drug design, is the inventive process of finding new medications based on the knowledge of the biological target. This type of drug design can be assisted by computer softwares Various types of softwares are available such as, AutoDock (The Scripps Research Institute), CombiBUILD (Sandia National Labs), DockVision (University of Alberta), LIGPLOT (University College of London), SITUS (Scripps Research Institute), DOCK (UCSF Molecular Design Institute), Bio-Suite (Tata Consultancy Services Ltd.), Maestro, Macro Model 5.5, Delphi etc.[3] This type of drug design can be assisted by computer software. Software will generate number of lead molecules depending upon the feed data and among these; compound of interest can be developed and tested. If such process is carried out manually then it will be time consuming and tedious. But use of computer reduces time hugely. Traditional drug discovery generally requires innovation of lead compounds, synthesis and experimentally tested until that a compound having the desired pharmacological effect. Out of 5,000 screened compounds only one compound will be get approved as a new drug for that approximately 10-12 years are need. This trial and error process is a time consuming and also very expensive one. Recently computer is used for chemical structure identification, to determine receptor structure and its receptor blocking site to reduce the time in the drug discovery.[8]

Various stages in drug discovery:
(a) Pre-discovery (Understand the disease).
(b) Modern drug discovery - Choose a disease and its genetic/biological target.
(c) Target Identification - Choose a molecule to target with a drug.
(d) Discovery of a "lead" molecule - Design assay to measure function of target.(e) Target Validation (Test the target and confirm its role in the disease).

7. **E-clinical softwares** - E-clinical softwares consist of integrated suite of application s that support clinical research process, including various ways of data collection, data entry, remote data capture, batch data load. These suites enable to quickly and easily design studies, capture clinical data, some examples of e-clinical softwares are, Oracle clinical V4i® from Oracle Corporation, Data LabsXC® from Data labs, Inc., Trial master® from Omnicomm systems, Cliniplus® Data management from DZC software solution, Inc., Openclinica by Akaza research (Cambridge, MA).

Pharmacokinetic analysis is basically carried out to get information on renal clearance, volume of distribution, metabolic deposition, absorption and multiple dosing of drug. This type of analysis can be carried out by using different softwares. These softwares help in therapeutic drug monitoring of patient. There are different approaches to pharmacokinetics using differential equations with the help of softwares which are,

NONLIN - The software which allows you to perform statistical regression analyses to estimate the values of parameters for linear, multivariate, polynomial, and general nonlinear functions.

KINPAK – This is software used to obtain Area under curve (AUC), Peak plasma concentration (Cmax) and peak plasma time (tmax).

ESTRIP and **STRIPACT** – These are the programs which are also used for mathematical analysis.[3]

8. **Data Analysis and Drug Development -** Scientists from many different disciplines participate in pharmaceutical development. Their research areas may be very different, but they all generate scientific data (and text documents), which are the products of development laboratories. Literally, truckloads of data and documents are submitted to the regulatory authorities in support of investigational and marketing authorization filings. For example, even a typical Investigational New Drug (IND) application requires around 50,000 pages of supporting documents. One way or another, every single data point has to go through the acquiring, analyzing, managing, reporting, auditing, and archiving process according to a set of specific rules and regulations. Needless to say, the wide use of computers has tremendously increased efficiency and productivity in pharmaceutical development. On the other hand, it has also created unique problems and challenges for the industry. This overview discusses these topics briefly by focusing on the preclinical development area (also known as the area of Chemical Manufacturing and Control, or CMC). Considering the pervasiveness of computer applications in every scientist's daily activities, special emphases are put on three widely used computer systems:
• CDS—chromatographic data systems • LIMS—laboratory information management

systems • TIMS—text information management systems.[4]

9. **Hospital And Retail Pharmacy / Medical Shops -** Clinical preliminaries are the imperative piece of current medication improvement which gives data about hazard and advantages of any drug. Healing facility drug store is division of doctor's facility which screens on the getting and assignment of medications and solutions and expert supplies, stores them and administers to in-out patients. The surprising progression in PC equipment and programming innovation has had colossal effect on clinical preliminaries information gathering and administration. Tolerant record support is indispensable employment in healing centers yet with the assistance of PCs; information can be kept up effortlessly and furthermore refreshed time to time. For this reason, occasional or ceaseless stock control frameworks might be adjusted. Software like Microsoft Excel are helpful in upkeep of all kind of numerical information. Clinical drug specialist may utilize PCs for restorative medication checking; which are extremely strong and having exceptionally restricted helpful. PC program are intended to compute medicate measurements to suit singular patients require. Information gathering and administration are exceptionally urgent in clinical preliminaries. Virtual products can be utilized for the preliminary database, information accumulation/information section, randomization, enrollment, examine administration instruments, and measurable examination.

10. **Stock Management , Bills and Mediclaims –** Stock management gets eventually easy when data sheet is maintained. Along with that billing can be made digital way, in this digital world digital methods implies uniqueness and vastness. Hospital or Pharmacy bills can be paid via internet. Mediclaims which the company provides for their employees pays direct to the charged organization.

11. **In Pharmacovigilance -** Competition among the pharmaceutical organizations and enormous request to build up the new medication atoms for testing infections prompt investigation of new helpful methodologies, however because of ill-advised access of the post advertised information of the recently propelled tranquilize particles. There are certain IT companies who are given

the assignments to keep up to the task and maintain a data sheet to balance the adverse drug system. A few antagonistic medication responses were not distinguished at the underlying phases of treatment. With the execution of nourishment, medication and beauty care products act in 1938 enhanced medication wellbeing. Anyway with absence of legitimate access and understanding of medication wellbeing information challenges progressively endured and keep on persisting to the present day. With advancement of electronic archive of post promoting deliberate unfavorable medication occasions reports broke down antagonistic medication occasions. In any case, there were still no regular stage for tranquilize gauges and interoperable framework set up. To correct this circumstance, the medication administrative offices and pharmaceutical industry started building an automated store of premarketing and post promoting clinical preliminary information that would guarantee successful information examination and basic leadership which prompt the execution of new programming for assessing and screen the unfriendly medication events. The outsider programming takes assignments from associations and keep up a record or to state information sheet on the unfavorable medication administration.

In another related development, the authority based and unchallenged art of medical diagnosis and prescription is getting replaced by "evidence based medicine". Here the emphasis is on a scientific rigor in medical decision-making where all the erroneous cases of the day/week, are brought up and cross-examined, latest journals cited and fresh decisions taken.[2]

Computers In Pharmaceutical Analysis – Computers in pharmaceutical analysis are mainly utilized for data storage, processing of data, searching of various files. Also various instruments like UV Visible spectrophotometer, Infra red instrument, HPLC, Microscopes, Mass spectrometer come along with particular softwares. These softwares do all necessary process required for analysis purpose. Also these programs contain in built libraries which prove useful for searching of data related to different chemical entities. For example if a mass spectrum of any unknown chemical is obtained then instructions can be given to the program to find out similar mass spectrum among the library which is present in it, which will help to find out unknown chemical entity. For interpretation of IR spectra commercial software packages are

available. Sadtler Standard infra-red collection and Sadtler commercial infrared collection contain over 1,20,000 spectra.[1]

12. **Maintenance and Survey –** Many riddles remain unsolved. There can be, for instance, unforeseen fatal reactions to an injection in a particular patient and it can bring the new therapeutic practice to a standstill. Further, transformation of fundamental features of biology into medical applications needs support by hospitals and funding by pharmaceutical firms. This is not always easy to organize. On the whole, there is immense potential for rational drug design, clinical test of herbal medicine and planned usage in the huge market. Therefore understanding of the infectious disease and seek intervention of pharmaceutical companies to create modern drugs-with long span of valid trials – to make life essentially healthy.[2]

13. **In Toxicology And Risk Assessment** – In silico toxicity prediction have made great strides since its inception in 1962 and to overcome the many problems following recommendation are made.
    - More toxicity data, of greater consistency are required.
    - A better mechanistic appreciation of clear toxicity is needed.
    - The model user should consider use of a variety of techniques instead of relying on a single prediction. Softwares include - Derek Nexus , Literature Look-Up, Virtualtoxlab, Metadrug, Topkat, Admet Predictor, etc.[5]

14. **Diagnostic Laboratories** – Manual procedures were tiresome and time consuming whereas automated computerized instruments accomplish number of tasks with accurate results in diagnosis. Laboratory Information System (LIS) is used to preside huge amount of data. Instruments function as preprocessors, i.e., which will convert the raw data to digital format and finally gives the numerical values in the reports. The advancement of persuasive computers offer better and enhanced view and perception in radiology department. In this many of the current imaging techniques such as Computerized Tomography (CT) and Magnetic Resonance Imaging (MRI) are inherently digital. In this computer conceives a "functional image" by executing intricate calculations on measured data .[5]

15. **Computer Aided Design Of Drugs (CADD)** – CADD is referred as a distinct and advanced drug designing process . It is a process of pronouncement of new medications . With a base of the refined graphics software existing or feed data the medicinal chemist have a scope to design the new molecules and improve their efficiency of the action.

16. **ANN (Artificial Neural Network) –** It is a learning system based on a computational technique which can simulate the neurological processing ability of the human brain. The ANN has been applied to solving various problems such as product development QSARs (quantitative structure–activity relationships, QSPRs (quantitative structure–pharmacokinetic relationships), estimating diffusion coefficient, predicting the skin permeability and predicting the mechanism of drug action.

17. **Simulation Games –** The introductory ancient Chinese proverb applies to teaching in general. It means that if an educator simply talks about a subject matters to students, it is very likely that they will forget what was said. If the subject matter is told and shown to them as well, they are more likely to remember what was taught. If the educator involves them in a 'hands-on' activity, where they 'do' what they are taught, they will fully understand and the subject will become 'learned'.[6]

18. **Company Recruitment –** When there's a vacancy in any pharmaceutical company, interested candidate can place their application via internet.

Few More Computer Software Used In Pharmacy
- WinPharm.
- Pioneer RX.
- HBS Pharmacy Software.
- Arteb Pharmacy Solution.

- Microsoft Office , WinRar, etc.

Notes : Computer-simulated pharmacology experiments were first introduced in June 1998 to a 4-year undergraduate pharmacy course at Charles Sturt University, Australia. The major teaching strategies for pharmacology, a full year subject, were formal lectures, small group tutorials and practical lessons in laboratories.[9]

DISCUSSION:
The Computer has been the harbinger of a quiet mechanical insurgency which has in truth the most recent ponder or to state the off-spring of upbeat relationship among science and innovation. One has seen the impacts of Computers in different parts of our life like correspondence, designing, wellbeing and pharmaceutical, economy and different territories. It can store a large number of data, figure thousands in minutes and even pay bills, analyze reply sheets, print books, advise correct time to demonstrate the score load up, and so on. Computers are utilized in workplaces, therapeutic shops, healing centers, retails, ventures, pharma observing and so on. Our legislature has offered rearrangement to the significance of Computer. Computers presented computerized reasoning in each sort of activity. World is moving quickly so we need to keep pace with this world so Computers are extremely helpful for advancement. The modern age is being literally ruled by Information Technology and has become a part and parcel of modern life. There is hardly any sphere of human life where Computer and Technology has not entertained.

The dissemination of research results and findings is an integral part of the research process and the career in academia. Researchers write to keep records of their work for themselves, but more importantly for readers and peers who are expecting a standard form, language and style when reading research papers. Writing in a scientific style may be hard in the beginning for novices, but clear communication and concise writing for a scientific audience can be trained (Davis, 1997).[7]

Even though Computers play a vital role in nearly all aspect of our lives, the work of an Pharmacist can seem like a mystery to those outside the profession. But it's really very straight forward, Pharmacist has many different roles in our community such as in manufacturing, academics, journalist, military, community pharmacist, research, marketing, hospital and also the leaders or entrepreneurs. They also gather information to improve many lives along with that they brainstorm the ideas with team efforts and with people and study possible solutions. Communicating the solution through writing and speaking to groups is the next step and finally they oversee the shape and implementation of the scheduled plan. Computer application process of developing software using software engineers with pharmacy people has certain advantages which are the predefined and consistent solutions of common problems and standardization method of implementation and testing. Almost all type of business maintains a vast network of computer systems to aid everyday operations. Many of these are networked either LAN, WAN or even Internet.

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. Computer is obligatory in this propelled time and drug store and related subjects are not least special case to it. The field of Pharmacy has enormously profited by the utilization of Computers and will keep on benefitting as the Pharmacy acquires recognition with Technology. Advancement of different programming raises it hell allowed to deal with tremendous information. The entire field of Pharma-field requires Computers. A portion of the essential zones where technologies are valuable for new medication revelation, sedate

outline, examination, assembling of medications and healing facility drug store. Computer altogether decreases the time, use, and labor required for any sort of work. Other than these, Technology enables drug specialist to team up with different experts, which is exceptionally fundamental in the present research work. It additionally gives answers for tedious manual assignment. Different equipment and programming projects have been produced without which tranquilize disclosure, planning, assembling and examining would turn out to be for all intents and purposes unimaginable. Encourage improvement is still in advance which will make drug specialist's activity less demanding. This survey predominantly centers on the different applications, virtual products and utilization of Computer, Technology in Pharmacy. The more imperative truth is that they will empower us to find new medications for the total care of risky of ailments like guides, disease and so on and decrease the cost of generation of medications for ailments which are effortlessly restored. Computers are likewise helpful for clinic, allied health sciences and in telemedicine.

Software engineering and innovation is profoundly used in Pharmacy field wherever like in Technology universities, Pharmacy colleges, pharmaceutical ventures, and looks into focuses, doctor's facility, drug store and some more. A great deal has been done, and a still must be improved for the situation enhancing the Computer offices to Pharmacists. Computer and Technology is compulsory in this propelled time and Pharmacy and whereupon on examination most would agree it has enormous noteworthiness and assumes a urgent part to united sciences and related subjects are not special case to it and to finish up to put it plainly, in this Analysis, Computers are assuming basic part in Pharmacy field, without Computers the drug store, Pharmacy, research will be enduring and costly for sure. So upon analysis it is clear that it is of no doubt that so many research papers and journals along with review articles upon the computer technology in the field of pharmacy are indeed true. This review article is to focus about the importance and to give tribute to people helping in the betterment in the field of pharmaceuticals through technology.

REFERENCE:

1. Jadhav Shivraj, Nikam Komal, Gandhi Anand, Shinde Narendra, Salunkhe Kishor, Applications of Computer Science in Pharmacy: An Overview, National Journal of Physiology, Pharmacy & Pharmacology 2012; 2(1):1-9.
2. Computer Today: India's Most Widely Read InfoTech Magazine 2001;17(233): 1, 5, 28-29, 69.
3. Blogspot - Computer and its application in Pharmacy - http://compappinpharm.blogspot.com/ .
4. Ekins Sean, Computer Applications In Pharmaceutical Research And Development, A John Wiley & Sons, Inc., Publication, ed., 2006 , 52.
5. Bandameed Ramu, Provenance of Computers in Pharmacy, Clinical Pharmacology & Biopharmaceutics 2016; 5(1): 1-7.
6. Schwarz Daniel, Dušek Ladislav, Computer Applications: Systems And Networks For Medical Education, Published by Masaryk University; Institute of Biostatistics and Analyses, 2014, 46.
7. Derntl Michael, Basics of research paper writing and publishing, Int. J. Technology Enhanced Learning 2014; 6(2): 105-123.
8. Prabu S. Lakshmana, Thirumurugan R., Vijay P.Mahesh, Shanmugarathinam A., Applications of computer in Health Profession: From Drug Discovery to Market, International Journal of Research in Pharmacology & Pharmacotherapeutics, Special Issue 1, 2016, 46-54.
9. Wang Lexin, Computer-Simulated Pharmacology Experiments For Undergraduate Pharmacy Students: Experience From An Australian University, Indian Journal of Pharmacology 2001; 33: 280-282.