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A REVIEW ON ARTIFICIAL INTELLIGENCE IN PHARMACOVIGILANCE CURRENT TRENDS AND FUTURE PROSPECTIVE

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ABSTRACT
The application of Artificial Intelligence (A.I.) in healthcare has led to significant advancements and transformative developments in various areas. Medical imaging and diagnostics benefit from A.I.'s ability to analyze and interpret complex imaging data, enabling more accurate and timely diagnoses. AI-driven disease prediction and risk assessment models aid in identifying potential health risks early, enabling proactive interventions and preventive measures. Additionally, A.I.'s involvement in drug discovery and development accelerates the search for new medications and treatment options, promising advancements in the pharmaceutical industry.

KEYWORD: *Artificial Intelligence, healthcare management, technology Evolution, Advantages and Disadvantages.*

INTRODUCTION

- The fourth edition of Introduction to Health Care Management is driven by our continuing desire to have an excel- lent text that meets the needs of the health care management field, health care management educators, and students enrolled in health care management programs around the world.
- The inspiration for the first edition of this book came over a good cup of coffee and a deep- seated unhappiness with the texts available in 2004. For this edition, many of the same master teachers and researchers with expertise in each topic revised and updated their chapters. A third editor, Bobbie Kite, joined the Buch- binder/Shanks team for this new edition in an effort to bring greater knowledge of several increasingly important areas in the health field, bringing expertise in health information systems & population health.
- Several other new contributors stepped forward to revise several chapters and write completely new cases for this text. This was the result of our listening to you, our readers and users. With a track record of more than 12 years in the field, we learned exactly what did or did not work in the class- rooms and online, so we further enhanced and refined our student & professor friendly.

ARTIFICIAL INTELLIGENCE

❖ **Background**

- AI is a branch of computer science. AI system contains a database of facts and uses an algorithm to make machines to imitate human behavior that requires understanding, creative composition, speech recognition, and decision-making.
- The machine acquires human intelligence by learning and training using a huge volume of robust datasets, just like a child learns from teaching and training from the environment and becomes an intelligent human being. [02]
- The new technology entails deep learning and natural language processing techniques having neural networks (like neurons in the human brain) to teach computers to process data like the human brain to solve a given problem that requires human understanding and reasoning.
- Interestingly, the computer creates an expert algorithm that has the ability to read structured and unstructured text, extract information from free text, and recognize simple and complex patterns in pictures and text to produce accurate insights to interpret images and predict medicine safety issues. [03]
- Fundamentally, the predictions by these machines are based on the training datasets and models that determine the performance and outcome of AI. Remarkable success has been achieved by AI in medical specialties that depend on the interpretation of images such as radiology, ophthalmology, and pathology

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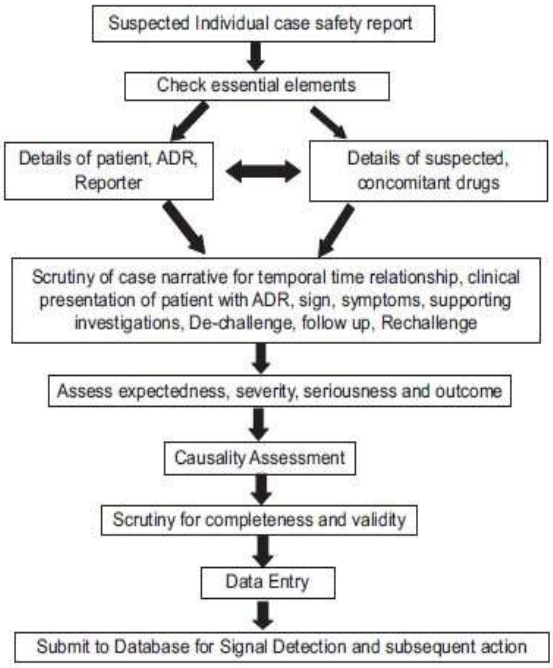


Figure 2: Individual case safety report case processing and evaluation in pharmacovigilance. ICSR = Individual case safety report, ADR = Adverse drug reaction

Fundamentals of Pharmacovigilance

- Pharmacovigilance is the process of keeping an eye on the safety of all medications, including biological agents, vaccines, and herbal and complementary therapies. The research and practices around the identification, evaluation, comprehension, and avoidance of side effects or any other medication-related issue are known as pharmacovigilance.

Objectives of Pharmacovigilance

- To maintain patient safety by keeping an eye out for adverse drug responses and reducing medicationrelated damage.
- To assist in maintaining public health by recognising and mitigating possible hazards linked to medication usage.
- To assess how well drugs balance their advantages and disadvantages in order to maximise their use and encourage wise decision-making.
- To optimise treatment results while lowering hazards, encourage the sensible and economical use of medications.
- To improve knowledge and proficiency in medication safety monitoring and reporting, healthcare professionals and the general public should be given more opportunities to comprehend, learn about, and receive training in pharmacovigilance techniques.

IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE TOOLS IN PHARMACOVIGILANCE

- **Opportunities and benefits:**

- The AI tool has been proposed to be beneficial for the manual repetitive and routine task of data entry, identifying AE, drug–drug interactions, subtle data patterns, and review of single cases.
- In addition, AI can convert the unstructured, free-text format of drug safety data and hand-written documents into machine-readable format.
- Further, the tool can automate the Medical Dictionary for Regulatory Activities coding, check duplicate reports, categorize reports into physician or consumer reports, identify serious reports, and exclude nonserious reports.
- Interestingly, the AI platform can also analyze unstructured data, extract the text, and identify relevant information to build clinically robust auto-narratives and identify patterns within structured and unstructured narratives, refuting the need for routine review of single cases and manual identification and validation of signals.
- Furthermore, it can extract ICSR information from various published documents such as medical literature, case reports, medication reviews in social media, free-text clinical notes in electronic health records, and discharge summaries.

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AI IN HEALTH CARE PV

- In PV, AI/ML has the potential to impact, and is being explored across, the entire lifecycle. Broadly ML in PV can be grouped into three areas: data ingestion-related tasks, signal detection activities and, thirdly, other applications.
- AI/ML has been shown to be useful for multiple aspects of data ingestion (case intake or processing), such as duplicate detection, anomaly identification as an orthogonal approach to quality assurance and for assessment of reported causality in individual case safety reports (ICSRs).
- At a later stage in the PV lifecycle, ML has been explored and used for signal detection and analysis. Basic ML, in the form of association rule analysis, which is referred to as disproportionality analysis in PV, has been used routinely since the late 1990s for quantitative alerting of specific drug/vaccine-event pairs for clinical review.



AI Revolutionizing Healthcare: Advancements, Applications, and Impact:

- Artificial intelligence (AI) is becoming more and more adept at performing tasks that humans do, but faster, cheaper, and more effectively. AI has enormous promise in the medical field. AI is progressively becoming a part of our healthcare ecosystem, just like it is in our daily lives. The combination of AI's many subdomains has sparked notable advancements and creative concepts in this dynamic context, which are transforming healthcare delivery systems worldwide.
- A key piece of technology in the healthcare industry, machine learning (ML) uses statistical models and algorithms to evaluate vast amounts of medical data and draw insightful conclusions10. By predicting patient outcomes, spotting illness trends, and streamlining treatment plans using individualized patient data, machine learning (ML) algorithms enable healthcare systems to improve clinical decision-making.
- A powerful branch of machine learning called deep learning has shown impressive results in deciphering complicated medical imaging data, including CT, MRI, and Xray images. Radiologists and other healthcare professionals can better diagnose and plan treatments for diseases including cancer, cardiovascular disease, and neurological disorders by using deep neural networks, which provide accurate and efficient detection of abnormalities and diseases.

Advantages of Balanced AI and Healthcare:

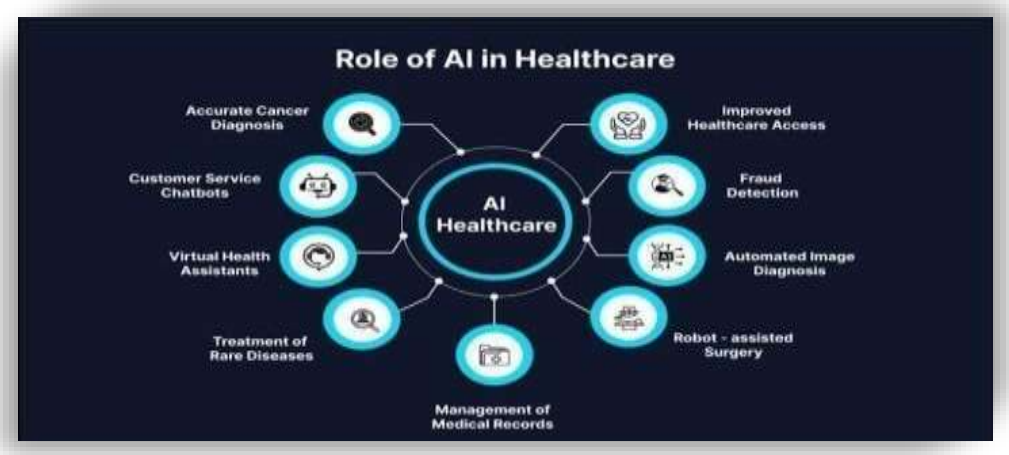
- **Enhanced Diagnosis:** Through pattern recognition and advanced data analyzing the capability of artificial intelligence diagnosis become accurate and less time-consuming.

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- **Customized Treatment:** According to the needs and characteristics of patients treatment plans will be customized with the help of AI algorithms.
- **Elaborated Patients Results:** patients results will be better and improve with.
- **Organized work:** with the help of advanced technologies and Al-driven healthcare professionals streamlined workflows take less time, in this way. Professionals communicate with patients without any time constrains.
- **Access increase:** underserved areas as well as remote areas, bo
- th get telemedicine and virtual treatment with the help of artificial intelligence. Al extended medical facilities all over the work.
- **Prognostic Analytics:** Predictions of diseases are in progress with the help.

Disadvantages of balanced AI and healthcare

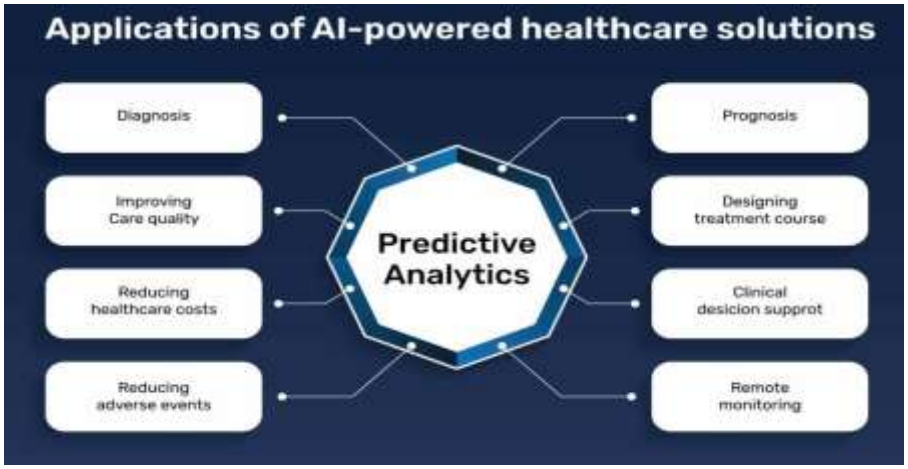
- **Concerns with Privacy of Data:** There is sensitive information or medical history of patients so data privacy is one of the important concerns with artificial intelligence.
- **Biasness in Algorithms:** Baise in the algorithm is dangerous for the patient because it leads to inaccuracy of diagnosis and many more things effects from it. So, it is a big disadvantage for health care professionals and patients too.
- **Limited Access on healthcare facilities:** Some of the healthcare centers do not have advanced treatments or some machineries are there but there by a lack of skills. So it affects the healthcare centers and patients too.
- **Costing of Treatments**: Due to these advanced terminologies and techniques. These things are expensive for the patients and they can't avail the facility.



Need of AI in the healthcare:

- Al in field of Pharmacy It is one of the top technologies shaping the future of pharmacy. Pharma industries has been developing cure & treatment for centuries. Traditionally the design & manufacturing of drug requires several years, lengthy clinical trials & huge costs with the rise of 21st century technologies, this has been changing.
- In future we will see completely different drug designs, manufacture &clinical trials. Collaboration between pharma and Al companies: The future of Al in pharma will depend on collaboration between pharmaceutical companies and Al technology providers. Partnerships between these two sectors can help to accelerate the development and adoption of Al technologies in the pharmaceutical industry.

- **Application of AI healthcare**



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- **Disease Identification:** Berg, an innovative US bio-pharma company, is using Al to research and develop diagnostics and therapeutics in the fields of oncology, endocrinology, and neurology. Their unique Al-based Interrogative Biology platform combines patient biology and Al- based analytics to identify differences between healthy and disease environments
- **Radiology and Radiotherapy**: This is an area in which Al has been speculated to play a major role in the future Presently, Google's Deep Mind Health is working on machine learning algorithms to detect differences between healthy and cancerous tissues.
- **Clinical trial Research:** Advanced predictive analytics can analyze genetic information to identify the appropriate patient population for a trial. Artificial Intelligence can also determine the optimal sample sizes for increased efficiency and reduce data errors such as duplicate entries.
- **Drug discovery:** A study published by the Massachusetts Institute of Technology (MIT) has found that only 13.8% of drugs successfully pass clinical trials.

Drawbacks

- **Data Collection Concern**:

The first problem is the inaccessibility of relevant data. The healthcare business has a complex issue with information accessibility. Because patient records are often regarded as confidential, there is a natural reluctance among institutions to exchange health data.

- **Algorithms Developments Concern**:

Potentially distorted outcomes might be the consequence of biases in the data collection processes used to inform model development. For instance, underrepresentation of minorities as a consequence of racial biases in dataset Development might lead to subpar prediction results.

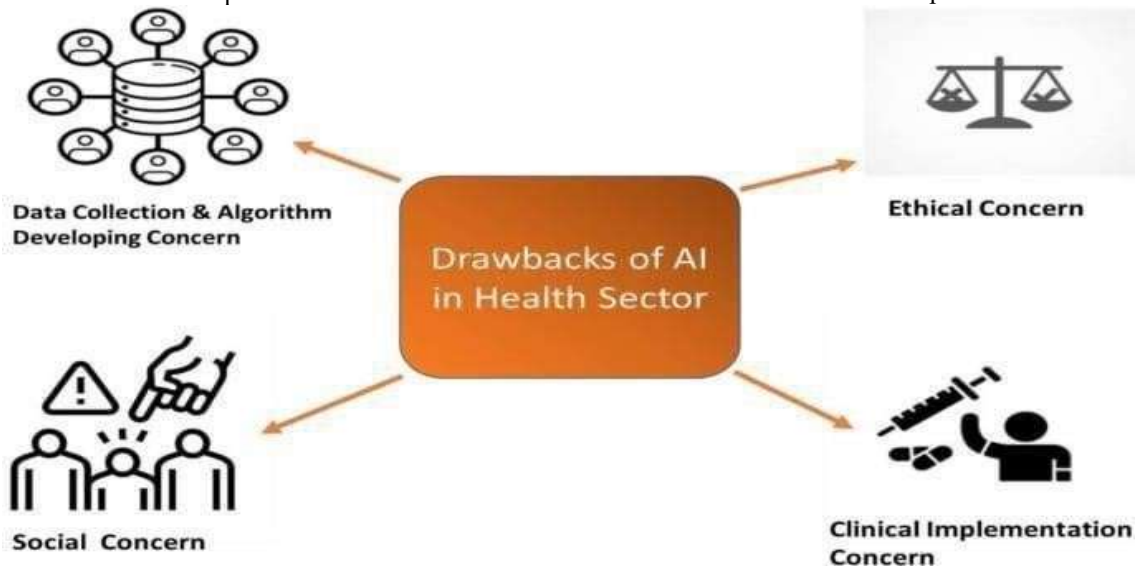
- **Ethical Concerns**:

Artificial intelligence has had ethical concerns raised about it ever since it was first conceived. The main problem is accountability, not the data privacy and security issues previously noted. Because of the gravity of the consequences, the current system requires that someone be held accountable when poor decisions are made, especially in the medical field.

Drawbacks

Clinical Implementation Concerns:

- Lack of empirical data validating the effectiveness of Al-based medications in planned clinical trials is them ain obstacle to successful deployment.
- Most research on AI's application has been conducted in the business setting; thus, lack information on how it affects the final results for patients.



CONCLUSION

- A Review on Artificial Intelligence in Healthcare Management and Drug Discovery In conclusion, the integration of Artificial Intelligence (AI) into healthcare management and drug discovery holds transformative potential for the medical field.
- Al has already demonstrated significant improvements in areas such as personalized medicine, diagnostic accuracy, predictive analytics, and operational efficiency in healthcare settings.
- By automating routine tasks, analyzing complex datasets, and offering novel insights, Al supports clinicians in making more informed decisions and optimizing treatment plans for patients.

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