

Abstract submitted for the 84th scientific sessions of the American Diabetes Association ADA, Orlando (FL), June 21-24, 2024

## Therapy Recommendation Neural Network for Comorbid Cardiometabolic Diseases

Yaron Dibner<sup>1</sup>, Nicolas Brandt<sup>1,3</sup>, Andrew Krentz<sup>1,2</sup>, Arina Lozhkina<sup>1,3</sup>, Alexandre Luster<sup>1,3</sup>, Arthur Père<sup>1</sup>, André Jaun<sup>1,2</sup>

**Objectives.** Type 2 diabetes, hypertension, and hypercholesterolemia often develop in tandem with risk factors that appear to be more than additive. This work studies early therapeutic intervention beyond the silos that are created when looking at each morbidity separately.

**Methods.** After reproducing national guidelines for three morbidities using a neural network, we rely on transfer learning to record real world evidence outcomes from 469,496 primary care patients to optimise therapeutic outcomes from a multi-morbidity perspective in the following 2 years. Single morbidity treatment recommendations are adequate for the majority, but are optimally complemented with a comorbid therapy for a minority. Shapley values explain differences and are used with digital twin cohorts to reject the null hypothesis for no clinical benefit over guidelines with 95% confidence.

**Results.** Applied retrospectively on a test set with 10,676 cardiometabolic therapy decisions, 807 comorbidity recommendations were identified, 575 with p<0.05 after testing digital twin cohorts for statistical support. Among these, diabetes therapies with two active ingredients should sometimes be complemented, either with an angiotensin receptor blocker (167) or a statin (117), in spite of not qualifying for a formal comorbid diagnosis. Apart from systolic blood pressure and IdI-c levels, we find that ethnicity plays an important role, with individuals of Asian origins being more than twice as likely to benefit from an early comorbidity intervention.

**Conclusion.** In this proof-of-concept study, we demonstrated that a neural network can formulate therapy recommendations beyond clinical guidelines to improve comorbid outcomes for persons with type 2 diabetes in primary care.

<sup>&</sup>lt;sup>1</sup> Metadvice, Route Cantonale 109, 1025 St-Sulpice, Switzerland

<sup>&</sup>lt;sup>2</sup> School of Life Course & Population Sciences, King's College London, UK

<sup>&</sup>lt;sup>3</sup> Ecole Polytechnique Fédérale de Lausanne, 1015 Ecublens, Switzerland