

# Harnessing Digital Medicine and AI to Optimize Combination Therapy for Infectious Diseases

## Dean Ho

<sup>1</sup>The N.1 Institute for Health (N.1), National University of Singapore

<sup>2</sup>The Institute for Digital Medicine (WisDM), Yong Loo Lin School of Medicine, National University of Singapore

<sup>3</sup>Department of Biomedical Engineering, NUS Engineering, National University of Singapore

<sup>4</sup>Department of Pharmacology, Yong Loo Lin School of Medicine, National University of Singapore

<sup>5</sup>Smart Systems Institute, National University of Singapore

biedh@nus.edu.sg

The process of designing combination therapies for a broad spectrum of disease indications ranging from infectious diseases to oncology has traditionally been based on mechanism-of-action based drug selection followed by dose finding to develop synergistic regimens. While this strategy has led to improved outcomes, drug synergy and globally optimized therapeutic efficacy are very different objectives. A number of factors associated with traditional drug screening substantially complicate its ability to realize globally optimized regimens. For example, effective therapies given at a non-optimal dose can expectedly lead to sub-optimal outcomes. However, dosing also plays a critical role in determining which therapies will ultimately comprise the best course of treatment. As such, when the best drugs and doses for a combination therapy need to be simultaneously identified, this creates a drug/dose space that cannot be reconciled through traditional screening, as even small pools of drugs considered across multiple doses can easily result in over 1 million possible combinations. To address this challenge, our team has developed a suite of platforms that can both select optimal drug combinations (IDentif.AI) and dynamically dose these combinations over time to sustain maximal therapeutic efficacy (CURATE.AI). Our platforms have been validated in multiple interventional clinical studies for organ transplantation, solid cancers, and infectious diseases. This lecture will discuss our study outcomes, and plans for upcoming trials.