

Closing the postnatal cardiovascular health gap

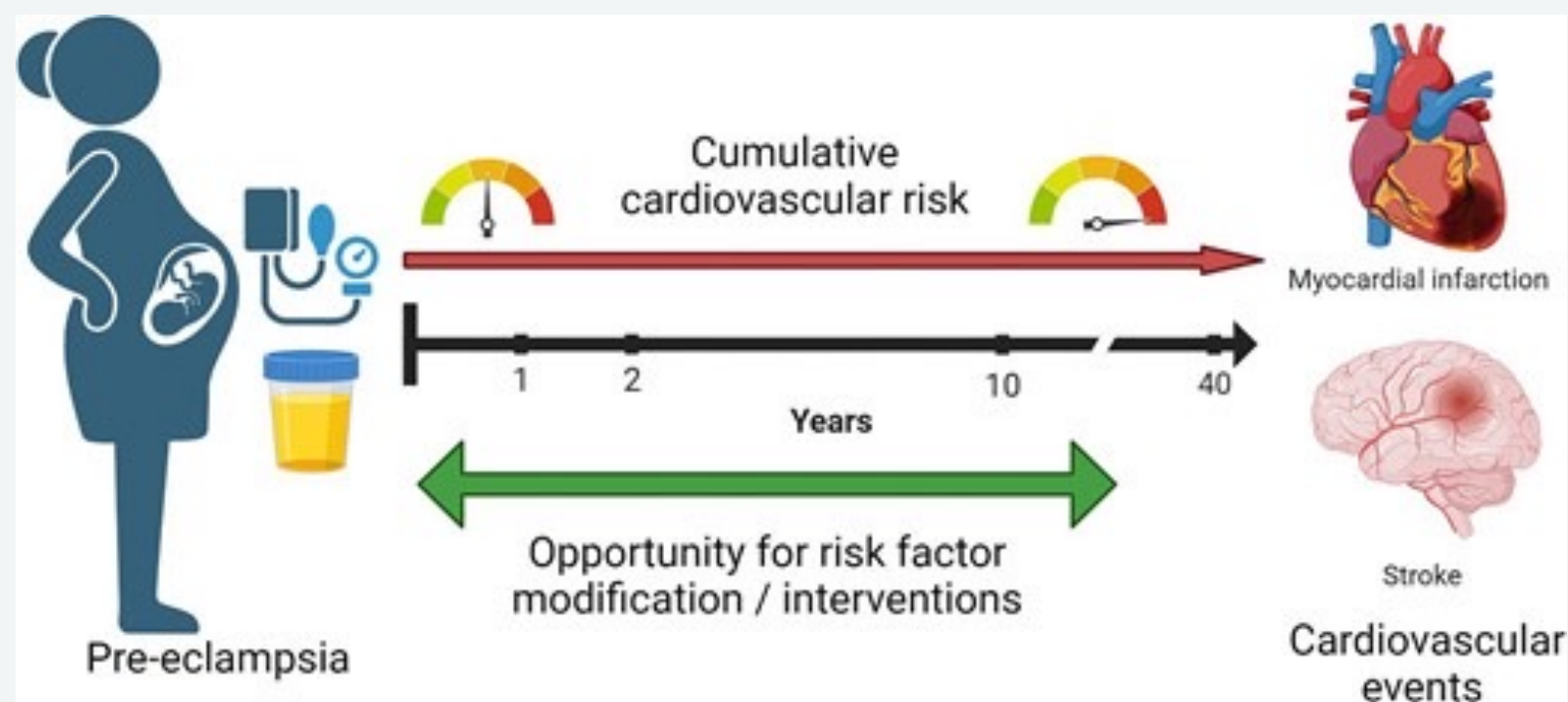
AI and real-world data to improve care after a hypertensive pregnancy

Frances Conti-Ramsden MBBS PhD¹, Hannah Beckwith^{1,2}, Liza Bowen³, Tom Searle⁴, Ronny Schweitzer^{6,7,8}, Samora Hunter⁴, Shubham Agarwal⁴, Kate Bramham^{1,2}, Lucy Chappell¹, Richard Dobson⁴, James T Teo^{4,5}, Antonio de Marvao^{1,6,7}
NHS Fellow in Clinical AI (Cohort 4) · Supervisor: Dr Antonio de Marvao

1 Dept of Women & Children's Health, KCL · 2 Dept of Renal Medicine, KCH · 3 City St George's, University of London · 4 CogStack Ltd, London · 5 Dept of Neurology, KCH · 6 British Heart Foundation Centre of Research Excellence, KCL · 7 MRC Laboratory of Medical Sciences, Imperial College London · 8 Medical University of Vienna

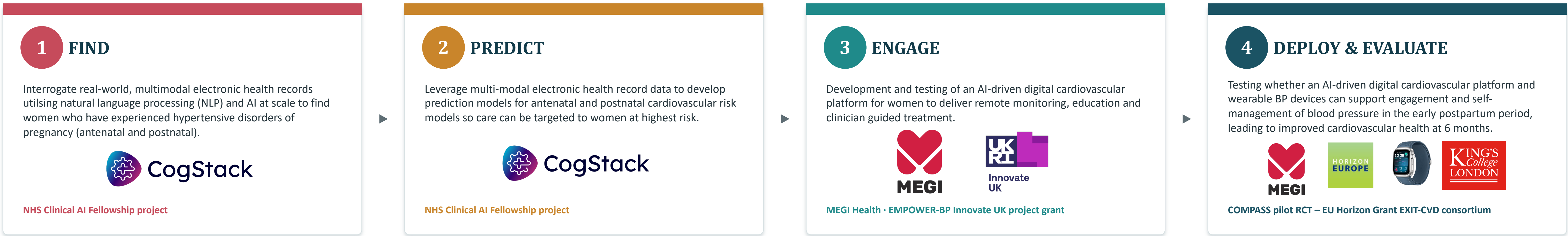
The clinical problem

Hypertensive disorders of pregnancy (HDP), including pre-eclampsia, affect around 1 in 10 pregnant women. They are a leading cause of harm to mothers and babies and a strong predictor of future cardiovascular, renal and metabolic disease. Existing research (SNAP-HT, POP-HT trials) has demonstrated that better blood pressure control in the early postpartum leads to lasting improvements in blood pressure up to 4 years of follow up. Blood pressure is the primary modifiable risk factor for cardiovascular disease, which is the number one cause of death of women worldwide. Despite the importance of the early postpartum for a life-course approach to cardiovascular risk modification in women, there is currently **no defined postnatal pathway** for these women in the NHS, representing a missed opportunity in primary prevention. Existing follow up in primary care relies on women attending the routine six-week postnatal check; with existing data demonstrating up to 40% of women miss this appointment, with attendance being lowest in deprived and minority-ethnic women, who are at the highest risk. This project aimed to leverage artificial intelligence (AI) technologies to identify, predict, engage and manage cardiovascular risk in pregnant and postpartum women.



From: Conti-Ramsden et al., commentary in EHJ-CQO 2024.

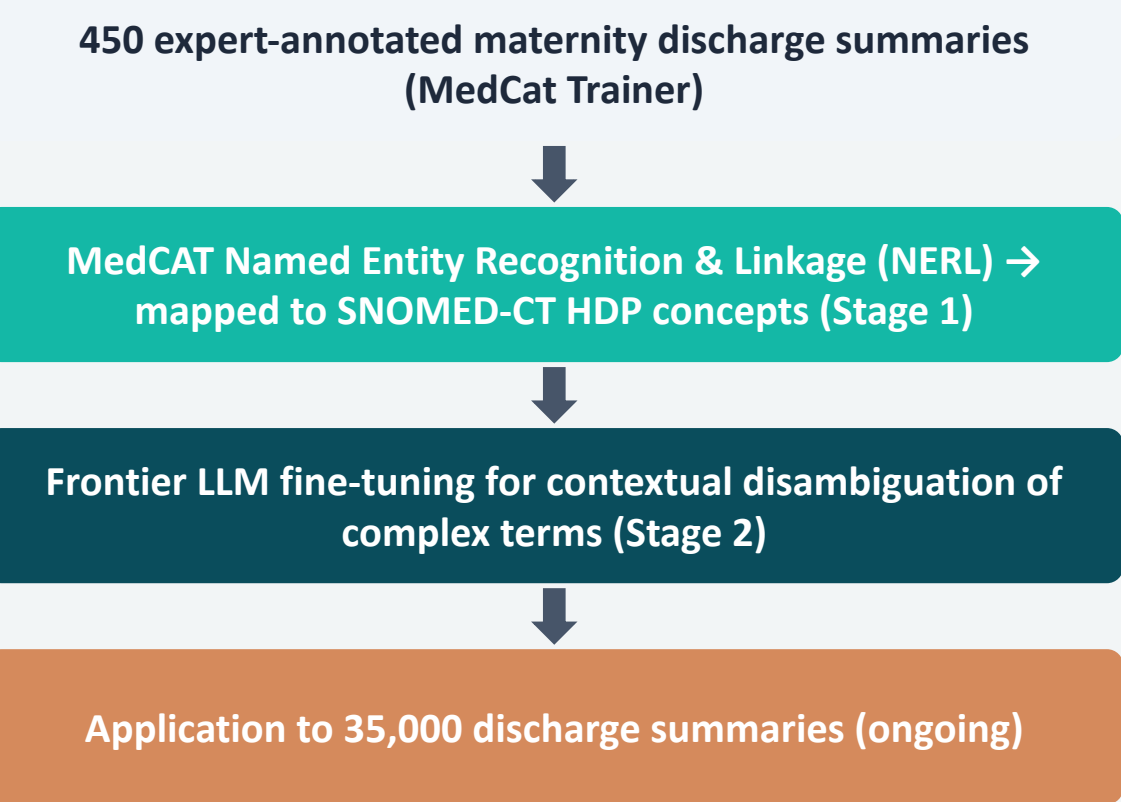
Development of a proactive, low-friction pathway, building across AI fellowship, academic and commercial workstreams



1 Find: case-finding from the EHR

★ First Prize - AI in Clinical Practice Conference GSTT 2026

During my fellowship project I have used CogStack NLP and AI (MedCAT NLP models fine-tuned on 450 clinician-annotated discharge summaries, mapped to SNOMED-CT, codes with large language model disambiguation) to phenotype a multi-ethnic cohort of **58,267 pregnancies (48,134 women, 2016 to 2023) at King's College Hospital** (Ethics: KCH KERRI Project 20241210B).



Term	n	F1	Precision	Recall
Pre-eclampsia	203	0.61	0.46	0.95
Gestational hypertension	110	0.99	0.98	0.99
Systemic arterial hypertension	50	0.73	0.68	0.78
Raised blood pressure	24	0.96	0.96	0.96
Fetal growth restriction	26	1.00	1.00	1.00
Chronic hypertension	11	0.80	0.71	0.91
Proteinuria	10	0.95	1.00	0.90
Severe pre-eclampsia	8	0.94	0.89	1.00

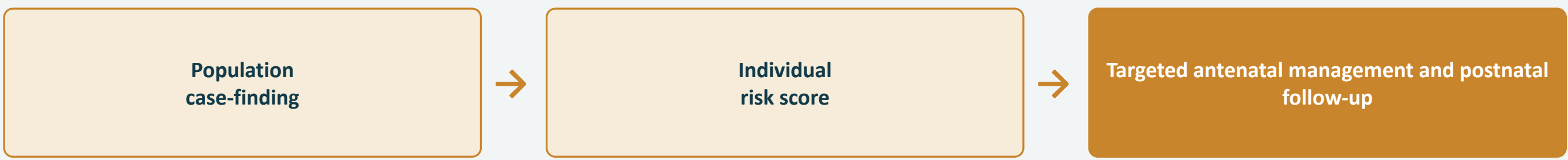
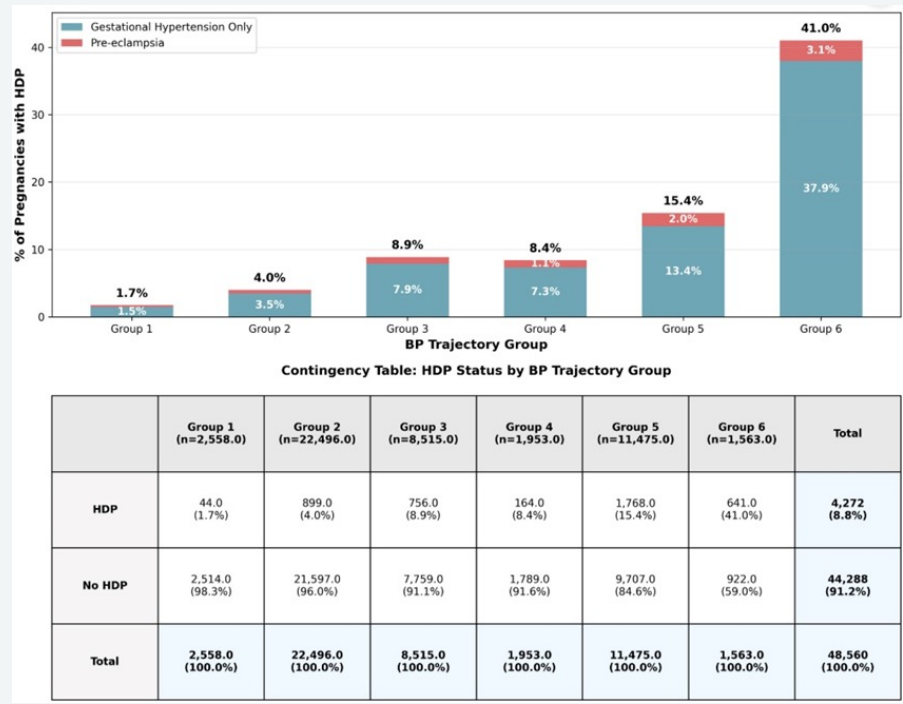
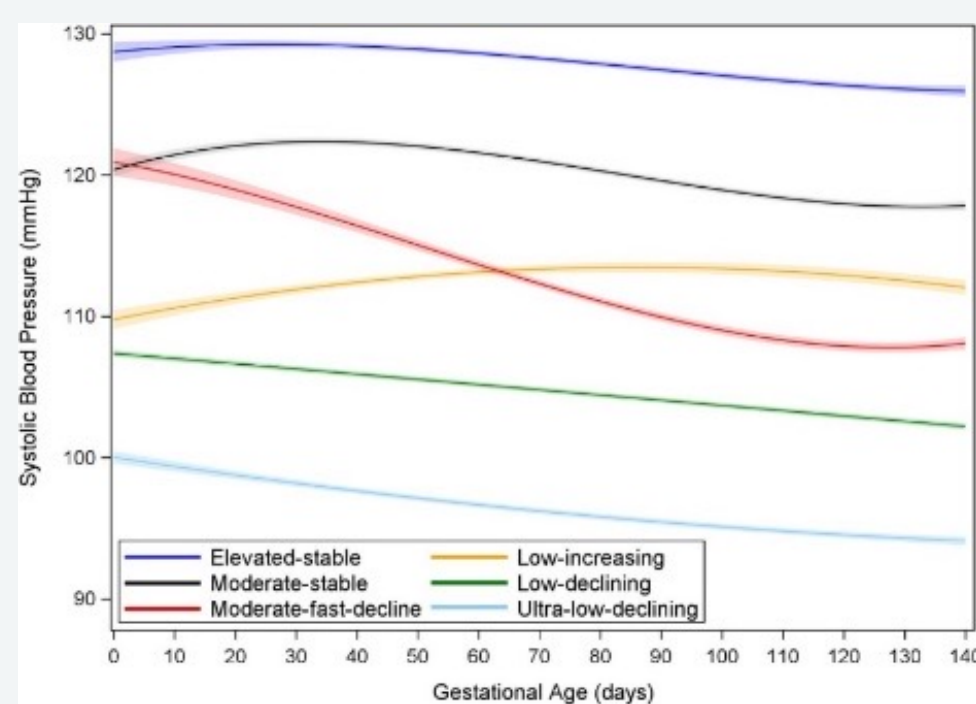
Table 1. NERL performance of HDP terms. LLMs in stage 2 contextualise lower-performing terms (e.g. pre-eclampsia negations, which drive low precision).

Ethnic disparities highlighted by multimodal data (BP+ lab data): Women of Black vs White ethnic backgrounds had highest incidence of chronic and de-novo HDP: 2.5x adjusted odds of chronic hypertension, 1.78x adjusted adds of de-novo HDP onset prior to 34 weeks. We are now investigating ethnic disparities in clinical vs criteria based (BP + lab data) diagnoses.

2 Predict: antenatal and postnatal risk

Accurate NLP outcome labels and granular, multimodal EHR data are enabling us to train **antenatal and postnatal risk models** that estimate an individual woman's risk of short- and long-term cardiovascular risk, so that antenatal care and postnatal care can be targeted to those who need it most. Models are being developed inside the CogStack secure data environment at KCH and GSTT.

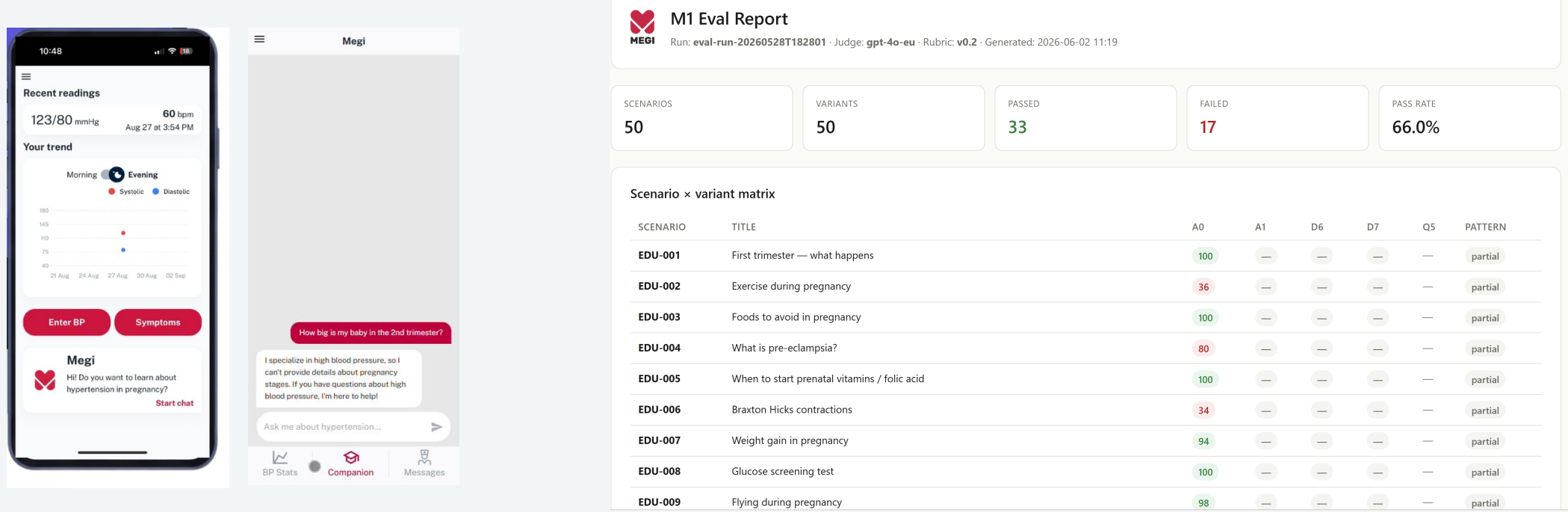
Once ground truth labelling is complete we will further develop prediction models. We have demonstrated promising early performance of early pregnancy BP trajectories (< 20 weeks) predicting incident de-novo hypertension later in pregnancy.



3 Engage: an AI-driven digital cardiovascular platform for women

Funded through a competitive Innovate UK BMC Catalyst Femtech grant (EMPOWER-BP project), I have worked with product and tech colleagues at Megi Health in a commercial role to develop and benchmark a conversational LLM for personalized cardiovascular education and support for pregnant and postpartum women within an existing Class I SaMD remote BP monitoring platform (50.3% one-year engagement across 5,136 users (Jelic et al., 2024)).

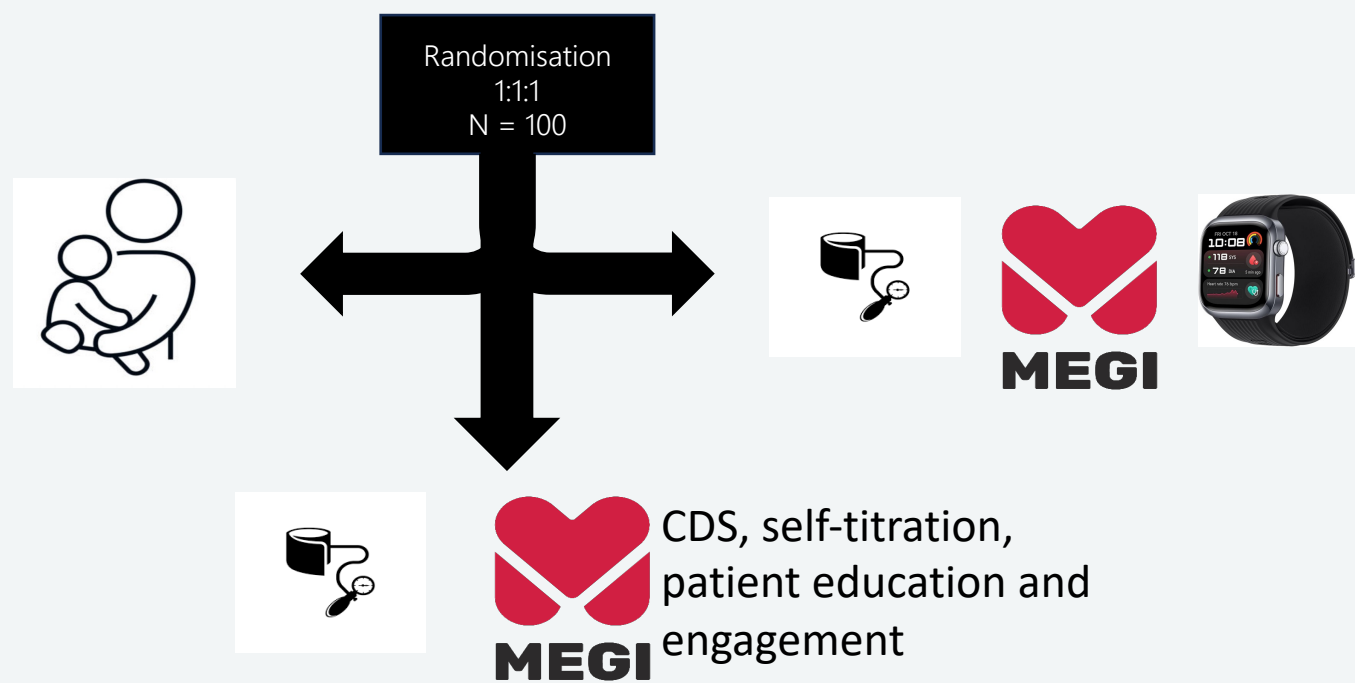
As project lead this included user needs assessment and co-design with women with lived experience of high-risk pregnancy, supported by Action on Pre-eclampsia (4 x focus groups, 1 x co-design workshop), beta testing and safety and bias monitoring and benchmarking of a patient-facing LLM working towards developing the evidence base for AI as a medical device regulation.



4 Deploy & evaluate: COMPASS pilot randomised controlled trial

In my academic role (Chadburn Clinical Lecturer, KCL), I have co-investigator on **COMPASS**, an EU Horizon/Innovative Health Initiative-funded study. COMPASS is a pilot three-arm RCT within the wider EXIT-CVD consortium focused on early prediction, prevention and management of cardiovascular disease. The study is a first step in investigating whether a remote postnatal hypertension pathway (AI-driven engagement and self-monitoring of BP with clinician-assisted antihypertensive agent titration, with or without a wearable BP smartwatch) can improve cardiovascular health in postpartum women.

The primary outcome is feasibility and acceptability, with 24-hour ABPM assessment at six months postpartum to assess cardiovascular health. We will recruit 120 women at two inner city multi-ethnic hospital sites in London. I have led protocol development with chief investigator Dr Antonio de Marvao and we are now working on ethical approvals and site set up with the aim of starting recruitment in Q1 of 2027.



Progress and recognition

- ✓ **Prizes:**
 - First prize for poster presentation, GSTT AI in Clinical Practice Conference 2026
 - Named as AI visionary in women's health 2025 by Health Innovation Kent Surrey Sussex (KSS) and the Department for Health and Social Care (DHSC) for outstanding pioneers behind groundbreaking advancements in women's health and gender equity through artificial intelligence (AI).
- ✓ **Funding:**
 - Innovate UK EMPOWER-BP project grant (£100,000) for LLM development for pregnant and postpartum women
 - EU Horizon/Innovative Health Initiative project grant (£257,000) for deployment and evaluation of digital cardiovascular platform and wrist wearable to improve postnatal cardiovascular health
- ✓ **Career:** Offered 5-year KCL Chadburn Clinical Lecturer post to continue research into application of digital and AI based technologies to improve outcomes for pregnant women
- ✓ **Experience across AI lifecycle:**
 - Training and test data procurement: Work streams 1 and 2 (CogStack cohort building)
 - Model building: Work stream 3 (EMPOWER-BP LLM development)
 - Testing and validation: Work streams 1 and 3 (evaluation of NLP and LLM based technologies including F1 scores and benchmarking)
 - Deployment, monitoring and business case: Work stream 4 (COMPASS study)
- ✓ **Visibility:**
 - Panels: AHA panel on AI agents in healthcare 2026, Adventures in Pharma panellist on AI in pharma and healthcare (2025 and 2026)
 - Podcasts: Pink Pineapple Femtech podcast

Next steps

- **Workstream 1:**
 - Publication of AI-assisted deep phenotyping of hypertensive disorders of pregnancy
- **Workstream 2:**
 - Publication of antenatal and postnatal prediction models for cardiovascular risk
 - Integrate case finding and risk prediction into EHR (EPIC) dashboard for clinical use
- **Workstream 3:**
 - Publication of LLM educational benchmark for DTC use case in pregnant women
 - Preparation of evidence base for AI as a medical device Class IIA regulatory submission
- **Workstream 4:**
 - Finalise study protocol and ethical approval
 - Deliver trial and apply for funding for a definitive RCT