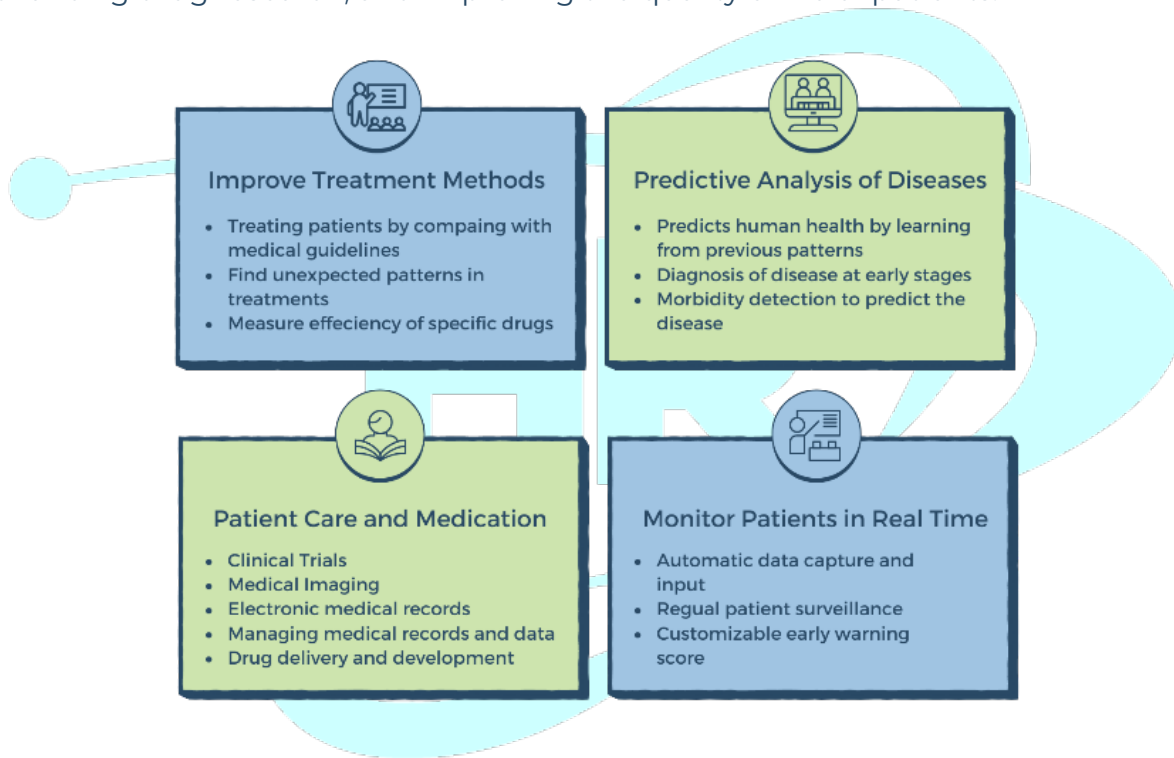# The Power and Potential of Artificial Intelligence: A Revolution for Healthcare

With recent advancements in artificial intelligence (AI) there has been an increased focus and debate about AI's potential to change society. AI can take many combinations and complex forms of technology with great capabilities. The healthcare field is one area where there have been significant advances in the application of AI. Although the medical field was slow to adopt AI in the beginning, more recently AI in healthcare has advanced quickly in a multitude of fields. Healthcare AI tools are now capable of completing the same tasks as doctors, advancing drug research, and improving the quality of life of patients.

Improve Treatment Methods
- Treating patients by compaing with medical guidelines
- Find unexpected patterns in treatments
- Measure effeciency of specific drugs

Predictive Analysis of Diseases
- Predicts human health by learning from previous patterns
- Diagnosis of disease at early stages
- Morbidity detection to predict the disease

Patient Care and Medication
- Clinical Trials
- Medical Imaging
- Electronic medical records
- Managing medical records and data
- Drug delivery and development

Monitor Patients in Real Time
- Automatic data capture and input
- Regual patient surveillance
- Customizable early warning score

Today, the implementation of AI in healthcare has resulted in numerous benefits for healthcare providers, patients, and researchers. AI is being used across healthcare to develop new diagnostic tools, new drugs, and new equipment. Doctors are using AI tools to support evidence based clinical decision making.

A recent study about the application of AI identifying breast cancer on mammograms showed very promising results. This study was inspired by the increasing belief that AI has the potential to save lives by detecting cancers, freeing up radiologists to see more patients, and easing the demand for specialists in areas that lack. The AI software used was developed by a German based company, Vara, in
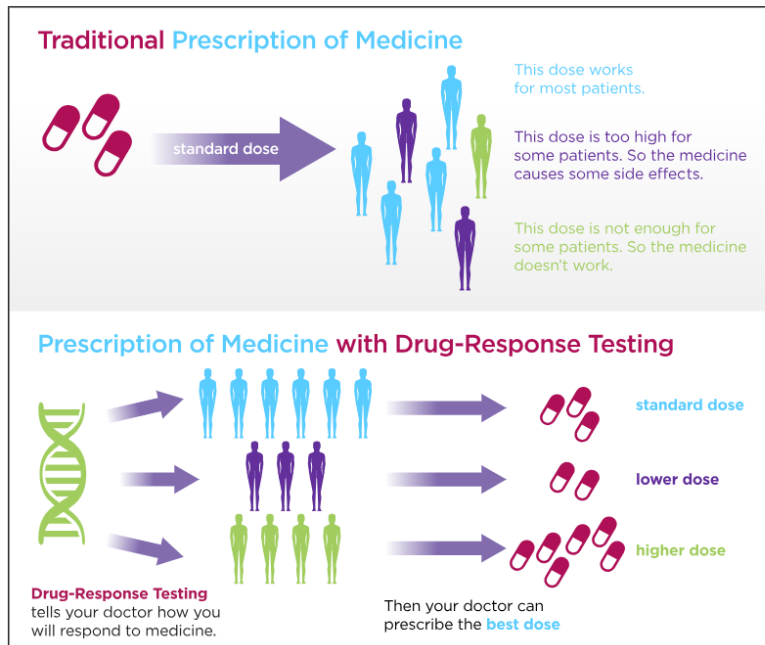
collaboration with the Essen University Hospital in Germany and the Memorial Sloan Kettering Center in New York, USA to conduct the study. They found that when AI and doctors worked together, they were 2.6% better at detecting breast cancer than a doctor working alone and raised fewer false alarms. This suggests the partnership between AI and radiologists would help ease the shortage of radiologists. The study acknowledged there was room for improvement with the AI, specifically mentioning lowering the number of false positives. Other studies on AI image analysis tools are being conducted. Vara's imaging technology is expanding into radiology departments in other countries.

AI has also been applied to precision medicine, which is a method developed to improve diagnostics, therapeutics, and treatment developments through analysis of individual genetic information, environmental variations, and additional variables. The AI is leveraged to generate insights and improves clinician decision making through deep analysis of large, complex data sets. The implementation of AI can predict with greater accuracy based on available multidimensional clinical and biological datasets. And it provides clinicians with an opportunity to specifically tailor early interventions to everyone.

Other Applications for Precision Medicine:
- Research and development for cancer treatments and rare genetic disorders
- Development and implementation of effective treatment plans in a timely manner
- Potential applications for precision medicine for chronic diseases, such as heart failure and chronic kidney disease
- Potential applications for neurodevelopmental disorders

One innovative tool used in precision medicine is pharmacogenomics, or sometimes pharmacogenetics. This is a tool that analyzes a patient's DNA to understand how the patient will metabolize the medication, how the patient's body will activate the medication, and possible reactions to the medication. Using pharmacogenomics, healthcare providers are able to determine the best medication and dosage for their patient's treatment. This testing is used to choose medications for conditions such as cancer, depression, anxiety, and seizures.

Traditional Prescription of Medicine

standard dose

This dose works for most patients.

This dose is too high for some patients. So the medicine causes some side effects.

This dose is not enough for some patients. So the medicine doesn't work.

Prescription of Medicine with Drug-Response Testing

standard dose

lower dose

higher dose

Drug-Response Testing tells your doctor how you will respond to medicine.

Then your doctor can prescribe the **best dose**

While there is an abundance of applications of AI in physical health conditions, there is also a growing field of AI used for neurodevelopmental and psychological disorders AI used for neurodevelopmental and psychological disorders, particularly for disorders that effect academic and social learning. Often there is a high co-morbidity of neurodevelopmental disorders and mental health disorders that create complex and unique diagnoses for each individual that often lead to social and communication deficits as well as negatively impacting learning. It has been argued that AI has the potential to create tools that can be personalized to support and improve the social interaction and education of these individuals. Already, there are applications that support structured teaching strategies to improve areas of writing, reading, focus and refocusing, and basic mathematics. Some applications and robots have been created to help those on the Autism Spectrum to recognize facial emotions, encourage social interactions, and enhance social interaction skills.

With AI's improved ability to make predictions based on complex variables, pharmaceutical companies are using AI to predict drug efficacy and side effects. Additionally, AI can be used to analyze data throughout the drug development process cycle to assist developers in making better informed decisions and forecasts. AI models have been developed to predict drug properties such as solubility, toxicology, blood-brain barrier permeability, and chemical properties. These applications of AI in the drug development process can develop drug treatments faster with better data to support their effectiveness.

AI in Drug Design	AI in Polypharmacology	AI in Chemical Synthesis	AI in Drug Repurposing	AI in Drug Screening
Predicting 3D structure of target protein	Designing bio-specific drug molecules	AI in prediction of reaction yield	Identification of therapeutic target	Prediction of toxicity
Predicting drug-protein interactions	Designing multitarget drug molecules	AI in prediction of retrosynthesis pathways	Prediction of new therapeutic use	Prediction of bioactivity
AI in determining drug activity		Developing insights into reaction mechanisms		Prediction of physicolochemical property
AI in de novo drug design		AI in designing synthetic route		Identification and classification of target cells

Other applications of AI in healthcare include smart stethoscopes, wearable fitness trackers, continuous glucose monitors, and many others. The application and adaptation of AI is likely only to increase in the healthcare field as they promote accuracy, healthcare outcomes, and potentially decrease disparities.

In the future, AI can improve access to healthcare in rural, underserved, or remote areas. Potential applications are broad and far-reaching. Already, AI is being used across healthcare to improve living assistance technologies, biomedical information processes, and to advance biomedical research and diagnostics. With each advance in AI technology, there will also be new applications and developments in healthcare.