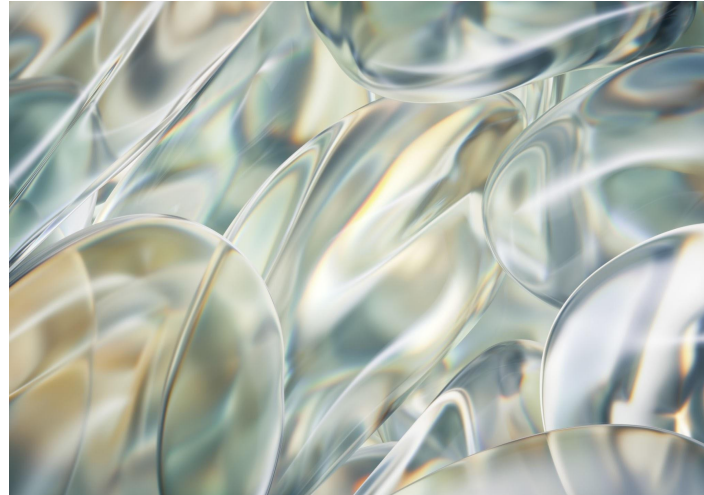


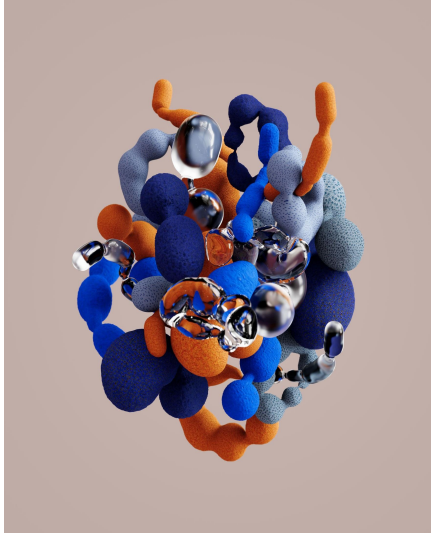
Genexia Health Project

Smarter Anticoagulant Dosing Through
Precision Medicine



3	Problem
4	Objectives
5	Approach
6-7	Results

Problem



Clinical Problem

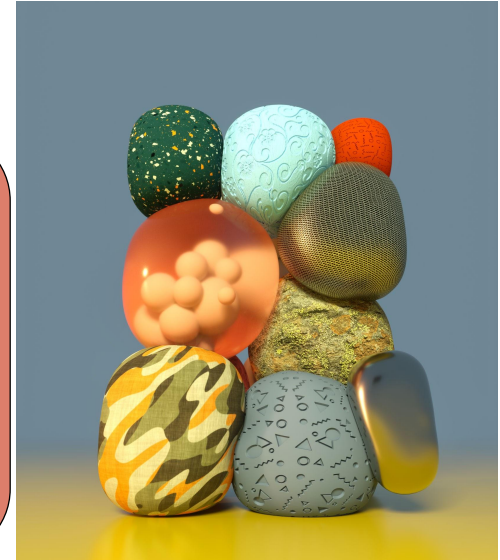
- ❖ Anticoagulant, Warfarin has a narrow therapeutic window which makes dosing highly sensitive
- ❖ Current prescribing practices fail to integrate genetic, clinical, and lifestyle factors which leads to:
- ❖ Patient safety risks: bleeding or clotting (if doses are too high or too low respectively)
- ❖ Extended stabilisation periods, frequent INR monitoring, and reduced quality of life
- ❖ Loss of patient trust due to non-personalised dosing

Hospital Impact

- ❖ High clinical liability and financial burden due to medication-related readmissions
- ❖ Operational inefficiency, as clinicians rely on trial-and-error dose adjustments without required guidance

Business Impact

- ❖ Faces competitive and regulatory pressure as AI-driven pharmacogenomics becomes standard
- ❖ Credibility and differentiation in precision medicine must be maintained
- ❖ Must prove clinical and financial benefits to partners and insurer



Objectives

1

Enhance patient safety by reducing adverse drug events

2

Comply with precision medicine and FDA guidelines

3

Improve clinical efficiency using AI and data-driven automation

4

Build patient trust through transparent, personalised dosing recommendation

5

Differentiate GenexaHealth's offerings to strengthen healthcare, insurer and research partnerships



Measurable KPI's

- ❖ 25% reduction in bleeding events within 6 months post-implementation
- ❖ Shorter stabilisation period: % of patients reaching target INR in <10 days
- ❖ ROI metrics: Hospital cost savings from reduced readmissions and faster stabilisation

Approach

Data Science

- ❖ Develop multimodal ML models for personalised Warfarin dose prediction
- ❖ Integrate genomic variants, clinical parameters, and lifestyle factors into model inputs
- ❖ Apply SHAP explainability for interpretable AI-driven recommendations
- ❖ Track/retrain models using MLf low for version control and reproducibility
- ❖ Deploy models through

PMO

- ❖ Use Agile methodology and Scrum (in two Sprints) with milestone tracking in Jira.
- ❖ Documentation and tools: Jira, Confluence, BPMN, Requirements Traceability Matrices.
- ❖ Monitor risks (including regulatory delays, EHR integration issues).
- ❖ Ensure cross-functional alignment between clinical, technical, and business teams

Business Analysis

- ❖ Elicit requirements from stakeholders
- ❖ Map current vs. future-state workflows and define integration needs
- ❖ Translate clinical guidelines into functional system requirements
- ❖ Define KPIs and success metrics for hospitals and insurers to assess ROI

Results

CHALLENGE

Traditional warfarin dosing relies on trial-and-error, putting patients at risk during weeks of stabilization

SOLUTION

AI model that predicts optimal warfarin dose with 90% accuracy using genetic + clinical data

- ❖ Successfully Merged Genomic, Lifestyle & Clinical Data
- ❖ Advanced Machine Learning for Precision Dosing

- ✓ 90% Prediction Accuracy ($R^2 = 0.90$)
- ✓ 0.4 mg Mean Absolute Error (Clinically significant)
- ✓ Integrated Genomic + EHR + Lifestyle data
- ✓ Deployable Clinical Decision Support Tool

MULTI-MODAL DATA INTEGRATION

- Clinical EHR: Age, Weight, Comorbidities, Medications
- Genomic Data: CYP2C9, VKORC1, CYP4F2 variants
- Lifestyle Factors: Diet, Smoking, Alcohol intake

DATA ENHANCEMENT JOURNEY

Baseline Features → Engineered Features

BASELINE (Limited Predictive Power)

- ❖ Age, sex, weight, height, ethnicity
- ❖ Basic medication flags
- ❖ Simple lifestyle scores

ENGINEERED INTELLIGENCE (High Predictive Power)

- ❖ Genetic risk
- ❖ Comorbidity Burden Index
- ❖ Polypharmacy Interaction Score
- ❖ Pharmacokinetic Calculations
- ❖ Lifestyle Impact Quantification

RESULT: 40%+ improvement in prediction accuracy

SEE LIVE DEMO



Champion Model Performance

EXTRA TREES REGRESSOR - ENGINEERED FEATURES

PREDICTION ACCURACY

- ❖ R^2 Score: 0.90 (90% variance explained)
- ❖ Mean Absolute Error: 0.4 mg (Clinically precise)
- ❖ Root Mean Square Error: 0.6 mg

CLINICAL INTERPRETATION

- ❖ Model accuracy within 0.4 mg of actual stable dose
- ❖ Outperforms traditional dosing protocols
- ❖ Validated on diverse patient population



Key Drivers of Warfarin Dose (Model Insights)

TOP PREDICTORS OF DOSE REQUIREMENTS

1. Genetic Factors** (CYP2C9, VKORC1 variants) - 35%
2. Body Composition** (Weight, BMI) - 25%
3. Clinical Comorbidities** - 20%
4. Drug Interactions** (Amiodarone) - 15%
5. Lifestyle Factors** - 5%

VALIDATES KNOWN PHARMACOLOGY

- ❖ Genetics account for largest dose variation
- ❖ Drug interactions significantly modify requirements
- ❖ Comprehensive model captures real-world complexity

Thank You