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Precision Medicine: Advances in Data Science and Medicine are Now Opening Up New Frontiers in Precision Medicine

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Precision medicine is the up and coming initiative in the American healthcare system. But what is precision medicine? As defined by Genetics Home Reference, precision medicine is “an emerging approach for disease treatment and prevention that takes into account individual variability in genes, environment, and lifestyle for each person.” Rather than administering standard procedures to all patients with a similar illness as we do today, precision medicine focuses on finding the correct, personalized treatment procedure that would benefit an individual most.



For example, for blood transfusions, the right blood types need to be matched between the people donating the blood and the people receiving it. Precision medicine is similar to this process, but it expands into other areas of healthcare.

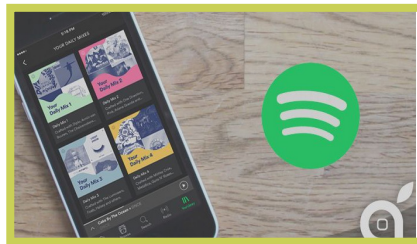
Precision medicine is often confused with personalized medicine. To clarify, the two terms can be used interchangeably, though they often connote different ideas. In this issue brief, we will talk about precision medicine specifically. The Precision Medicine Initiative was first launched by President Barack Obama in 2015. Obama introduced the initiative as an embodiment of the American culture of “hope, resilience, and community.”



With precision medicine, doctors would be able to identify specific genes causing illnesses and would follow a treatment path that would suit the patient specifically, and be the path most likely to cure them. Precision medicine is a new innovation in the healthcare field and has an impact on all humans, transforming healthcare procedures for providers and patients alike. It is therefore worth analyzing this initiative. Precision medicine is the healthcare of the future.

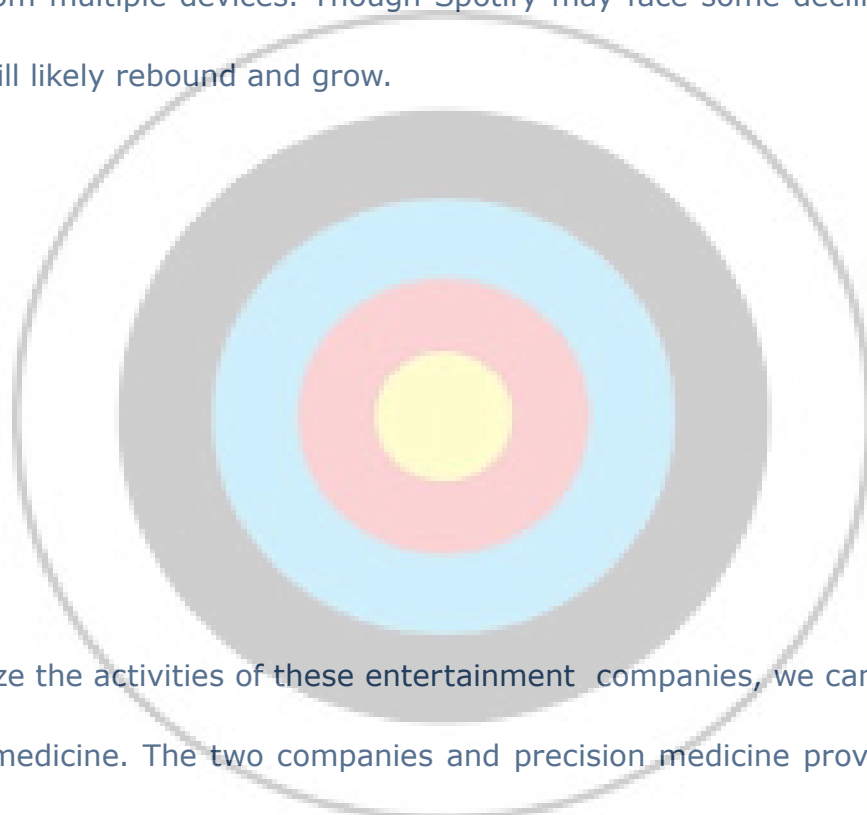
To help explain the concept of precision medicine

and its application in our world, I will use a couple of analogies. For instance, take Netflix into account. Initially, Netflix would mail DVDs to its users in red envelopes. There was no concept of streaming media content as there is today. In that era, Netflix predicted that in the future, humans would not be satisfied with the complexities of dealing with physical DVDs. Humans would want personalized entertainment, that they could choose to their desire and could watch on their own time, without having to compromise with their household members about which movie they would all watch.



Hence, Netflix's streaming offering was launched. However, customers were unhappy. They were comfortable with the DVD format and initially no one could comprehend this new change. They did not understand why the company was pushing to stream entertainment. Streaming seemed to be a peculiar innovation at the time. Stockholders lost faith in the company and Netflix's stock crashed. Eventually, everyone realized the benefits of streaming, as they began to understand that streaming conveniently allowed for entertainment anywhere and on any device. Netflix began to regain its popularity. Now, the company is doing better than ever as one of the top entertainment streaming services in the world.

Likewise, we can consider Spotify. The company recently became public, a newbie on the stock market. Spotify is considered one of the most widely used music streaming services, on par with Apple music and surpassing several older music streaming companies. Spotify provides personalized music--one can listen to to different genres of music from multiple devices. Though Spotify may face some decline initially like Netflix, it will likely rebound and grow.




As we analyze the activities of these entertainment companies, we can find parallels to precision medicine. The two companies and precision medicine provide innovative services in fields that are already well established. Furthermore, precision medicine fits in with the trend for personalized goods. As Netflix and Spotify provide customized entertainment to their customers, precision medicine provides customized healthcare to patients all over the world.

*R*egardless of the promising future of precision medicine, there are still several questions to consider. Is precision medicine a good bet? Should experts be trusted in their recommendation to support the initiative? Precision medicine definitely has many risks. Prices could rise. The system could be ineffective. The research and resources required to create a healthcare system based on precision medicine may not reap profits. However, we must take a chance on precision medicine in order to see the results.

UNDERSTANDING PRECISION MEDICINE

In precision medicine, patients with tumors that share the same genetic change receive the drug that targets that change, no matter the type of cancer.

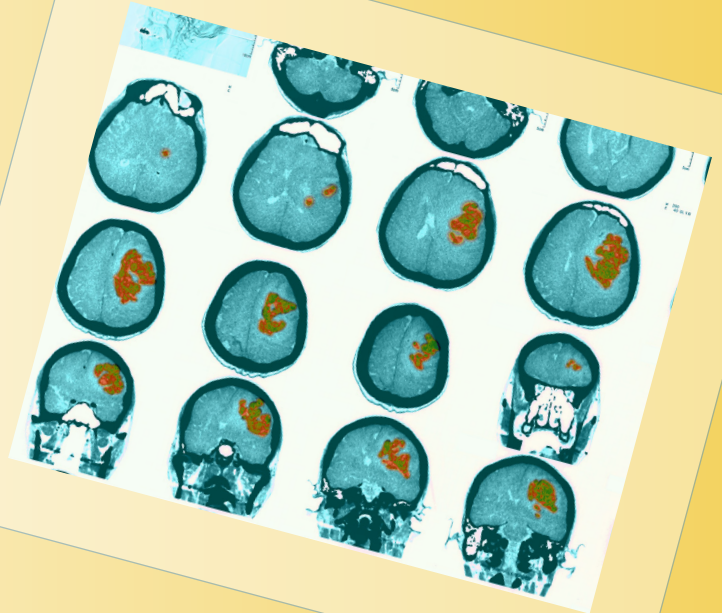


<h1>ETHICAL ISSUES </h1> <p>Raised by Precision Medicine</p>	
DATA COLLECTION	Data from 1 million patients The All of Us Program created by President Obama aims to collect health and genetic data from around 1 million subjects
STORING DATA	Data must be protected The patients' data needs to be stored and protected in a safe place per ethical guidelines
TECHNOLOGY	Need larger databases The technology we have currently may not have databases large enough to safely store such data
DEVELOPING TECHNOLOGY	Adapting current technology We cannot create completely new technology that is unfair to those in less fortunate environments.
SOLUTIONS	Cooperation We just need everyone to work together, hard and well, in order to create a safe environment for patients and the information that will be shared

Though many healthcare organizations are working to implement precision medicine, there are some challenges to ensuring that this emerging practice will be effective. There are also barriers that obstruct the passage of the treatment from the healthcare providers to the patients. The initiative requires databases that are large enough to store detailed data for millions of patients and the technology we have available for such a cause is still at a developing stage. Moreover, costs will be expensive and may make it harder to lower economic classes to afford precision medicine. People in rural areas may be unable to access information that would inform them about the initiative. Despite the challenges, precision medicine leads to vision that would transform our world.

The future of precision medicine is bright

With the implementation of precision medicine, we are able to envision a world in which we can effectively match the right treatment to the right person, rather than guessing or using the average person as a reference. We will be able to achieve A's and B's, levels above the average C, in the healthcare field with precision medicine. Though precision medicine may be costly and requires a lot of effort and dedication, it is a necessary advancement that will take the healthcare system to the next level. The most basic skill that is required for this mission is hope and cooperation. The initiative has already bonded two radically different people, a medical student at the University of Pennsylvania and a mathematics major who had attended MIT and Harvard.



The medical student expressed hope, saying that if doctors could find the cause of the ailment quicker, then they could find the correct treatment and medicine quicker and more accurately. This would speed up the process and prevent doctors from putting patients on medicines that would not help them. Precision medicine will cut unnecessary system costs for doctors and patients. Meanwhile, the mathematics major said that in the initial years, expenses may be high but that they would later level out once the cause began to serve its purpose. As long as we supported the cause, united and with an open mind, we would be able to receive benefits of our efforts.





Shriya Jain

Currently, the most popular region that precision medicine is being used is cancer. Cancer was even established as the short term goal for precision medicine. Personally, I believe that this is because:

- Cancer is pervasive and lethal
- There is enough research to identify what causes cancer at the genomic level
- There is a good framework laid out the test precision medicine in healthcare
- Patients who only have terminal cancer may agree to testing medicine
- Addressing a pressing issue proves the authenticity of precision medicine, which could then be expanded to all areas of healthcare

*T*o be reasonable, precision medicine is not a magical cure or a silver bullet. It may not solve all of our problems, but we must patiently and cooperatively let science progress to a point where, perhaps one day, such a feat could be accomplished. Therefore, though precision medicine requires a substantial amount of effort and cooperation, it is an initiative that will improve the lives of practically every human being and is worth investing time in. More research about the cause will be found in the following years. As this process continues, it is valuable to keep an eye out for progress in the field of precision medicine.

*F*or more information on precision medicine visit:

<https://ghr.nlm.nih.gov/primer/precisionmedicine/definition>

<https://obamawhitehouse.archives.gov/precision-medicine>

Shriya Jain is a junior at San Mateo High School. She has an interest in business, economics, and technology, and is the founder and CEO of Empower Future Foundation (www.empowerfuture.org). Shriya can also be found on Facebook and at <https://www.linkedin.com/in/shriyajain2002>. She is the first author in the new *BCHT - Emerging Voices* series, sharing fresh perspectives on key biomedical topics.



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