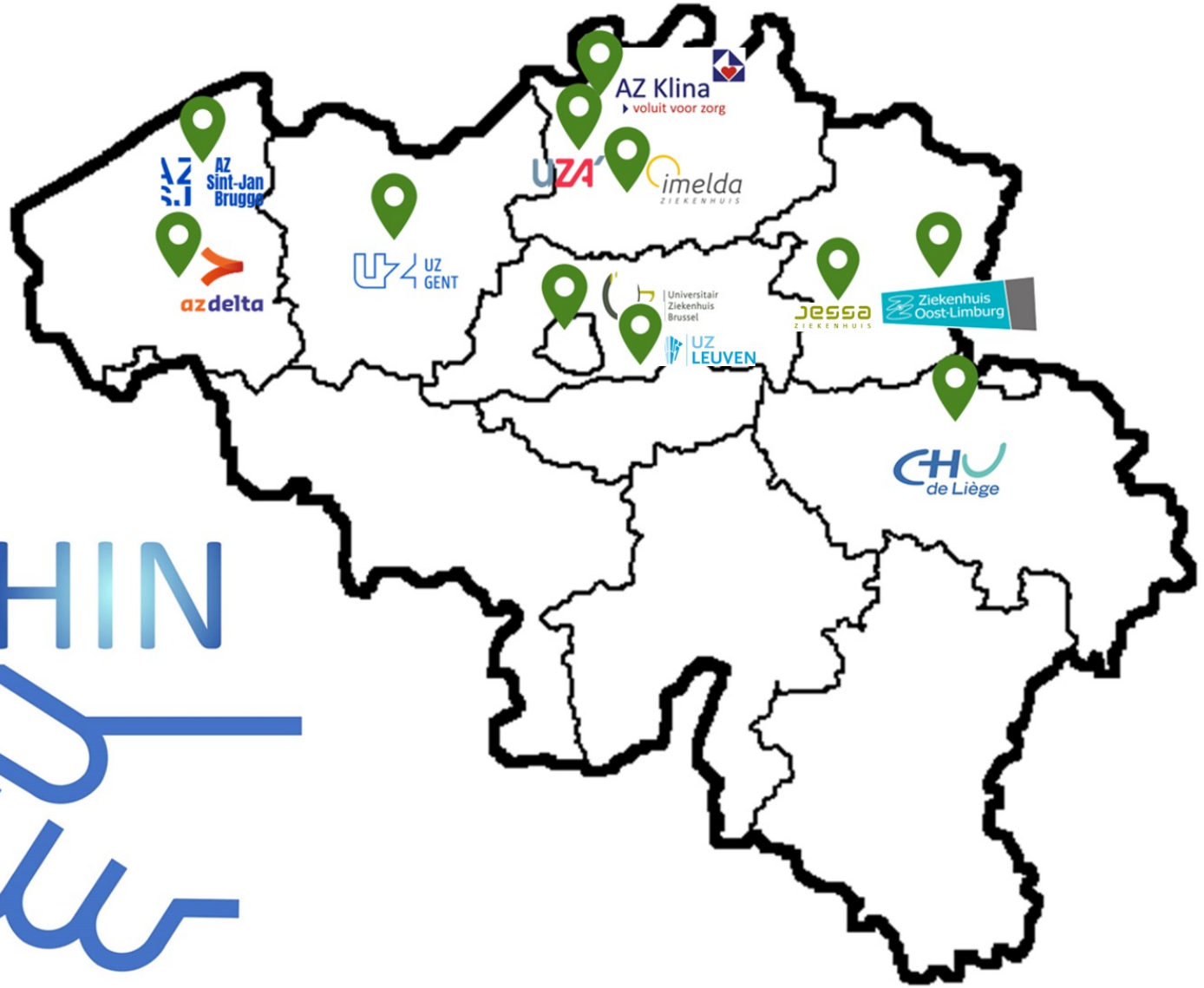


FHIN

# FHIN-EUFEMED – 23/05/2025

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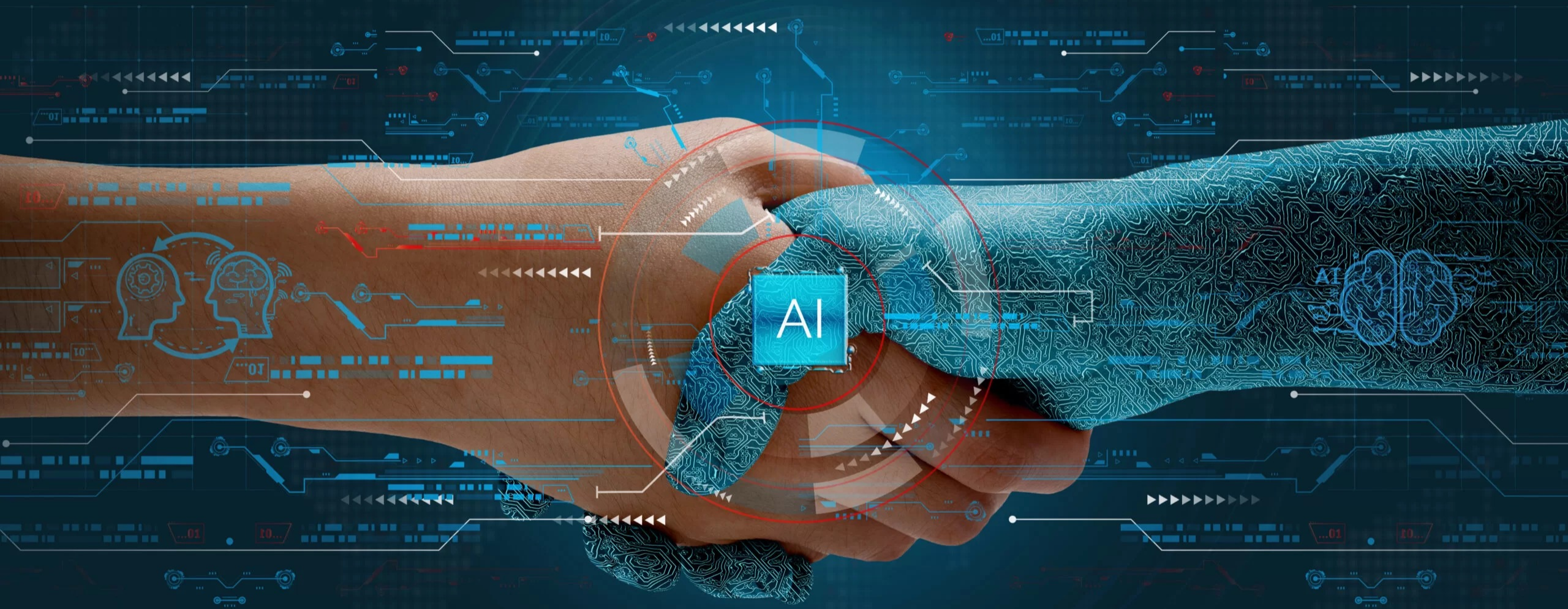
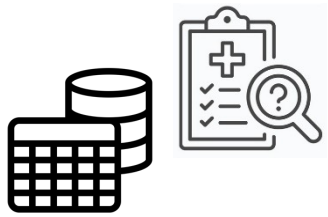
# Initial motivation for multicentric collaboration

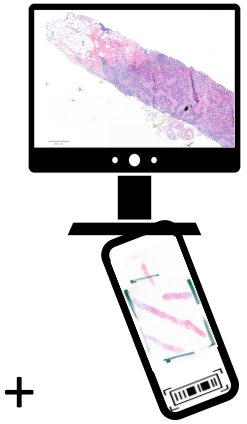


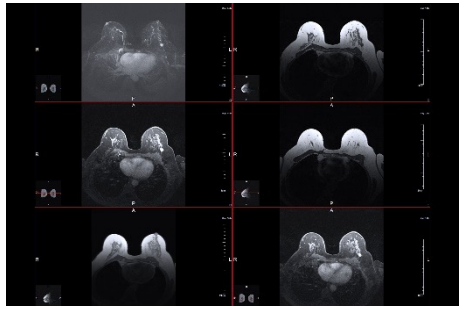
# Multi-institutional meets Multimodal

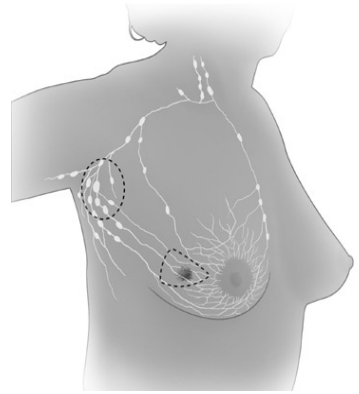
BreaCS

EUSOMA
European Society of Breast Cancer Specialists



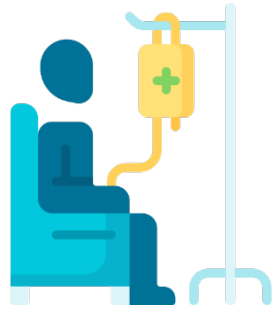




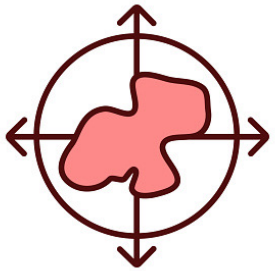


Sentinel lymph node

Neoadjuvant respons

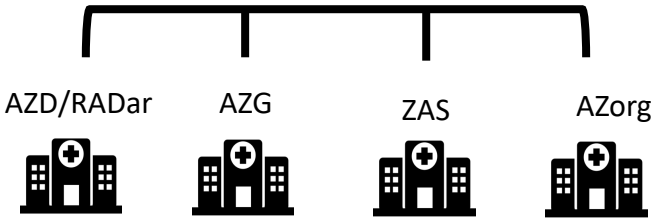


Tumor size



**Prediction Model**

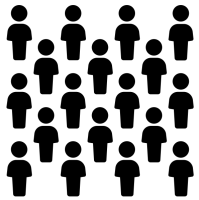
AZD/RADar AZG ZAS AZorg



azdelta

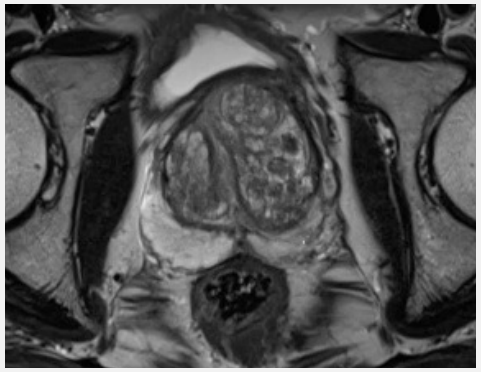
RADAR

~5000 patients



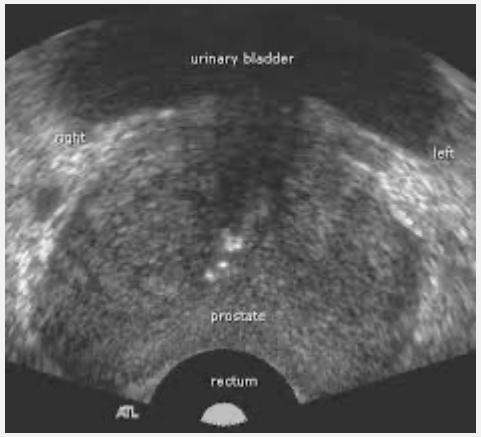
# IBIS-PRO: AI for prostate cancer screening

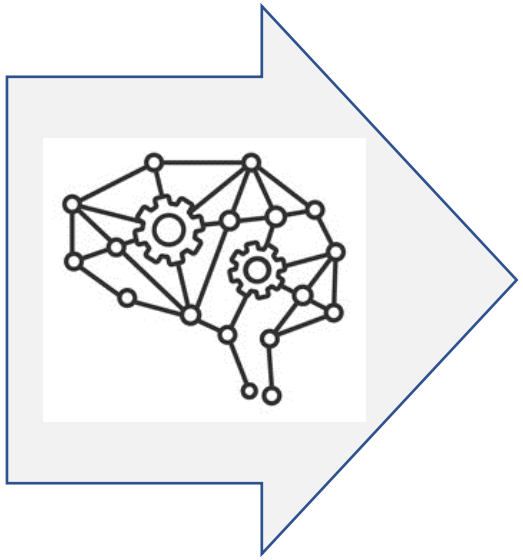
MRI



Blood results


Ultrasound



Prediction: Is prostate biopsy necessary?

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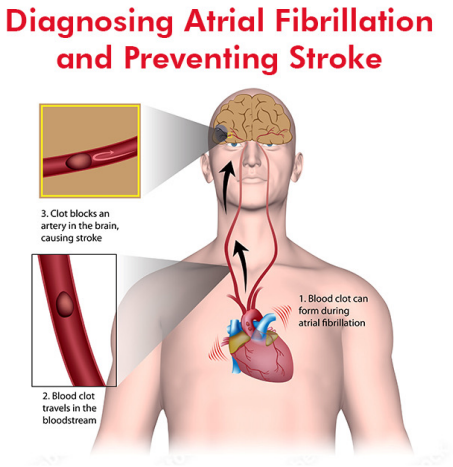
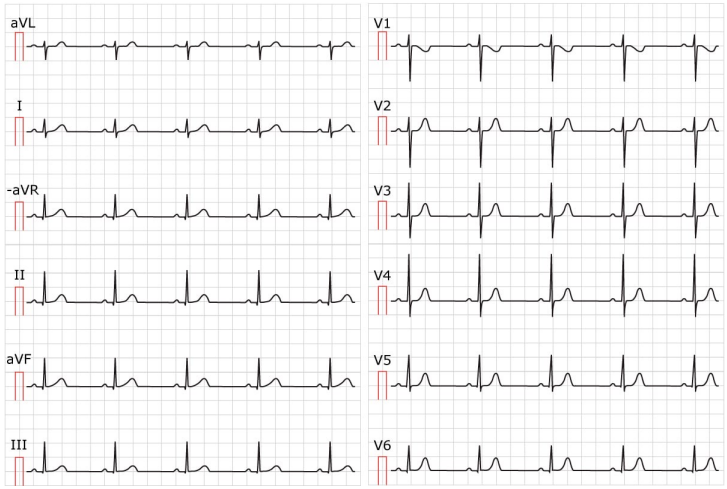
# Early detection of atrial fibrillation

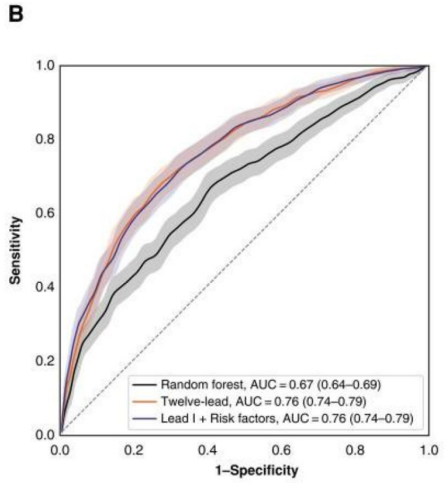
- **Research Question:** Can we detect atrial fibrillation from an ECG in sinus rhythm?
- **Objective:** Atrial fibrillation causes 6,000 strokes per year in Belgium. The goal is to prevent strokes through early detection.

Data: Klinisch, ECG

Resultaat: 0.76 AUC




ESC European Society of Cardiology
Europace (2024) 26, 1–9
https://doi.org/10.1093/europace/euad354
CLINICAL RESEARCH

**Single-lead electrocardiogram Artificial Intelligence model with risk factors detects atrial fibrillation during sinus rhythm**

Stijn Dupulthys [1], Karl Dujardin[2], Wim Anné[2], Peter Pollet[2], Maarten Vanhaverbeke [2], David McAuliffe[3], Pieter-Jan Lammertyn [1], Louise Berteloot [4], Nathalie Mertens [1], and Peter De Jaeger [1,5]*

**Verklaarbare A.I: welk deel van het ECG doet het model beslissen (aandachtskaart)**

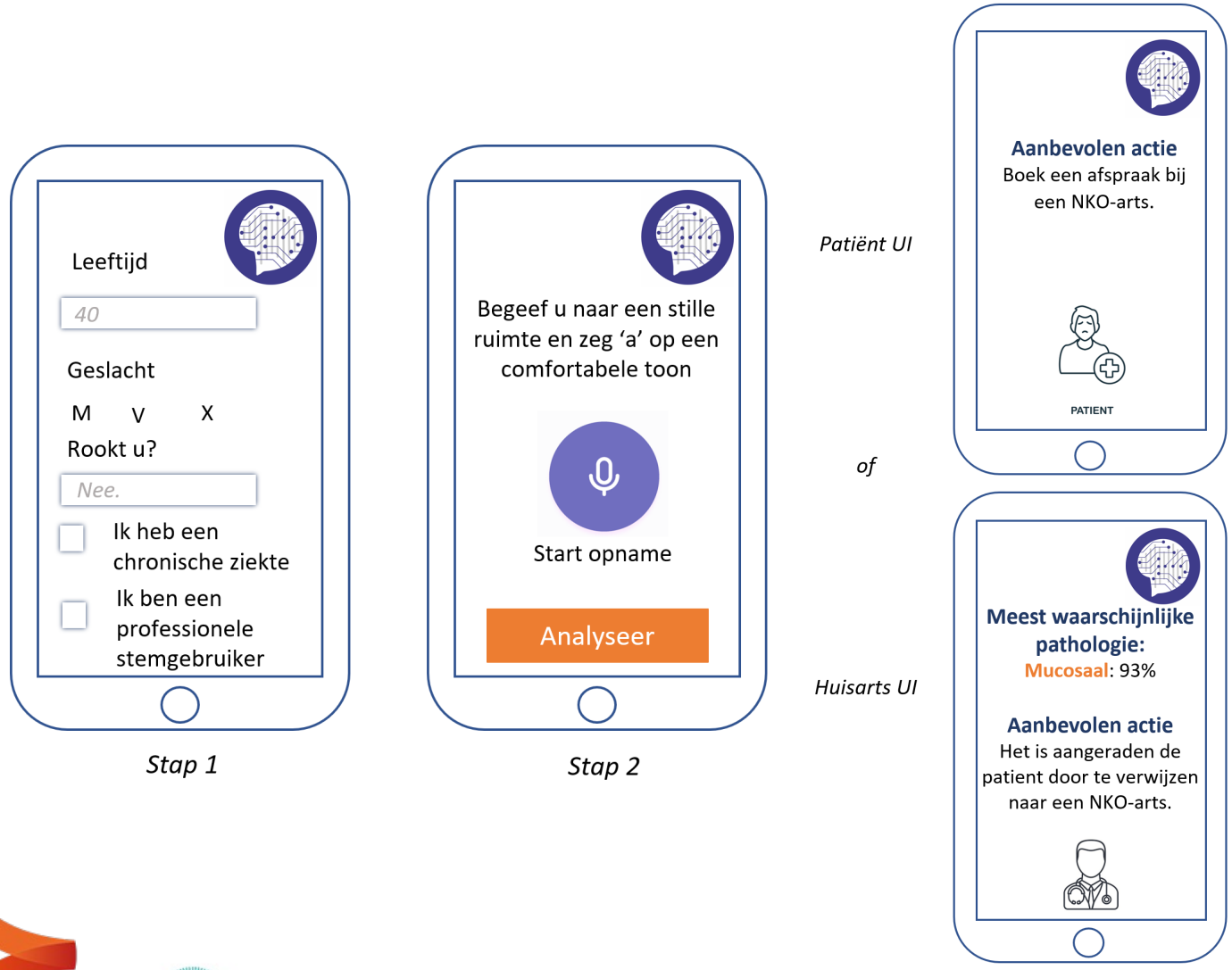
**Project**
Funding: RADar
Consortium: AZ Delta, ter discussie

azdelta

RADAR

https://drraghu.com/resources/atrial-fibrillation/diagnosing-atrial-fibrillation-and-preventing-stroke/

# Early screening of voice disorders




- Is early detection of voice disorders via mobile app feasible?
- Develop integrated care technology for optimal detection & treatment
- Voice Disorder Detection: AUC > 0.90
- Voice Disorder Classification: AUC ≈ 0.75
- Partners: European Institute for Otorhinolaryngology (EIORL), Goomyx, ELG De Piramide (Vlaio O&O)

azdelta RADAR

# FHIN VISION ANY SECUNDARY USE

## MULTICENTRIC SYSTEM TO SUPPORT ANY SECUNDARY USE OF ANY KIND OF DATA

- **Reporting** (e.g., quality indicators, compliance, FOD/RIZIV/KRC reporting)
- **Benchmarking** (within or across institutions)
- **AI model training & validation**
- **Epidemiological studies** (e.g. OHDSI international studies)
- **Phase 4 clinical studies**
- **Operational intelligence** (e.g., dashboarding for hospital management)
- **Health economics and policy analysis**
- **…**

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# FHIN VISION ANY KIND OF DATA

## MULTICENTRIC SYSTEM TO SUPPORT ANY SECUNDARY USE OF ANY KIND OF DATA

- **Medical data** (diagnoses, medications, lab results, imaging, procedures)
- **Nursing & Care data** (care plans, vitals, observations, support)
- **Financial & Administrative data** (cost data, billing codes)
- **Logistics & Resource tracking** (patient movement, bed management, asset flow)
- **Operational & capacity data** (staffing levels, OR schedules, forecasting, KPIs)
- **…**

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# FHIN GOAL

- **Question 1:** Is it possible to achieve clinically accurate standardization and harmonization of multimodal data across multiple hospitals?

- **Question 2:** Can this be done within a governance model in which:
  - Healthcare institutions retain full control over their own data (data does not leave their infrastructure)
  - Open source / Open science is central
  - Voluntary participation in projects is possible
  - All partners are equal

- **Requirement:**
  Standardization of clinical content (process approach) and software tools (for open-source collaboration and mutual support).

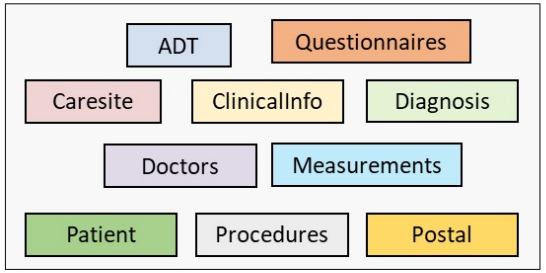
# FHIN GOAL

QUESTION 1:
IS IT POSSIBLE TO ACHIEVE CLINICALLY ACCURATE STANDARDIZATION AND HARMONIZATION OF MULTIMODAL DATA ACROSS MULTIPLE HOSPITALS?

# From data to clinically relevant insights

Federated approach

Raw data




→ Not standardized database

DIFFERENT EHR SYSTEMS

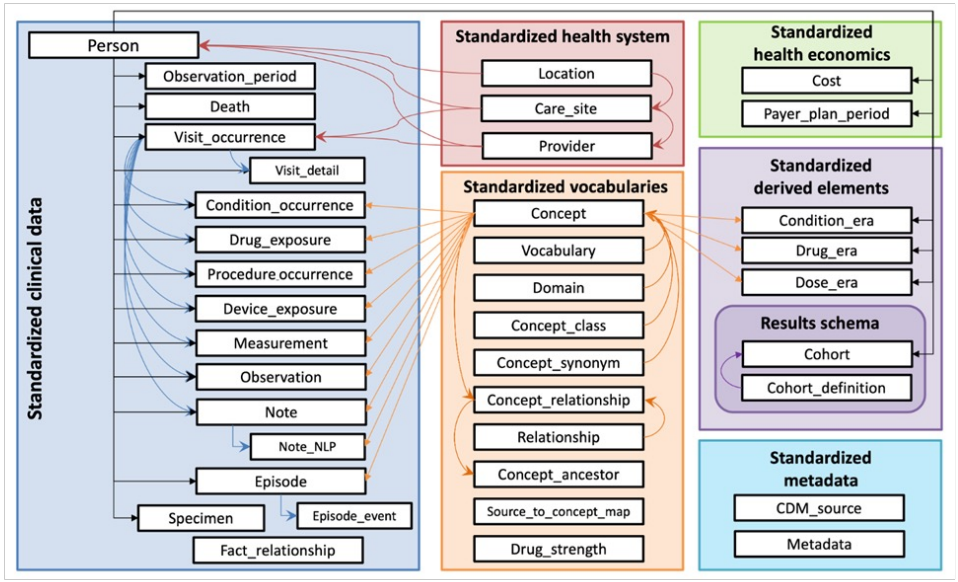
RABGIN

KEUN

RABBIT IN A BLENDER

CLOUD SERVICE
SELECT *
FROM raw_dataset

OMOP CDM

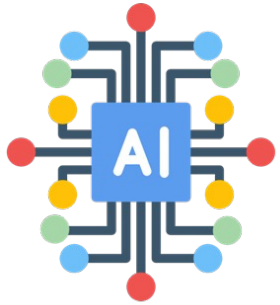



→ Standardized database structure
→ Standardized vocabulary

FHIN PARTNER A

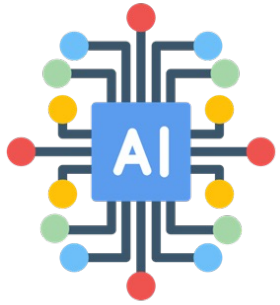
CLOUD SERVICE
SELECT *
FROM omop

Prostate cancer prediction




CLOUD SERVICE
SELECT *
FROM omop

Lung cancer prediction

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*FLEXIBILITY & COMPATIBILITY ACROSS DIFFERENT ENVIROMENTS (CLOUD, EHR)

# Data refset/inventory lung cancer

OMOP concept_ids

| | concept_id | concept_name | unit_concept_id | vocabulary_id | concept_code | OMOP Table |
|---|---|---|---|---|---|---|
| 2 | 3020460 | C reactive protein [Mass/volume] in Serum or Plasma | mg/L | LOINC | 1988-5 | MEASUREMENT |
| 3 | 3000963 | Hemoglobin [Mass/volume] in Blood | g/dL | LOINC | 718-7 | MEASUREMENT |
| 4 | 3000905 | Leukocytes [#/volume] in Blood by Automated count | x10³/µl | LOINC | 6690-2 | MEASUREMENT |
| 5 | 40763077 | Lactate dehydrogenase [Enzymatic activity/volume] in Body fluid by Pyruvate to lactate | U/L | LOINC | 60017-1 | MEASUREMENT |

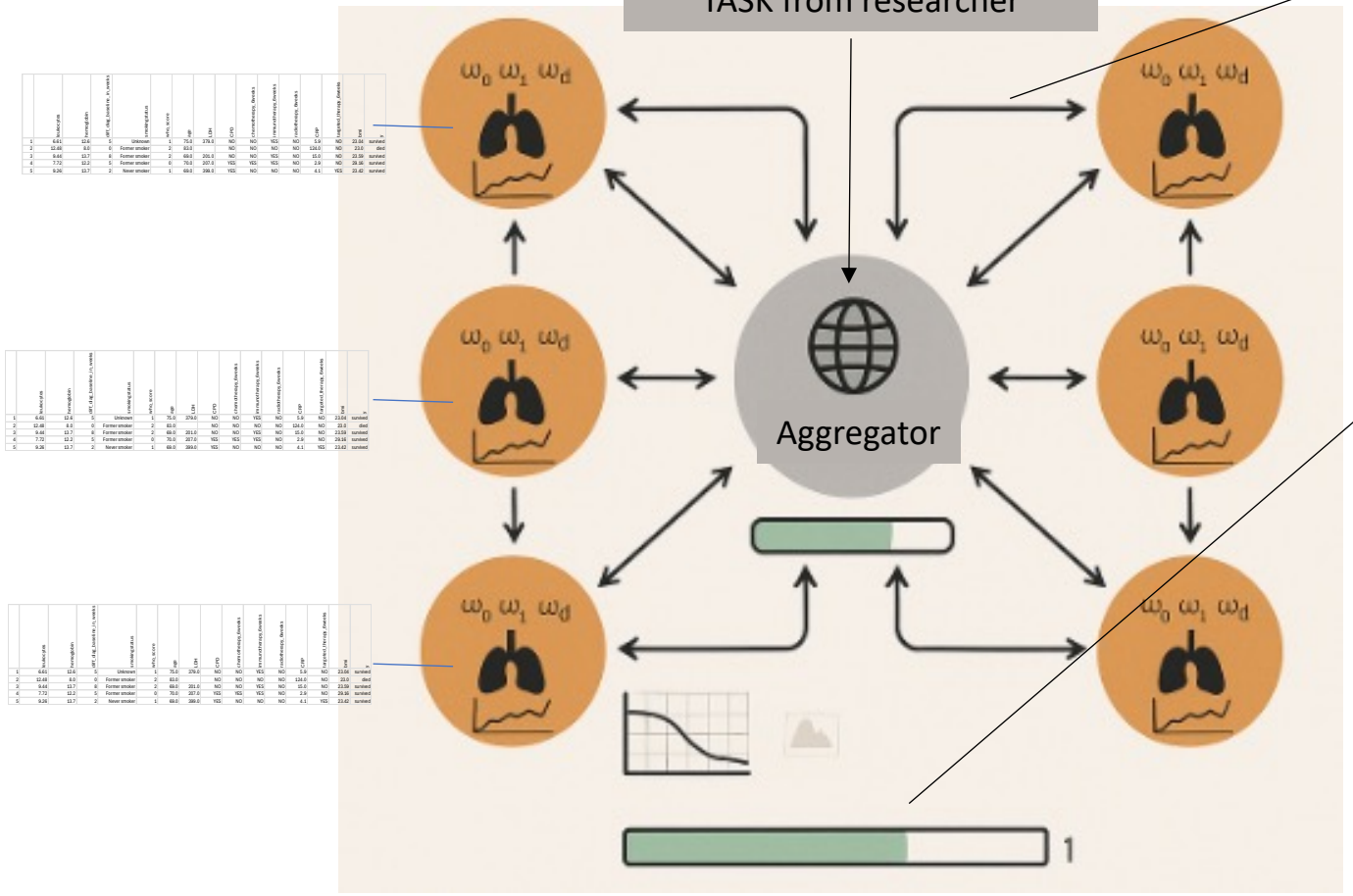
Data catalogue lung cancer with >670 target datapoints


Medical Concept Mappings

ICD-0-3 diagnose | clinical TNM | WHO score | Smoking | Lab results | Detail chemotherapy | Detail immunother | Detail target the | Radiotherapy | comorb CPD | Measurement

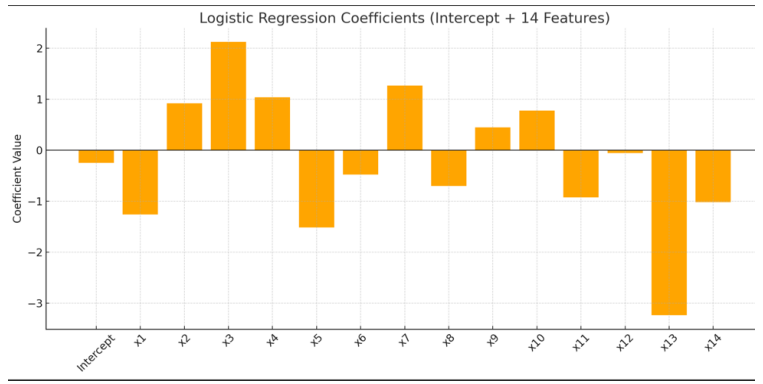
# Federated learning

$$\text{logit}(P(y=1|\mathbf{x})) = \mathbf{x}^\top \boldsymbol{\beta} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_d x_d$$

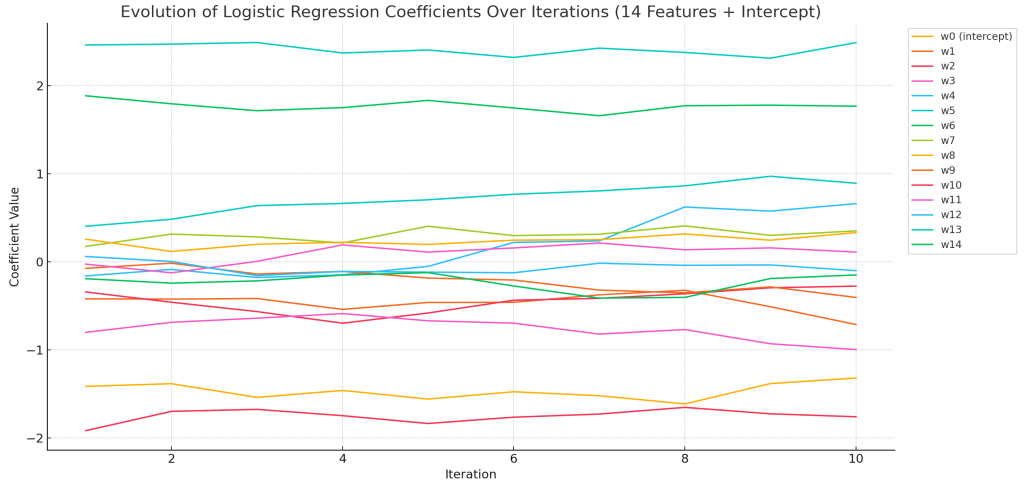



- $\beta_0$ is de intercept (bias term),
- $\beta_1, \ldots, \beta_d$ zijn de coëfficiënten voor de $d$ features.

Model training result of 1 node (intercept + weights)




Iterations to come to convergence



# REAL WORLD USE CASES FHIN (DATA QUALITY)

## LUNG CANCER

PREDICT SIX WEEK SURVIVAL AT START OF FIRST TREATMENT AS A BINARY OUTCOME (survived/died)

FEATURES OMOP CDM per FHIN partner

- PERSON TABLE
  - AGE
- DEATH TABLE
- PROCEDURE OCCURRENCE
  - RADIOTHERAPY
- CONDITION OCCURRENCE
  - LUNG DIAGNOSES
  - COMORBIDITIES
- MEASUREMENT TABLE
  - LAB RESULTS
  - BMI
- DRUG EXPOSURE TABLE
  - CHEMOTHERAPY
  - IMMUNO THERAPY
  - TARGETED THERAPY
- OBSERVATION TABLE
  - SMOKING STATUS
  - WHO SCORE
  - CLINICAL TNM

## PROSTATE CANCER

PREDICT RISK AT PROSTATE BIOPSY DATE OF CLINICALLY SIGNIFICANT PROSTATE CANCER (GLEASON SCORE >= 7? YES OR NO)

FEATURES OMOP CDM per FHIN partner

- PERSON TABLE
  - AGE
- PROCEDURE OCCURRENCE
  - MRI OF PROSTATE
  - BIOPSY OF PROSTATE
- MEASUREMENT TABLE
  - PSA
- NOTE & NOTE-NLP TABLE
  - PI-RADS SCORE
  - GLEASON SCORE
- OBSERVATION TABLE
  - GLEASON SCORE
  - PI-RADS SCORE

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# FHIN RESULTS

- Locally trained lung cancer model with x FHIN partners

- Feature distribution checks → iterations
- Metric review & quality checks OK
- Federated learning strategy → averaging coefficiënts of AI models

| | FHIN partner 1 | FHIN partner 2 | FHIN partner 3 |
|---|---|---|---|
| **train_auc** | 0.8325 | 0.8663 | 0.8533 |
| **test_auc** | 0.814 | 0.8564 | 0.8335 |
| **std_train_auc** | 0.0124 | 0.0091 | 0.0169 |
| **std_test_auc** | 0.0495 | 0.0364 | 0.074 |

# FHIN GOAL

QUESTION 1:

IS IT POSSIBLE TO ACHIEVE CLINICALLY ACCURATE STANDARDIZATION AND HARMONIZATION OF MULTIMODAL DATA ACROSS MULTIPLE HOSPITALS?

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# FHIN GOAL

QUESTION 2:

CAN THIS BE DONE WITHIN A GOVERNANCE MODEL IN WHICH:
FULL CONTROL OVER DATA
OPEN SOURCE / OPEN SCIENCE
VOLUNTARY PARTICIPATION IN PROJECTS
EQUAL PARTNERSHIP?

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# Equal partnership and open



**OPEN COLLABORATION, KNOWLEDGE SHARING AND A SHARED FOCUS ON IMPROVING PATIENT CARE**

FHIN

# FHIN GOAL

QUESTION 2:

CAN THIS BE DONE WITHIN A GOVERNANCE MODEL IN WHICH:
HEALTHCARE INSTITUTIONS RETAIN FULL CONTROL OVER THEIR DATA
OPEN SOURCE / OPEN SCIENCE
VOLUNTARY PARTICIPATION IN PROJECTS
EQUAL PARTNERSHIP?

FHIN

# START OF FHIN non-profit organization dec 2024

– Foto getekend

# FHIN NEXT STEPS

- [BELHINDA, de Belgische Hospitaal-Industrie Data Alliance. Voor beter gebruik van gezondheidsgegevens | pharma.be]
- Feasibility: BELFHINDA-Lung project

pharma.be ALGEMENE VERENIGING VAN DE GENEESMIDDELENINDUSTRIE


HDA health data agency


FHIN

# Questions?

FHIN@FHIN.BE

HEALTHCARE ORGANISATION GENERATING HEALTH DATA?
Welcome to join the FHIN network!