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# Transforming Health Care with Artificial Intelligence

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**Abstract**

*Artificial Intelligence (AI) is the use of machines, especially computers, to act intelligently without much human interference. AI is basically accepted as coming into existence with the development of robots. The term robot derives from the word robata, that means use of biosynthetic machines as forced labor. Now a days, AI is spreading its arms in the medical field by use of robotic-assisted surgery, for complex urologic and gynecologic procedures. The stage for this innovation was set by robotic sketchbooks of DaVinci's. AI, defined as the scientific and engineering innovation of constructing intelligent machines officially came into existence in 1956. This term includes a broad range of items in medicine such as robotics, medical diagnosis, medical statistics, and human biology. This paper focuses on use of AI in medicinal drugs, that has two main branches: virtual and physical. The virtual branch involves the use of informatics approaches of deep learning information management, to have a control on health management systems, in terms of electronic health records, and active guidance to physicians in their treatment decisions. The physical branch refers to the use of robots to assist the elderly patient or to attend the surgeon. Moreover, targeted nanorobots, a unique new drug delivery system is also included in this branch. Apart from this, the societal and ethical complexities of these applications that require further reflection, proof of their medical utility, economic value, and development of interdisciplinary strategies for their wider application are also included in this research paper.*

## INTRODUCTION

Artificial intelligence (AI) came into existence with the invention and application of robots. Karel Capel (1921) introduced the word robot, in his literature Rosum's Universal Robots (RUR)'' that was derived from Czech word robot a. The book RUR was about a factory that used biosynthetic machines asforced labor. Towards end of last century Isaac Asimov honored the word "robot" in a great collection of short stories about modern science-fiction. However, Yan Shiwas first mechanical engineer of China who introduced humanoid automaton, in third century by presenting a human shaped figure of leather, wood and artificial organs to the Emperor Mu of Zhou. In the 12th century, a Muslim golden age scholar, al-Jazari created a humanoid robot that was able to strike cymbals.[9] Also, Leonardo da Vinci reported a detailed study of human anatomy to design his humanoid robot during Renaissance period. Leonardo's reported robot was operated by pulleys and cables to stand-up, sit-down, wave arms and move head and jaw. Da Vinci's sketchbooks were not only an indicator of his accomplishment in this area but were also a source of inspiration for the scientists working at NASA to give birth to the robotic era. Tohonor DaVinci's innovation, a surgical system constructed by an American

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company, was named Da Vinci. Food and Drug Administration (FDA) approved this intuitive surgical system in 2000, and at present more than5000units of this system are operating around the world. This remarkable surgical system facilitates highly complicated surgery using a minimally invasive surgical approach and can be handled by a surgeon from anywhere. This system is generally preferred for gynecologic surgical procedures. It is also used for cardiac valve repair. In eighteenth century, French inventor Jacques de Vaucanson, brought revolution inhuman world by introducing the first robot, playing repertoire of 12 songs on flute. Later in 1948, William Gray Water became popular for the fabrication of the first electronic autonomous robot, to whom he named Machina Speculator that was introduced to represent human brain functioning.

It depicted that the connections between a small number of "brain cells "could give birth to large scale complex behaviors. The term ``artificial intelligence" was defined by John McCarthy in 1955, defining as "the science and engineering of inventing intelligent machines". He was very inspiring in the early development of AI. In 1956 he founded AI at a Dartmouth College conference on artificial intelligence. The conference leads to a new interdisciplinary research area. After this conference computers started to solve many complex mathematical problems that soon became an area of interest to the Department of Defense of the USA. Then, after a slowdown period of the 80's, a new golden era of artificial intelligence restarted with the use of machines in logistic data mining and medical diagnosis. New instruments were developed that had high computational power. This new capability enabled Big Blue to beat the world Chess champion, Gary Kasparov finally on May11, 1997.

Today, AI refers to a special branch of engineering that implements novel concepts and novel solutions to resolve real world complex challenges. With continued progress in electronic speed, capacity, and software programming, the day is not far away when the computers might be as intelligent as a m a n . The significant contribution of contemporary cybernetics to the development of AI can never be neglected. Cybernetic sisatrans- disciplinary approach that aims at control of any system using technology that explores system regulation, structure and constraints. The origin of cybernetics is attributed to Norbert Wiener (1948),[14] who reported feedback, with implications for engineering, systems control, computer science, biology, neuroscience, philosophy, and the organization of society. Systems theory, sociology, neuropsychology and cognitive psychology, and theory of organizations, are the most influenced field by cybernetics.

Today literature on engineering and science is rich with AI. AI was represented as a possible threat to the world economy during the 2015 economic forum held at Davos,[15] where Stephen Hawking even voted against AI by saying that it may kill humanity one day. The focus of the present paper is on the role of AI in medicine and health systems.

**Artificial Intelligence in Health Care: Virtual Branch**

The virtual branch of AI is termed Deep learning or Machine Learning, that involves the representation of real-world problems by mathematical algorithms that improve learning through experience. There are three types of deep learning mathematical algorithms: (i) unsupervised (ability to find patterns), (ii) supervised (classification and prediction algorithms based on previous examples), and (iii) reinforcement learning (use of sequences of rewards and punishments to form a strategy for operation in a specific problem space). First, AI has boosted and is still boosting discoveries in genetics and molecular medicine by providing machine learning algorithms and knowledge management. Rapakoulia et al. (2014) pointed out in his studies that novel computation al methodology can identify DNA variants such as single nucleotide polymorphisms (SNPs) as predictors of diseases or traits, using novel evolutionary embedded algorithms that are more robust and less prone to over- fitting issues that occur when a model has too many parameters relative to the number of observations [11]. The ofilatos et al. (2015) reported successes of unsupervised protein interaction algorithms in medicines that result in novel therapeutic target discoveries. The methodology followed in this algorithm was a combination of adaptive evolutionary algorithms and state-of-the-art clustering methods, that was named as

 

evolutionary enhanced Markov clustering".[13]

Today's health care systems do not only focus on the classical interactions between patients and doctors but also take larger-scale organizations and cycles into consideration. Apart from this, instead of being stagnant by the existing approaches this system is learning from its own experiences and implementing great improvements. This is a multi-agent system (MAS), where the assets of agents situated in a common environment interact with each other. This process involves building or participating in an organization, which uses AI to achieve significant progress. An example of such a process in medicinal environment is the development of problematically complex ecosystems to treat chronic mental diseases (Silverman et al. (2015)).[5][12] Responses of individual patients to received medicines and their behavior interactions to the society are more important to MAS approach than issues of health expenditures and recovery cost. "This global care coordination technology allows process mapping, facilitates control, and better supports changes to the system with a demonstrated increase in response to medication, decrease of costs and more efficacious interventions. Its implementation has allowed health systems managers to analyze the dynamics of system performance across changes in social, medical and criminal justice components" reported by Kalton et al. (2016).

As reported by Bartigis et al. (2016) use of soft bots as psychotherapeutic avatars is virtual application of AI in medicine.[1] see below in figure 1. The use of emotionally sensitive teachable avatars is receiving recognition in medicine as it has been applied to pain control in children with cancer (called "pain body") and is able to detect early emotional disturbances in youngsters in native American reservations, including suicidal tendency. This approach seems to work better than human interventions. One of the clearest examples is the control of paranoid hallucinations when the subject designs his own avatar representing the persecutor in his mind. The systemin courage's the subject to engage in discussions with his persecutor who progressively learns to moderate such destructive behavior. Initial successes with this technology have been demonstrated by the achievement of a lower level of hallucinations and vocal threats. Perhaps the most use subfunction will be in care of the elderly, where the frequency, reassuring nature, and kindness of what is said are all important elements of improved communication. Pouke and Hakkilla (2013) reported that Avatars have been also applied to homecare, and for biological and physical monitoring with three Division.[10]

**Fig. 1 Artificial Intelligence in Medicine**

 

One example of virtual existence of AI in healthcare practices is the issue of electronic medical records where specific algorithms are implemented to identify subjects with a family history of an inborn disease or risk of getting caught by a chronic disease (fig 1.) AI plays tremendous role in improving performance of an organization by enabling members to get, share and implement their collective knowledge to take optimum decisions in right time Therefore, electronic medical records and healthcare process management are desirable to achieve the best quality. From current patients' record keeping of variable quality, details need to be organized in a digital format that would always be accessible as individual data as well as in aggregated forms for epidemic logical research and planning. Process flow of virtual existence of AI in healthcare practices is shown in figure 2.

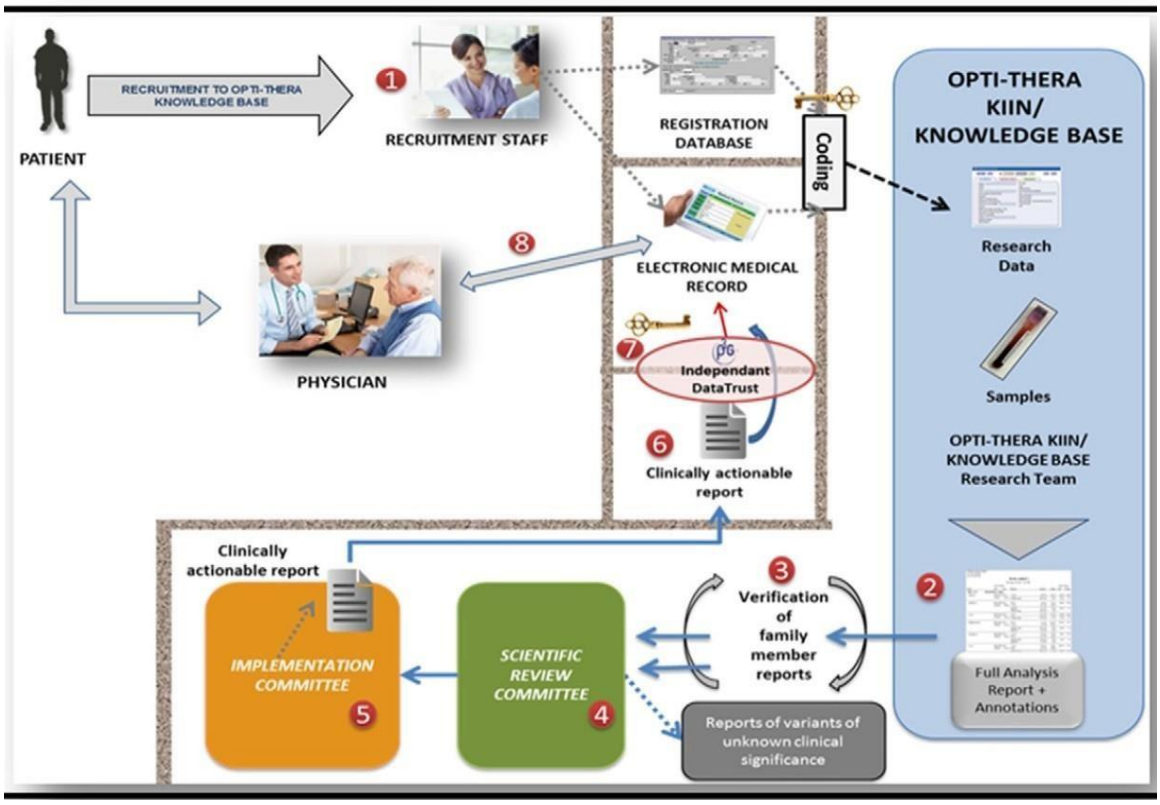


**Fig. 2 An example of virtual existence of AI in healthcare practices**

## Artificial Intelligence in Medicine: Physical Branch

The physical approach of application of artificial intelligence in health care activities involves physical objects, medical equipment's and existence of advanced robots ready to be a part in the delivery of care (Comet (2013)).[2][4] In the modern era use of robots as helpers during surgery is the most promising approach. Additionally, a robot companion for old people with declined bodies or limited mobility is admirable. Japanese care bots are the most advanced forms of this technology (Larson et al. (2014)) [7]. See in below figure 3.

**Fig. 3 Artificial intelligence in various branches of medicine**

## Applications of Artificial Intelligence to Test Effectiveness of Treatment

Robots play a remarkable role in the evaluation of changes that occur in human performance in many situations such as recuperation. To monitor the guided delivery of drugs to the targeted organs, tissues or carcinoma is another area of application of AI in medicinal branch. For instance, in the present era scientists are working on designing nanorobots that can identify and overcome drug delivery problems that arise when therapeutic agents fail to get diffused into the targeted

 

site of human body. This problem generally encounters when the provider is trying to target the core of a tumor tends that is less vascularized, anoxic, however excessively active. As reported by Hamet and Tremblay to overcome short comings of mechanical or radioactive robotics, researchers have utilized a natural agent with desired features in place of nanoparticles alone. To meet the target, they are emphasizing Magneto coccus marinus which moves continuously to low oxygenated regions inside the body. Under this technology, an agent is guided initially by a n outer magnetic source and then inherent characteristics of nanorobots are put into action. Studies of Felfaul (2014) pointed out the data that reported a significant increase in the gradient of desired drug into the tomour [3] regions.

AI plays an important role in the health care area however human computer interactions need to be studied to get more desirable results. Moshimo Mori (1970) introduced the notion of uncanny valley in which an important theme is the human– robot interaction (HRI) field.[8] In these studies, humanoid robots were evaluated for their apparent humanity, eeriness and attractiveness as factors making perception of robots either acceptable, feared or rejected.

## CONCLUSION

In the modern world there is a vast variety of AI techniques available that can solve different kinds of clinical problems. However, despite this fact that AI can help human practitioners in solving health related complicated problems at very early stage, medical AI technology has not been embraced with enthusiasm by everyone. One main reason behind such a situation is the attitude of the clinicians towards this technology being used in the decision-making process. On contrary, there is no doubt in going with the biochemical results generated from an auto-analyzer or images produced by magnetic resonance imaging. However, researchers who are active in this field put obligation that these techniques cannot successfully work on a practical eve land can harm humanity. Therefore, there is a need to undertake

More randomized controlled studies in favor of AI, to prove the efficiency of AI systems in medicine and healthcare practices.

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