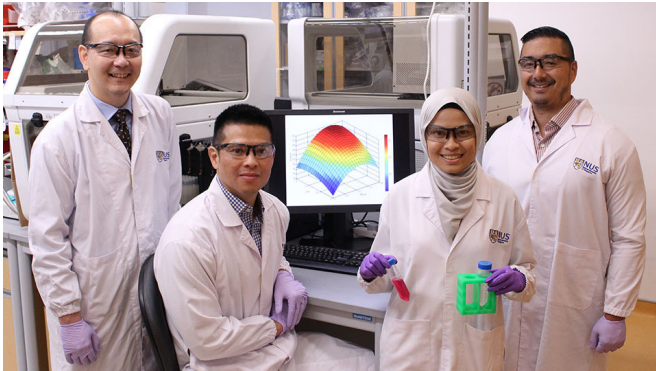


# Researchers develop AI platform to rapidly identify optimal personalised drug combinations for myeloma patients

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A multidisciplinary team of researchers from NUS has developed an AI technology platform that could enable doctors to prescribe personalised treatments for myeloma patients (From left: Professor Chng Wee Joo; Dr Edward Chow; Dr Masturah Rashid; and Professor Dean Ho). Credit: National University of Singapore

A multidisciplinary team of researchers from the National University of Singapore (NUS) has developed an artificial intelligence (AI) technology platform that could potentially change the way drug combinations are being designed, hence enabling doctors to determine the most effective drug combination for a patient quickly.

Applying the [platform](#) towards drug resistant multiple [myeloma](#), a type of blood cancer, the researchers were able to establish new effective drug combinations, as well as identify the patients who may be more responsive to these treatments in under a week.

Existing methods for designing drug combinations typically involve testing arbitrary combinations of commonly used drugs or incorporating new targeted therapies into established drug combinations. Bortezomib-containing drug

combinations are currently used as the first and second-line treatment for multiple myeloma. However, most patients inevitably become resistant to these drugs and new combinations need to be established. While some newer combinations have shown to be effective for some patients, rapid identification of an optimal personalised treatment for a specific patient from an infinite span of possible drug combinations remains a challenge.

## Customising the optimal drug 'cocktail' for every patient using AI

The research team comprising clinicians, engineers and molecular biologists from NUS have therefore developed the AI technology platform, Quadratic Phenotypic Optimisation Platform (QPOP), to speed up drug combination design and to identify the most effective drug combinations targeted at individual patients using small experimental data sets. With just a small amount of blood or bone marrow sample from patients, the platform is able to map the drug response that a set of drug combinations will have on the specific patient's cancer cells.

From an initial pool of 114 FDA-approved drugs, QPOP was able to identify a series of effective drug combinations, including a completely novel and unexpected combination that outperformed the standard of care regimen for relapsed myeloma. The performance of the novel combination was validated against 13 patient samples. QPOP was also used to fine-tune dosage ratios of the novel combination for optimal effectiveness.

Using four other patient samples, the research team further demonstrated that QPOP was able to evaluate and rank the novel combination against the other two current clinically used drug combinations. The novel combination was found to

be the most effective treatment option for two of the myeloma patient samples tested. While the novel combination was not the most effective for all four patient samples, QPOP was able to match the best drug combination to each patient, hence demonstrating proof-of-concept for personalised medicine.

The ability of QPOP to simultaneously incorporate optimisation and personalisation of drug combinations with unprecedented speed opens the door to improving patient accessibility to personalised medicine. New combination therapies can also significantly broaden the spectrum of effective treatments for [patients](#).

Dr. Edward Kai-Hua Chow, principal investigator at the Cancer Science Institute of Singapore, NUS, who led the study, said, "QPOP revolutionises the way in which [drug](#) combinations are designed and represents a key area in healthcare that can be transformed with AI. The efficiency of this platform in utilising small experimental data sets enables the identification of optimal [drug combinations](#) in a timely and cost-efficient manner, which marks a big leap forward in the field of personalised medicine."

Provided by National University of Singapore

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