# Artificial intelligence in medicine

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Abstract

As Artificial Intelligence grows it will keep changing the way healthcare providers, physicians, radiologist, and their patients live from day to day. Considering the capabilities and realistic opportunities that A. I. could have in medicine takes weighing all of the factors that would go into implementing Artificial Intelligence in various types of practices. The name of the game is change and if doctors are willing to accept it,  it would jumpstart the impact Artificial Intelligence could have in hospitals and clinics and how it could change the scene of patient care, diagnosis through imaging, and treatment with smaller than ever organisms that will affect everyone.

Could you imagine microscopic robots inside your body alerting your smartphone if you were about to get sick? Maybe not so realistic yet, but how about with just the scan of your eye doctors could tell how at risk you are for heart disease? Still far fetched? Well actually, not so far as one may think. New bounds and innovations in Artificial Intelligence will allow the medical field to make improvements in patient care, diagnosis through imaging, and treatment.

Artificial Intelligence or sometimes referred to as Machine Intelligence is a general term that means to accomplish a task solely by computer with a very limited amount of human work (Bo-Jie, Hu 2018). By constructing a computer program that uses experience and algorithms to update itself, it creates an feigned system that mimics the way humans think to improve our work efficiency by taking care of tasks one would otherwise be doing. As of now, in

the early stages of development Artificial Intelligence has mixed views, but by 2030 A. I. is expected to play a huge role in medicine.

The possibilities are endless when it comes to what A. I could be implemented to in all aspects of the medical scene, but the focus of the patient ultimately comes first and compassionate care is something that could be enhanced and is defined as paying attention to the needs of the others, listening to spoken or noticing unspoken wishes, imagining the other person's situation and expressing acts of empathy to lessen their suffering (Dr. Burtalan, M. 2019). It is understood that technology cannot fill in the gaps of empathy but it can create the space for it. Care providers are responsible for much more than their initial task of caring for the patient and it can cause them to get caught up in administrative tasks, which can lead to with dealing with technology errors and issues. In the long run, the vision to have Artificial Intelligence take the load off of busy work for nurses has a high potential of successes in the workplace. Artificial Intelligence can accomplish repetitive and monotonous tasks, such as, doing the paperwork or unlocking insightful data for diagnosis, while nurses and doctors could do what they should do best: care for patients and heal them. This can have a huge impact if it is used for the right purpose and the concept of what to do with the free time could essentially just be taken advantage of. While compassionate care should be the basis of medicine, many professionals, mostly doctors, are excluded from this as Hanari explains " *many doctors focus almost exclusively on processing information: they absorb medical data, analyze it, and produce a diagnosis. Nurses, in contrast, also need a good motor and emotional skills to give a painful injection, replace a*

*bandage or restrain a violent patient. Hence, we will probably have an A. I. family doctor on our smartphone decades before we have a reliable nurse robot"* (Harari, Yuval 2018). This statement points out the fact that with addition of A. I. doctors will have to pick up some parts of their job that were initially nursing specific. This is not to say that A. I. will ever replace doctors and physicians but it will transform the mindset and thinking of the job. They will be pushed to adapt by bringing elements of empathy, paying attention, and communicating with their patients to the new environment. On the other hand, the position of nursing and caretaking will be magnified . The US Bureau of Labor Statistics predicts that while jobs for doctors and surgeons willriseby 14 percent between 2014 and 2024 (Dr. Bertalan, M. 2019). Compassionate care and all the areas of healthcare requiring soft skills, such as empathy, compassion, the ability to listen, pay attention and communicate will thrive much more in the age of artificial intelligence then expected.

The gateway to a patient focused environment is to say the least something that will be changing the standards of healthcare but along with that also comes the way Diagnosis will be growing with A. I. as well. Medical imaging plays a significant role in majority of Diagnosis and in this field A. I. can potentially see its biggest breakthrough. Researchers at Google have developed an algorithm to analyze eye scans as a method for predicting heart disease. Artificial Intelligence is being used to quickly analyze data to identify patterns that can help speed up diagnosis. The program they designed and produced with 280, 000 eye scans can give accurate data about an individual just from an eye scan. How it works is actually by looking

at the back of the eye called the fundus, and by analyzing the blood vessels the program can tell sex, age plus or minus three years, if a patient is a smoker, blood pressure and most importantly how at risk a patient is for heart disease (Dr. Agus, 2018). All of this is done by computers and in terms of imaging, is something where A. I. can work great because it is designed to look for patterns that the human brain couldn’t have seen but the computer can.

This thought alone sends radiologists into a panic at the belief that their jobs could ultimately become automated making them a thing of the past. This misconception also can make students second guess themselves when thinking about pursuing a career in radiology. It can be broken down by comparing this situation to that of the autopilot in aviation. The innovation did not replace real pilots, it amplified their tasks. On very long flights, it is convenient to turn on the autopilot, but they are useless when rapid judgment is needed (Langlotz, 2017). Just as in this innovation enhanced the way pilots fly, the same can be said for radiologists. With a study that shows the amount of pictures a radiologist has to looking at being one every 3-4 seconds, it’s easy to say that A. I. could make it less stressful and potentially diagnose more accurately in some circumstances (Hosny, A., Parmar, C., Quackenbush, J., Schwartz, L. H., & Aerts, H, 2018).

Currently there are two types of machine learning that allow A. I. to work the way it does in medical imaging. The first one uses handcrafted engineered features that are defined in terms of mathematical equations (such as tumour texture) and can be calibrated using computer programs. These features are used as inputs on high class machine learning models that are

trained to classify patients in ways that can support clinical decision making. This type of machine however relies on the input of professional definition meaning if it sees anything new or not defined in its program, it will be unable to recognize, which isn't ideal or accurate. However, the second method known as, deep learning, has gained some notoriety in recent because it doesn't rely on prior definitions and equations in its program to interpret images. It uses algorithms that can automatically learn from its data meaning it can define on its own without prior professional code. Because deep learning is data driven, with enough example data, it can automatically identify diseased tissues and hence avoid the need for expert-defined segmentations (Aerts, H, 2018). An example of a deep learning machine would be the eye scanning software earlier mentioned, after researchers developed the code, than ran it over and over 280, 000 plus times before claiming it to be accurate. The way to think about deep learning algorithms is that, just like humans, practice makes perfect.

A. I. continues to grow from these discoveries and adjustments to the programs.  Professionals are working to transition this technology into nanotechnology to use for a more targeted, more timely treatment. The winners of the 2016 Nobel Prize in chemistry was awarded to scientists SirJ. Fraser Stoddart, Jean-Pierre Sauvage and Bernard L. Feringa, for having developed molecules with controllable actions. Although molecular nanotechnology is still very new, by awarding the Nobel Prize to these three scientists, the Royal Swedish Academy of Sciences is recognizing that this technology has huge potential (Dr. Burtanlan, M. 2016). Nanotechnology is the science, engineering, and technology conducted at the nanoscale, which

is unable to be seen with a naked eye. nanometer is a million times smaller than the length of an ant, somewhere at the molecular and atomic level. Machines defined as nanorobots can essentially ensemble and manipulate things promptly at an atomic level (Jeffery, C. 2014). Imagine a robot that can precisely remove and replace atoms and have the capability build anything from the most basic atomic building blocks of life. The trillions of cells in our body undoubtedly have organisms that function as nanorobots would, and are essentially programmed to pull off functions in the body, just in a natural form.  Nanotech uses DNA and the machinery of life to produce structures made of proteins or DNA. With this technology, scientists will be able to develop a multitude of robots and could be considered one of the most forward thinking innovations in medicine.

A type of robot ETH Zurich and Technion researchers have developed are noted as nanoswimmers. Made of a polypyrrole nanowire about 15 micrometers long and 200 nanometers wide, this bot can travel through biological fluid environments at an estimated speed of 15 micrometers per second (Dr. Burtanlan, M. 2016). Intended to swim through non-Newtonian fluids, like the bloodstream, or around the lymphatic system, nanoswimmers might be programmed to deliver drugs and magnetically controlled to a target location in the body. The actual science behind the motion of these nanoswimmers starts with taking the advantage of the fluid it is moving through which has changing viscosity depending on how much force is exerted upon it (Jeffery, C. 2014). They are programmed with a pulsing motion which helps these scallop like swimmer move around. Although in its environment, the nanoswimmer is likely to attach itself on things that move

around in a human biological system such as, non-reciprocating organisms like flagella to get around. The design is so simple that they can be 3D printed and Apart from the obvious use in delivering a product in a targeted way to parts of the body impossible with conventional methods, researchers have yet to illuminate any other uses for their swimming microscallop robots. However, if they get the devices small and agile enough, it is likely to say that the medical world will find a way to implement them into practices to benefit patients.

As many more of innovative nanobots surface, there become more and more ways to treat illness in a timely manner that wouldn’t be possible without A. I. programming and technology. It is even noted to be the most promising way to effectively treat cancer if continue on the pace of development which also brings up some big questions about the ethicality. What if there comes a point at which the overlap between nanorobots and our own cells end up merging with synthetic ones, causing our bodies to become problematic? In able to prepare for the future not so hectic, many believe there should also be discussion about the ethical and philosophical issues involving nanobots and groups have emerged focusing on the conflicts that comes with introducing a very advanced software into medicine. All in all, with A. I. on the verge of major breakthroughs, its safe to say that majority is for the regulation of nanotech and all other programs for the common good of patients.

Such huge strides and revolution in Artificial Intelligence could dramatically shift the way the world sees health care in terms of how hospital patients receive care, how radiologists diagnose, and the process at which treatments

are delivered. A. I. already developed and in the stages of development have the promise for a future with a more efficient, highly accurate system for doctors and nurses to predict, diagnose, and treat their patients. When you consider it, research trends and experts underline how A. I. will impact medicine in the long term. Its success can be dependent on how the medical community, and the world reacts to the changes, but all in all the fact that Artificial Intelligence will blossom a more prosperous world is practically inevitable.

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