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# HOW MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE CAN HELP PRIMARY HEALTHCARE?

The essence of practicing medicine has been obtaining as much data about the patient’s health or disease as possible and making decisions based on that. Physicians have had to rely on their experience, judgement, and problem-solving skills while using rudimentary tools and limited resources. With the cultural transformation called digital health, disruptive technologies have started to make advanced methods available not only to medical professionals but also to their patients<sup>i</sup>. Instead of developing treatments for populations and making the same medical decisions based on a few similar physical characteristics among patients, medicine has shifted toward prevention, personalization, and precision.

Personalized patient treatment revolves around the following 5 steps.

1. Recognizing the problem: The diagnosis forms the first basis of recognizing the problem that the patient has, and based on the information, treatment is prescribed.
2. Seeking information: If needed, the additional information is requested by the doctor to strengthen the treatment activity.
3. Evaluate treatment: With all the available information at this point of time, evaluate the best treatment possible.
4. Make decision: After one or more cycles of the above three steps, a treatment decision is agreed upon.
5. Review decision: Over the course of the treatment, quality of the treatment is assessed and adjustments are made to maximize the effect.

In order to fulfil the necessary requirements to successfully treat a patient, the above steps are fundamental for a clinician. However, given the stress on using the EHR/EMR to document the clinical data, in addition to their revenues, physicians do not have time. In this shift and cultural transformation, AI is the key technology that can bring this opportunity to everyday practice.

## ARTIFICIAL INTELLIGENCE JOURNEY SO FAR IN HEALTHCARE

Artificial intelligence has not been popular lately. Leading thinkers have attacked the concept—Elon Musk and Bill Gates have both voiced their concern. At the World Government Summit in Dubai, Elon Musk said “sometimes what will happen is a scientist will get so engrossed in their work that they don’t really realize the ramifications of what they’re doing<sup>ii</sup>.” He continues to say that the development of full artificial intelligence could spell the end of the human race. Some people in medicine, however, don’t think that way. It’s worth a look at different alternatives and use cases

of how artificial intelligence could potentially bring value to the process of healthcare delivery and the treatment of diseases. Which options the healthcare community would then embrace is up to health leaders and patients to decide.

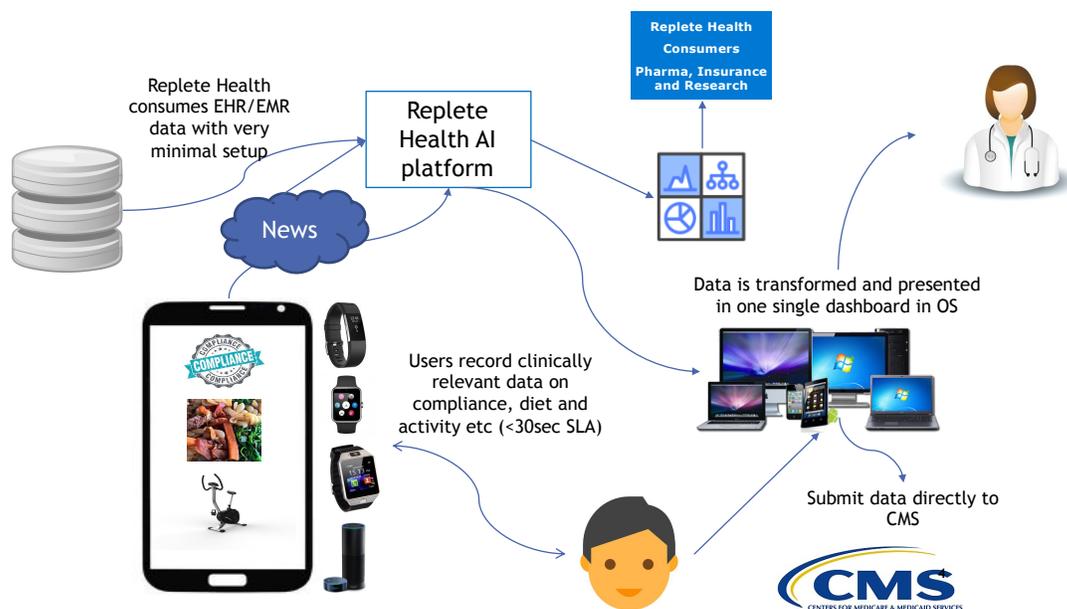
## ARTIFICIAL INTELLIGENCE IN HEALTHCARE

The strongly regulated healthcare industry has made little use of artificial intelligence so far. One of the problems has always been that healthcare is too complex. In order to predict anything around one's health, we need information on demographics, proteins, environmental effects, and a whole host of other facets, writes Rebecca Harrington in Popular Science<sup>iii</sup>. However, the patients adherence is a major factor that drives the outcome of the treatment<sup>iv</sup>. AI could possibly nudge patients to adhere to treatment but there is no such platform that could help actually helps patients to adhere to their medications and behaviors as per the treatment requirement, until now.

## REPLETE HEALTH

Replete Health ecosystem allows patients to monitor their daily activities including diet, smoking, alcohol consumption, etc. Patients can also link their wearables to Replete Health and visualize all data in a single app. Patients can also record other medications that they are currently on, and the doctor will be notified immediately if there is any conflict with their current treatment regimen and communicate it back to the patient. Also, patient can access all their health records from various providers and have a consolidated view of their care, which they can share with remaining providers as well as their personal contacts.

**Fig: Replete Health Ecosystem**





For the patient, they don't have to feel overwhelmed with remembering every detail of their problem list, as their doctor will have access to all the information directly. They just need to spend few seconds every day on the app. Replete Health intends to improve communication with their physicians, thus improving overall health outcomes. All of this is done with minimalistic intrusion into the user's life. The valuable data collected as part of this ecosystem, helps address many healthcare related problems.

## CONTENT

A central plank of healthcare reform is an expanded role for educated consumers interacting with responsive healthcare teams. However, for individuals to realize the benefits of health education requires a high level of engagement. Population studies have documented a gap between expectations and the actual performance of behaviors related to participation in healthcare and prevention.

Interventions to improve self-care have shown improvements in self-efficacy, patient satisfaction, coping skills, and perceptions of social support. Significant clinical benefits have been seen from trials of self-management or lifestyle interventions across conditions such as diabetes, coronary heart disease, heart failure and rheumatoid arthritis. However, the focus of many studies has been on short-term outcomes rather than long term effects.

To address the health education, Replete Health has partnered with A.D.A.M Inc to bring the medically validated content to the users the patient's finger tips. Patients can search and read all the medical content related to their treatment, while the doctors are kept informed on the patient's understanding.

## MACHINE LEARNING

Replete Health ML is designed to learn from patient's news interests, understand whether they like positive or negative style articles which leads them to improve their health aspect, and cater those news which user likes. For example, an individual who is obese and likes to read/learn positive ways to reduce weight, Replete Health machine learning algorithm will be able to identify their preferences and will show more and more articles relating to this topic, thus reinforcing their learning/improving style for positive outcomes.

## ARTIFICIAL INTELLIGENCE

Replete Health platform allows providers to choose personalized notifications to individuals based on their own clinic population. For example, a provider can choose, by gender and age group, how many steps should they be walking every day, minimum expected adherence to medications, missing meals, alcohol consumption etc., on their dashboard. Replete Health business logic coupled with AI, will take over from there and push notifications intuitively to the patients. The Replete Health platform also reminds patients to take medications at an appropriate time, thus improving adherence.

Replete Health AI assesses data gathered from combining electronic healthcare records with its ecosystem, which will learn patient behaviors and keep the physician informed of patient preferences and outcomes, thus significantly improving overall communication. This feature significantly increases the trust between the doctor and patient which means, there will a natural increase in footfall for the primary care doctors. In conclusion, primary care providers can increase their revenue, not compromising the quality of care.

## CONCLUSION

Replete Health aims to cater needs to wide range of individuals from a novice smart phone user to a super user, who are interested in their overall health. Over 88% of US population below 50 uses a smart phone while more that 74% under 65 use a smart phone. Smart phone usage in older people is increasing at a rate of over 30% per year. By 2020, mobile apps are forecast to generate around 189 billion U.S. dollars in revenues via app stores and in-app advertising. This shows that the reach of smart phones is quite significant.

Younger generations, especially millennials, are all about convenience and preventive health. They do not want to see the doctor in person, which is one reason why they want to stay healthy. The demands of millennials on society as consumers, they are a group that uses services such as Amazon and the Internet and aren't really used to person-to-person service per se. They're used to reaching out when they need something, getting instant gratification, moving on and only coming back when they have the need again. It's a behavior that's starting to make its mark on the healthcare field and is expected to lead to even bigger changes as millennials get older. At the top of the list is how healthcare is provided.

Replete Health Apps are built with the novice user in mind. Business logic, coupled with Machine Learning and Artificial Intelligence will drive periodic notifications that will ensure user participation along with the ability to read news and content specifically catered to their needs and behaviors.

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i <https://doi.org/10.1080/23808993.2017.1380516>

ii <https://www.vanityfair.com/news/2017/03/elon-musk-billion-dollar-crusade-to-stop-ai-space-x>

iii <https://www.popsoci.com/how-artificial-intelligence-can-make-drugs-better-and-faster>

iv [https://www.jstor.org/stable/3764638?seq=1#page\\_scan\\_tab\\_contents](https://www.jstor.org/stable/3764638?seq=1#page_scan_tab_contents)