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Scope of Artificial Intelligence in Medicine

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ABSTRACT

Artificial Intelligence concept is becoming popular in search engines, voice recognition Softwares, biometric recognition Softwares, automatic vehicles, healthcare electronic device. With the assistance of Artificial Intelligence, clinicians can sort out the relevant information about the management of a disease in order to take right decisions. Moreover, clinicians could consult e-books, websites, e-journals for collecting updated information. As technology is evolving day by day, Medical researchers also use this technology in setting up appropriate modalities and algorithm for several diseases.

Artificial Intelligence methods excel at recognizing tumours at early stages, complex images, exact pathologies behind several disease and tumors. AI also reserved its importance in robotics, by which several complicated surgeries can be performed easily. Here, we also explore the emerging potential of Artificial Intelligence in research, in which, AI can extract the relevant information from huge data towards taking perfect clinical decision in healthcare system. Artificial Intelligence has got its application in several branches of medicine. In this review, we tried to establish a general understanding and scope of Artificial Intelligence in medicine.

Key words: Artificial intelligence, Machine learning, Algorithm, Deep learning, Computer aided diagnosis, Automated computer diagnosis

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INTRODUCTION

Artificial Intelligence (AI), first proposed by Professor John McCarthy in 1955, direct to reproduce human intelligence using computers and other electronic devices [1]. The concept of Computer Aided Diagnosis (CAD) was introduced in 1980. Its primary intention was to provide second opinion to radiologists [2]. CAD is strongly related to Artificial Intelligence (AI). CAD and automated computer diagnosis (ACD) are two concepts with different meanings [3].

AI concept has become tremendously popular in recent years, as this concept has empowered search engines, automatic vehicles, voice recognition software's etc. have mesmerized our daily lives. Moreover, AI also gets importance and shows great promise in improvement of research quality, practice efficacy, personalized patient management, drug effects etc. [4,5].

Artificial Intelligence has revolutionized the medical world and can be commonly regarded as the component of computer sciences, that's is able to handle huge data easily with little theory [6]. AI-powered medical technologies enable a 4P model of medicine, that is predictive, preventive, personalized, participatory [7]. Smartphones are filling the gap and distribute the electronic personal health record [8], helping patients for

monitoring vital functions with biosensors and to reach optimal therapeutic compliance [9,10]. AI techniques can help the clinicians to sort out clinically relevant information from massive amount of data, so that clinicians can take decisions easily and appropriately. Additionally, AI can assist the researchers to analyses huge clinical data within a short time, in order to make the healthcare facility successful [11-13].

In other words, Artificial Intelligence also assist physicians by giving them updated information from journals, websites, e-books about clinical practice. Simultaneously, Artificial Intelligence System can minimize the diagnostic and therapeutic errors, which are inevitable to avoid. With real time reference, as technology moving ahead, Artificial Intelligence filters key information from gigantic population data to make prior health risk alert and therapeutic outcome predictions [13-17].

CURRENT APPLICATIONS OF ARTIFICIAL INTELLIGENCE (AI) IN MEDICINE

AI is becoming the main constituent of health care, including drug discovery, remote patient monitoring, medical diagnostics, medical imaging, virtual assistance, hospital management and risk assessment and management. Many branches of medicine dealing with huge data such as analysis of DNA and RNA sequencing, imaging data including radiology, pathology, dermatology and ophthalmology, have already benefitted from Artificial Intelligence implementations [18-20]. Pathologists have utilized Artificial Intelligence to decrease their error rate in the recognition of cancer- positive lymph nodes from 3.4% to 0.5% [21]. Additionally, Artificial Intelligence improved the outcomes in the field of surgery and radio-diagnosis for improved identification of high risk patients, also reduced the rate of lumpectomy by 30% in patients whose breast needle biopsies are considered high risk lesions but finally found to be benign after surgical excision [22].

Recently, Bhandari et al. reported that the progress in cloud computing, big data analytics and AI have led to evolution of more intelligent robots and subsequently with the application of deep learning, several surgical companies are collaborating with tech Companies for developing intelligent robots. There is huge development in the field of autonomous robotics. However, the role of robotics in operation theatre remains hazy. It is time, when surgeons actively take part in development of next generation smart and intelligent robots [23].

The primary aim behind the emergence of Artificial Intelligence in radiodiagnosis is because of greater efficacy and efficiency in clinical outcome & clinical settings. Patrick et al. also reported that Magnetic Resonance Imaging (MRI) is an effective modality in the selecting the patients suitable for arthroscopy from a general population [24]. Google launched its Deep mind Health project, which is used to collect the data of medical records for efficient health services. In 2016, they also launched a cooperative project with Moorefield's Eye Hospital NHS Foundation Trust to improve eye treatment [25]. Some other companies also there, who are using artificial intelligence to improve health care outcome mentioned in Table 1.

Study reported that AI and Machine Learning can be used in the diagnosis of interstitial lung disease and few studies also reported about interpretation of images on chest X-ray and diagnosis of bronchial asthma. Despite, ML may be helpful in making clinical decisions, can't replace the expertise completely [26].

Table 1: Shows List of companies using AI to improve outcome in health services.

Name of Company	Description
IBM Watson Health	Explore data and analytics
Cerner	Can discover hidden trends in healthcare data
Health Catalyst	Its products can withstand with any IT environment present, and applicable to meet future needs in data analytics
Health EC	This company process over 40 million claims annually, also providing services to more than 425,000 patients covered under value- based reimbursement models.
Epic	It currently has data 0f 190 million patients in order to run health care more efficiently.
Amitech	The company can proceed through a comprehensive strategy in order to monitor outcomes, reduce cost, and provide better patient experience.
Conifer health solutions	Can access clinical and administrative data from several sources, which provides clients simple access to hospital admission data, predictive analytics, population on risk and referral data.
Prognos	Prognos uses both diagnostic expertise and AI. This company improves quality and uniformity in data and realise the import EC of clients in health industry.

Importantly, Nick identified 16 review studies related with AI applications in acute stroke diagnosis and added that stroke onset timing, core and penumbral volume, clinical examination may be combined for exact detection of LVO (Large vessel occlusion) in order to enhance the patient selection for a rapid thrombectomy [27].

Applications of Artificial Intelligence have also shown importance in prediction of development of Alzheimer's disease from positron emission tomography [28], detecting cancers in mammograms [29], analyzing CT scans [30,31], identifying brain tumor lesions Magnetic resonance imaging [32], detecting Arrhythmias [33], identification of cancerous skin lesions [34,35], assessment of embryo quality for maximizing the success chances of in vitro fertilization [36], interpretation of retinal imaging [37], improvement in genomic expression [38] etc.

Commonly, Outcomes of most of the orthopedic surgeries are uncertain, because even after success full surgeries, surgeons can't avoid inevitable complications such as malunion, implant failure, surgical wound infections, Heterotopic ossification, spinal trauma & hematoma in Artificial Cervical Disc Replacement (ACDR), etc. Another study concluded that in case of pilon fracture management, no single method or approach can be regarded as ideal for the treatment of pilon fracture, even surgeon's skills and choice also matter a lot in the outcome of surgery. Therefore, we need to implement stem cell regenerative medicine (SCRM) in place of surgeries. We can regenerate several damaged tissues, tendons, cartilages, muscles, etc. [39-42]. In this scenario, AI techniques could be used for optimization of stem cell therapy and gene therapy in Pediatric patients by predicting clinical outcomes, simplifying cost and treatment [43]. In near future, hopefully researchers can implement the same in all branches of medicine.

Limitation of artificial intelligence

Artificial Intelligence also has its own limitations, as forecasting and predictions about outcomes of therapeutics may be wrong in novel cases of viral infections (e.g. Novel corona virus infection or COVID -19, recently we have limited information about behavior of this virus and definitive treatment modalities), novel side effects or resistant cases, newly reported side effects, rare disease, novel modalities of treatment, where there is no prior information for therapeutics, diagnosis, prognosis and outcomes. Obviously, in the lack of information, AI may not replace human knowledge and human brain reasoning power [44]. Telemedicine is filling the gap between Multispeciality hospital and Primary health care units, where Surgeons and super specialist can give relevant suggestions and diagnosis online, but they can't provide surgical treatment online.

CONCLUSION

Artificial Intelligence is expanding its roots in several branches of medicine, such as radiology, pathology, oncology, surgery, etc. As technology evolves, Artificial Intelligence also able to change the decision of Surgeons and Physicians. Additionally, healthcare professional able to keep themselves safe in the era of pandemic (COVID -19), with well programmed robots, which can scan the patient's vital sign without coming into direct contact with them. Last but not the least, huge clinical evaluation is essential for ensuring the efficiency, accuracy and safety of Artificial Intelligence.

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