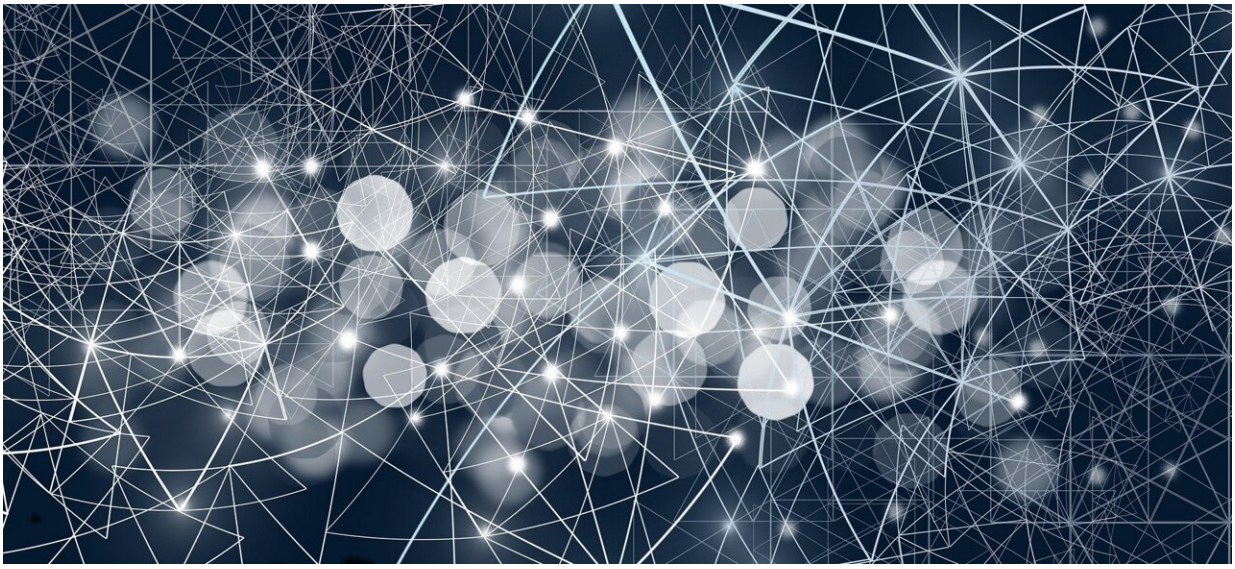
AI platform enables doctors to optimize personalized chemotherapy dose

June 13 2022



Credit: Pixabay/CC0 Public Domain

A team of researchers from National University of Singapore (NUS), in collaboration with clinicians from the National University Cancer Institute, Singapore (NCIS) which is part of the National University Health System (NUHS), has reported promising results in using CURATE.AI, an artificial intelligence (AI) tool that allows clinicians to make optimal and personalized doses of chemotherapy for patients.

Based on a pilot clinical trial—called PRECISE.CURATE—involving

10 patients in Singapore who were diagnosed with advanced solid tumors and predominantly metastatic colorectal cancers, clinicians accepted close to 97% of doses recommended by CURATE.AI, with some patients receiving optimal doses that were approximately 20% lower on average. These early outcomes are a promising step forward for the potential of truly personalizing oncology, where drug doses can be adjusted dynamically during treatment.

Developed by Professor Dean Ho and his team, CURATE.AI is an optimization platform that harnesses a patient's clinical data, which includes drug type, drug dose and cancer biomarkers, to generate an individualized digital profile which is used to customize the optimal dose during the course of chemotherapy treatment.

"Chemotherapy treatment is often given at fixed doses, based on certain patient parameters. However, these toxicity-guided doses may not result in optimal response to treatment. Using CURATE.AI, which is efficacy-driven, we hope to help doctors to quickly identify the optimal doses that are customized for each patient at different stages of the treatment cycle. The ultimate goal is to improve patient and treatment outcomes," explained Prof Ho, who heads the Department of Biomedical Engineering under the NUS College of Design and Engineering (CDE) and is a co-corresponding author of the study. He is also the Director of the Institute for Digital Medicine (WisDM) under the NUS Yong Loo Lin School of Medicine (NUS Medicine) and the N.1 Institute for Health (N.1) at NUS.

He added, "The aim of CURATE.AI is to potentially find more responders to treatment, and also find the right doses for patients that can optimize efficacy and/or prolong the period the patient is responsive to the treatment. For some patients, these doses may potentially be lower than the high doses that are traditionally used."

"An important aspect of applying AI in medicine is the direct involvement of clinicians in building individualized datasets. The pilot trial represents a promising step towards incorporating CURATE.AI into the clinical workflow of dynamic dose selection in the treatment of solid tumors. A key aim of CURATE.AI is to enable truly personalized dosing for patients while also empowering clinicians to identify the optimal dose for each patient, without adding to their workload. In this way, clinicians can focus more on the patient and the caregiver," said Dr. Raghav Sundar, Principal Investigator of the PRECISE.CURATE clinical trial, and Consultant at the Department of Hematology-Oncology, NCIS.

How does CURATE.AI work?

CURATE.AI uses a small data approach to calibrate each patient's drug dosage using his/her own clinical data. Each patient is given varied doses of a drug and his/her responses to these varied doses are measured. This data, together with other relevant clinical data, are then used to construct a digital profile for each patient. By relating the drug dosing to treatment efficacy and safety, CURATE.AI selects the right doses to optimize treatment outcomes for each digital profile. During the course of treatment, the dose may evolve over time.

During the pilot trial, which was conducted from August 2020 to April 2022 at the National University Hospital, clinicians were permitted to accept or reject CURATE.AI dose recommendations based on clinical judgment.

"We are very encouraged by the results of the pilot trial. We've observed an average reduction of chemotherapy doses by around 20%, and 96.7% of the dose recommendations by CURATE.AI were accepted by clinicians," said Dr. Agata BIasiak, the presenting author and co-corresponding author of the study.

"Other outcomes of the study demonstrated 80% patient adherence to the recommended doses, and 100% compliance in providing dosing recommendations within the required timeframe. These early results serve as an optimistic step forward towards downstream implementation of CURATE.AI into clinical practice," added Dr. Blasiak, who is also from CDE, WisDM and N.1 at NUS.

As a prospective and interventional study that harnesses an AI-based approach for human treatment, the results of the pilot trial were presented at the 2022 American Society of Clinical Oncology (ASCO) Annual Meeting. ASCO is a leading professional organization for healthcare practitioners who care for people with cancer, and the meeting will showcase presentations on the latest advancements in cancer research.

"On a global scale, having a clinical trial of a technology from a Biomedical Engineering department accepted for presentation at the ASCO Annual Meeting is exceedingly rare. This demonstrates the real-world and patient impact that is being realized through innovation that spans Engineering, Medicine and a number of other disciplines needed to drive practice-changing medicine," added Prof Ho.

Next steps

Following this initial progress towards incorporating CURATE.AI into clinical workflows of dose selection in the solid tumor treatment, the NUS team will advance towards a larger, randomized trial to further validate the performance of the optimization platform.

The research team will also be conducting clinical trials involving patients diagnosed with other types of cancers, such as multiple myeloma, and disorders such as hypertension, among others. Of note, the team is also launching an imminent trial to optimize personalized

immunotherapy dosing for solid cancers.

Provided by National University of Singapore