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RESEARCH ARTICLE

A SYSTEMATIC REVIEW OF SOFTWARE AND RESOURCES AVAILABLE IN THE PHARMACEUTICAL SECTOR

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Abstract

The whole pharmaceutical area (pharmacy industry, pharmacy billing, clinical trials, pharmacovigilance, and drug-drug interaction detection) needed various innovative and scientific solutions to solve the problems. A systematic review was performed on various software applications widely used in the pharmaceutical industry, including clinical trials, pharmacy billing, pharmacovigilance, the detection of drug interactions that assist the healthcare professional. Our review concluded that computer software has created a significant role in the pharmaceutical industry, pharmacy billing, and herbal industry. The computer software and programmes aid in reducing manufacturing costs, manufacturing errors, medical errors, and clinical errors.The software performs various safety functions, supplies on-screen access to pertinent drug and patient information, manages data, and assists in the product formulation process. The programmed safeguards can be modified to meet changing requirements.

Introduction:-

Software is a set of instructions, data, or programmes used to operate a computer and execute specific tasks. It is the opposite of "hardware," which describes the physical aspects of a computer. Software used in pharmacology is mainly related to minimising the efforts needed in determining the pharmacokinetic principles of a particular drug in individuals, the pathways of that drug, and consequently its adverse reactions, drug-drug interactions, clinical research, and clinical trials. Applications of software in pharmaceutical chemistry are to elucidate various physiological properties of drugs, to build databases, to analyse the chemical structure of drugs, to perform molecular modeling, homology modeling, docking, QSAR, and to predict activity values for new compounds within certain limits. Software used in pharmaceutics helps predict the dissolution rate, biopharmaceutical characterization, accurate and precise stability profile, etc. of a formulated dosage form. It is used in the pharmaceutical industry to reduce errors, documentation, and manufacturing costs. Software used in pharmacognosy gives information on herb activity, interaction, mechanisms of action, and supporting data underlying the use of herbs for health. The wide application of software in pharmaceutical biotechnology helps to increase the predictability of results, identify genes, elucidate protein structure, identify the genome responsible for the expression of particular characteristics, etc. Software is built to satisfy the needs of a specific client or business. In today's competitive world of software, software developers have to deliver a quality product on time.

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Application Of Software In Pharmacy

The pharma industry is a risk-prone sector because it handles life-saving medicines. Errors during the sale of medicines can critically impact the health of individuals who are under medication. Managing a medical store requires alertness and strict adherence to standard rules and norms, such as remembering the expiry dates of available medicines in stock and the capacity to decipher the prescriptions written by doctors. Wondersoft, a pioneer in retail pos software, offers efficient pharmacy billing software that supports optimal management of drugs with ease. Wondersoft offers pharmacy software to independent outlets through ShopAid and to large retail chains through eShopAid. The pharmacy management software allows batch tracking, blocks billing of drugs, and shares alerts for medicines or drugs that will expire soon. Through this web-based retail pharmacy software, it is easy to manage the return of expired medicine and drugs to vendors for return credit. Pre-clinical and clinical trials are an important part of current drug development, evaluating the pharmacological benefits along with the toxicological risks associated with the medication. It became easier to analyse adverse drug events after the creation of a computerised repository of voluntary post-marketing adverse drug event reports. However, there was still no common platform for drug standards or interoperable system in place. Computer software has found its place as a data management and analysis tool in pharmaceutical R&D.

Pharmaceutical Industry

The pharmaceutical industry is defined as the discovery, development, and manufacture of drugs and medications. It's widespread, including research, chemicals, and the regulation and involvement of government agencies. As well as driving medical progress by researching, developing, and bringing new medicines that improve health and quality of life for patients around the world, the pharmaceutical industry is a key asset to the global economy.

Software Used in the Pharmaceutical Industry

Nowadays, it is only possible to understand the complex processes and effectively and efficiently handle resources, money, and manpower due to computer software in the pharmaceutical sciences area. Computer software may assist in relieving medical professionals of daily documentation and other clerical duties, reducing errors and increasing accuracy in data transmission and storage, reducing the use of animals and chemicals, improving productivity and providing solutions for time-consuming manual tasks, developing uniform standards and continuing to monitor or transactions, and providing fast and direct access to various information via remotely located terminals. [(1) (10) (11) (12) (13)]

Software list

Werum PAS -XMES, ProcessPro, ProcessPro's Comprehensive Analytics and Reporting Software, BatchMaster ERP, Mar-Kov Chemical Management System, ResponsePro, MAXlife365.

Werum PAS-XMES

PAS-X is the market-leading MES (manufacturing execution system) for the pharma and biotech industries. It is used by more than half of the world's top 30 pharmaceutical and biotech companies, and it has over 1000 installations worldwide.This software is used to reduce the error rate and the manufacturing rate.

ProcessPro

ProcessPro offers a comprehensive ERP system with complete production, stock, and economic integration—a total system from the start of order entry to production and accounting. The programme addresses the essential batch processing needs involving on- and reverse-lot quality control and sophisticated procedures and ingredient management. The better integrated quality control functions remove the need to re-enter data, and the centralized database offers instant and reliable revenue, production, and inventory visibility in the company.

ProcessPro's comprehensive analytics and reporting software

ProcessPro offers a robust ERP solution with full manufacturing, inventory, and financial integration, developed as a complete system from beginning sales order entry through the manufacturing and accounting processes. ProcessPro incorporates the critical needs of batch processing manufacturers, which include lot control, compliance, and the management of complex formulas and recipes. Discover how we meet the unique needs of your industry.

BatchMaster ERP

BatchMaster Software offers cloud and on-premise software solutions for growing, mid-market recipe- and formula-based manufacturers. BatchMaster's Add-On Manufacturing application and ERP solution have been designed with

your industry's best business practises in mind to support your company's unique business requirements and processes. Built with industry-specific functionality, libraries, and templates, our experienced team is able to get your application up and running quickly and effectively, maximising your time to value.

Mar-Kov Chemical Management System
Mar-Kov CMS offers a manufacturing execution system, electronic batch recording, chemical inventory management, recipe and formulation management, laboratory information management, and equipment maintenance. The solution allows the recipe manager to add new products into the system for manual or automatic batch execution. Maintenance scheduling enforces routine maintenance in accordance with HACCP best practices.

ResponsePro
ResponsePro, from 2 M Technologies, Inc., is an ERP (enterprise resource planning) system for the pharmaceutical, medicinal, food, and chemical industries. Since 1987, 2 M has helped businesses get the most out of their investment in technology. offers you a competitive advantage to increase productivity and profitability. Publishing reports on safe websites, For faster action or entry, it has a powerful lookup capability for any inquiry or entry screen.

MAXLife
MAXLife software increases your visibility into product performance, resulting in better decisions and increased revenues and profits. It enables quality control and quality assurance processes to work together as part of the business system and to be transparently available for reviewing and reporting.

Clinical Trials
A clinical trial is any research study that prospectively assigns human participants or groups of humans to one or more health-related interventions to evaluate the effects on health outcomes. Often, a clinical trial is used to learn if a new treatment is more effective and/or has fewer harmful side effects than the standard treatment.

Software Used in Clinical Trials
The clinical data management system is widely used to manage the data that is collected during clinical trials. This system offers various comfortable methods via which the data can be collected, managed, and stored easily for further use. The use of various softwares in the clinical data management process has been discussed, depicting how the softwares perform various functions to keep the data in a managed, secured, and accessible form. The analysis and authorization of new pharmaceuticals are based upon the trust that clinical trials will intend to find the answers to the investigation's problems by providing clinical data that further proves or disproves a particular hypothesis. [3][9]

Software List [22]
Clinphone, VialPro, Siebel Clinical, Oracle Clinical, Parexel, eResearchTechnology, Nextrials.

Clinphone
ClinPhone Drug Accountability is a web-based solution that enables centralised management of the entire clinical trial supply chain. When combined with ClinPhone Trial Supply Management, it allows sponsors, sites, and depots to manage drug accountability, reconciliation, returns, and destruction activities. [4]

Vial ePRO
Electronic patient-reported outcomes are an electronic system that allows patients to directly report the status of their health condition. ePRO systems can be accessed through computers or mobile devices and may be in the form of electronic diaries or questionnaires. alerting to remind patients to input information. E-Diaries to allow patients to track daily data. Integrations with the rest of Vial's eClinical Suite and third-party vendors [8]

Siebel Clinical
The Siebel Clinical Trial Management System allows biotechnology companies, pharmaceutical companies, and CROs (clinical research organizations) to better manage the clinical trial process, maintain the quality of clinical trials, and manage investigator relationships. It provides a comprehensive set of tools for CRAs (clinical research associates), clinical investigators, and site coordinators and includes a personalised Internet portal to conduct study activities more efficiently. [23]

Oracle Clinical
The Oracle Clinical Software tool is used in clinical research. It is known that conducting research is a costly and time-consuming process as it requires extra human resources, many software tools, and thorough knowledge of software in clinical research. This particular software helps improve the trial's performance and reduces the cost to the company. [24]

Parexel:
Parexel International is an American provider of biopharmaceutical services. It conducts clinical trials on behalf of its pharmaceutical clients to expedite the drug approval process. It is the second-largest clinical research organisation in the world and has helped develop approximately 95% of the 200 top-selling biopharmaceuticals on the market today. [25]

eResearchTechnology:
eResearchTechnology provides global patient data collection solutions for use in clinical drug development. ERT delivers a combination of technology, services, and clinical consulting that increases the accuracy and reliability of patient data and improves the efficiency of the clinical development process. [26]

Nextrials
Nextrials' award-winning Prism melds sophisticated clinical trial management functionality with EDC in a single, integrated package. By receiving a constant flow of data, Prism enables sponsors and sites to fully utilise the real-time integration of disparate information and data sources, such as a hospital's EHR or patient records, to better provide a continuum of care for patients enrolled in clinical trials. [27]

Pharmacy Billing
Pharmacy billing refers to sending a prescription to the pharmacy, which then bills the patient's drug insurance and dispenses the medicine either directly to the patient or to the provider's office. Pharmacy billing can help automate the process of generating invoices and sending out reminders for order delivery. This shows that you care for your customers, resulting in increased loyalty and raised confidence in your pharmacy. Thus, it helps increase sales.

Software Used in Pharmacy Billing
Pharmacy billing software is a set of applications that streamlines the entire process of purchasing and refilling stocks, making payments, and managing customers' invoices. It helps in automating time-consuming processes like invoice generation, product tracking, and other accounting documentation. [2]

Software List
Liberty Software, Winpharm, PrimeRx, ECP eMAR, Primecare, PioneerRx, GoFrugal

Winpharm
Winpharm is one of the most popular pharmacy billing software options for pharmacies today. It has many features, including an intuitive user interface, so employees can start using it immediately. You can manage your business anywhere at any time with this cloud-based system. Some of the key features include automatic refills, barcode management, e-prescribing, and the attachment of electronic signatures.

GoFrugal
GoFrugal is a billing software for pharmacies that does all the hard work for you. The software allows you to easily bill patients (with or without insurance), print free coupons, and fax claims directly to insurance companies. With its robust multi-location pharmacy management software, you can control everything in your account, from inventory to business analytics and stock management.

Liberty Software
Liberty Software began as an independent computer service company serving the computer needs of community pharmacies across the South.

PrimeRx
PrimeRx offers a comprehensive solution that includes complete customer relationship management control from a single platform, acting as the pharmacy's backbone. It provides essential functions, including patient and provider

intake, prescription processing, workflow management, claims processing, labelling and dispensing, inventory management, and patient record management.

ECP eMAR
ECP eMAR is an electronic medication administration record solution that enables daycare centers, assisted living facilities, and pharmacies to streamline risk mitigation, document follow-ups, and medical charting, among other processes.

PrimeCare®
The PrimeCare® pharmacy management system is mindfully designed for long-term care pharmacies. Ideal for skilled nursing, hospice, group homes, assisted-living facilities, and combo shops, it provides time-saving and productivity-enhancing technology, including streamlined workflow and simplified billing and reporting. [28]

PioneerRx
PioneerRx offers the most advanced, customizable workflow, which gives pharmacists more time to focus on patient care and enhance clinical services. Having the best pharmacy software allows you to say yes to new opportunities as they arise and adapt your business for long-term success.

Pharmacovigilance
Pharmacovigilance is the pharmacological science relating to the detection, assessment, understanding, and prevention of adverse effects, particularly long- and short-term side effects of medicines. Generally speaking, pharmacovigilance is the science of collecting, monitoring, researching, assessing, and evaluating information from healthcare providers and patients on the adverse effects of medications, biological products, herbal remedies, and traditional medicines with a view to identifying new information about hazards associated with medicines and preventing harm to patients. Pharmacovigilance begins in the clinical stage and continues throughout the drug's product life cycle, which is primarily divided into pre-marketing (clinical phase) and post-marketing pharmacovigilance. [5]

Pharmaceutical Vigilance Software
Although patient safety is a major problem, most health care organisations rely on spontaneous reporting, which detects only a small minority of adverse events. As a result, problems with safety have remained hidden. Chart review can detect adverse events in research settings, but it is too expensive for routine use. Information technology techniques can detect some adverse events in a timely and cost-effective way, in some cases early enough to prevent patient harm. [6] [14] [15] [16] [29].

Software List
Oracle Argus Safety , ArisG , PvNET, repClinical, Vigilanz Dynamic Monitoring System, WebVDME, VigiFlow.

ArisG
ARISg forms a core component of an integrated pharmacovigilance and risk management system, enabling companies to monitor their products and identify safety risks proactively. ARISg helps speed up the management of adverse drug reactions with its configurable workflow and advanced automation features. Users can set up a system that meets their business process and standard operating procedure (SOP) requirements more efficiently by automating the routing of cases as defined in their workflow rules. As with all Aris Global products, ARISg is available in both on-premises and on-demand versions.

PvNET
PvNET is a comprehensive pharmacovigilance solution that goes beyond mere compliance. It is one of the leading software used in pharmacovigilance with adverse event reporting, adverse drug reaction (ADR) data management, and regulatory reporting of ICSRs (individual case safety reports).

repClinical
RepClinical is a secure web-based service that helps you manage critical pharmacovigilance activities in a timely and cost-effective manner. With repClinical, you can capture adverse event data, generate regulatory reports, and exchange ICSRs with multiple regulatory bodies and business partners. [7]

Oracle Argus Security
It is a comprehensive platform mainly used to fulfil the requirements of pharmacovigilance. Pharmacovigilance is currently dealing with issues such as an increase in the volume of cases, a complex business, the need to analyse safety data from disparate sources, and disparate data sources.As a result, it is intended to manage the needs.

Vigilanz Dynamic Monitoring System
VigiLanz' software is considered by thousands of users who depend on our technology to be best-in-class real-time pharmacovigilance and quality care management. With VigiLanz, clinicians perform in seconds what currently takes hours to complete manually and retrospectively, resulting in improved clinical outcomes and increased clinician productivity.

WebVDME
WebVDME is used by pharmaceutical and biotech companies as well as several regulatory agencies, many of which participated in the project as development or testing partners. Our goal with this release is to make the WebVDME product even more flexible and intuitive, so that safety evaluators and medical reviewers can easily investigate a signal in terms of the adverse events involved, assess the interactions of multiple drugs, and determine the influence of other characteristics in different combinations.

Vigiflow
It is your country's own national pharmacovigilance database, which supports the collection, processing, analysis, and sharing of ADR and AEFI reports.

Drug-Drug Interaction
A drug interaction is a reaction between two (or more) drugs or between a drug and a food, beverage, or supplement. Taking a drug while having certain medical conditions can also cause a drug interaction. For example, taking a nasal decongestant if you have high blood pressure may cause an unwanted reaction. Drug interactions involve combinations of a medication with other substances that alter the medication's effect on the body. This can cause the medication to be less or more potent than intended or result in unexpected side effects.

Drug-Drug Interaction Software [17, 18]
Several electronic databases that report the prevalence of drug-drug interactions (DDIs) are used as tools for the evaluation of potentially harmful DDIs. The most commonly used software in the included studies was Micromedex® Drug-Reax, for which some authors argue that it is the most reliable due to its high sensitivity. It gives information about the clinical consequences of DDIs, classifies the underlying mechanisms and onset of the adverse outcome (either rapid or delayed) as well as severity (such as minor, moderate, or major), and provides the level of evidence that supports this information.

Software List [19] [20]
Micromedex, ePocrates, Medscape, iFacts, Lexi-Interact

Micromedex [21]
Designed specifically for point-of-care clinicians, the IBM Micromedex® browser-based interface is intuitive and easy-to-use, providing quick access to evidence-based content at any point in the patient care process. Micromedex understands clinicians need common questions answered quickly and accurately to provide the best patient care possible. In designing the next generation of Micromedex, we listened to the needs of you, our customers.

Epocrates [30][31]
Epocrates is a well-known web service and mobile application used by healthcare professionals. The service initially gained popularity as a pharmacology reference but has more recently expanded to include a variety of medical reference materials.

Lexi- Interact
The Interactions tool is accessed via the blue tool bar at the top of the screen. This drug and herbal interaction analysis tool is designed to identify potential drug-drug interactions, drug-allergy interactions, and duplicate therapy interactions. Begin by entering the list of medications and known drug allergies to be analyzed. The interactions tool allows users to enter medications (both prescription and over-the-counter), natural products, foods, and/or alcohol.

Medscape

Medscape draws on periodical literature by connecting to MEDLINE. Medscape supports keyword and Boolean searching and some advanced search functions, such as proximity, for in-app searching of MEDLINE. A convenient additional feature is that MEDLINE references in Medscape can be exported directly to a variety of citation management programs. [32]

Conclusion:-

Our review concluded that computer software has created a significant role in the pharmaceutical industry, pharmacy billing, and herbal industry. The software performs various safety functions, supplies on-screen access to pertinent drug and patient information, manages data, and assists in the product formulation process. The programmed safeguards can be modified to meet changing requirements.With the advances in software technology, applications lead to the structural analysis and management of biological information, which is useful for the exploration of biological processes with the aim of enriching the healthcare sector. The computer software and programmes aid in reducing manufacturing costs, manufacturing errors, medical errors, and clinical errors.

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