

11th February 2025

RE-SAMPLE Project

Open challenges in digital health
research - insights and experiences

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Overview



Background on **RE-SAMPLE** project



Open challenges - Integration into healthcare



AI, Trustworthiness, Ethics, Risks

Project RE-SAMPLE (EU, 3.2021-8.2025)

- Topic

- REal-time data monitoring for Shared, Adaptive, Multi-domain and Personalised prediction and decision making for Long-term Pulmonary care Ecosystems
- Call Topic H2020-SC1-BHC-2018-2020 “Better Health and care, economic growth and sustainable health systems”

- Goals

- AI infrastructure for predictive and personalized support for treatments and coaching for COPD patients and CCs
- Empower patients with COPD and CCCs in self-care by developing a multidisciplinary, adaptive virtual companionship programme
- Drive structural change in healthcare together with patients, healthcare professionals, scientists, policy makers, and industry

www.re-sample.eu

Multidisciplinary consortium of 10 partners specialising in respiratory medicine, artificial intelligence, real-world data, privacy, ethics, data protection, and health policy.



UNIVERSITEIT TWENTE (UT)

STICHTING MEDISCH SPECTRUM TWENTE (MST)

UNIVERSITY OF PIRAEUS RESEARCH CENTER (UPRC)

SIHTASUTUS TARTU ULIKOOLI KLIINIKUM (TUK)

FONDAZIONE POLICLINICO UNIVERSITARIO AGOSTINO GEMELLI IRCCS (GEM)

FEDERATION EUROPEENNE DES HOPITAUX ET DES SOINS DE SANTE (HOPE)

DEUTSCHES FORSCHUNGSZENTRUM FÜR KUNSTLICHE INTELLIGENZ GMBH (DFKI)

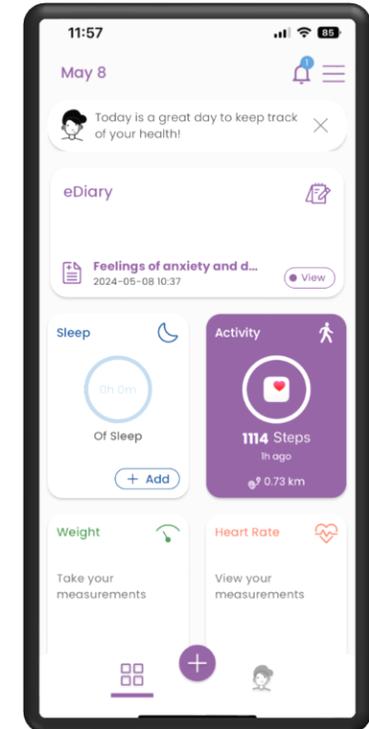
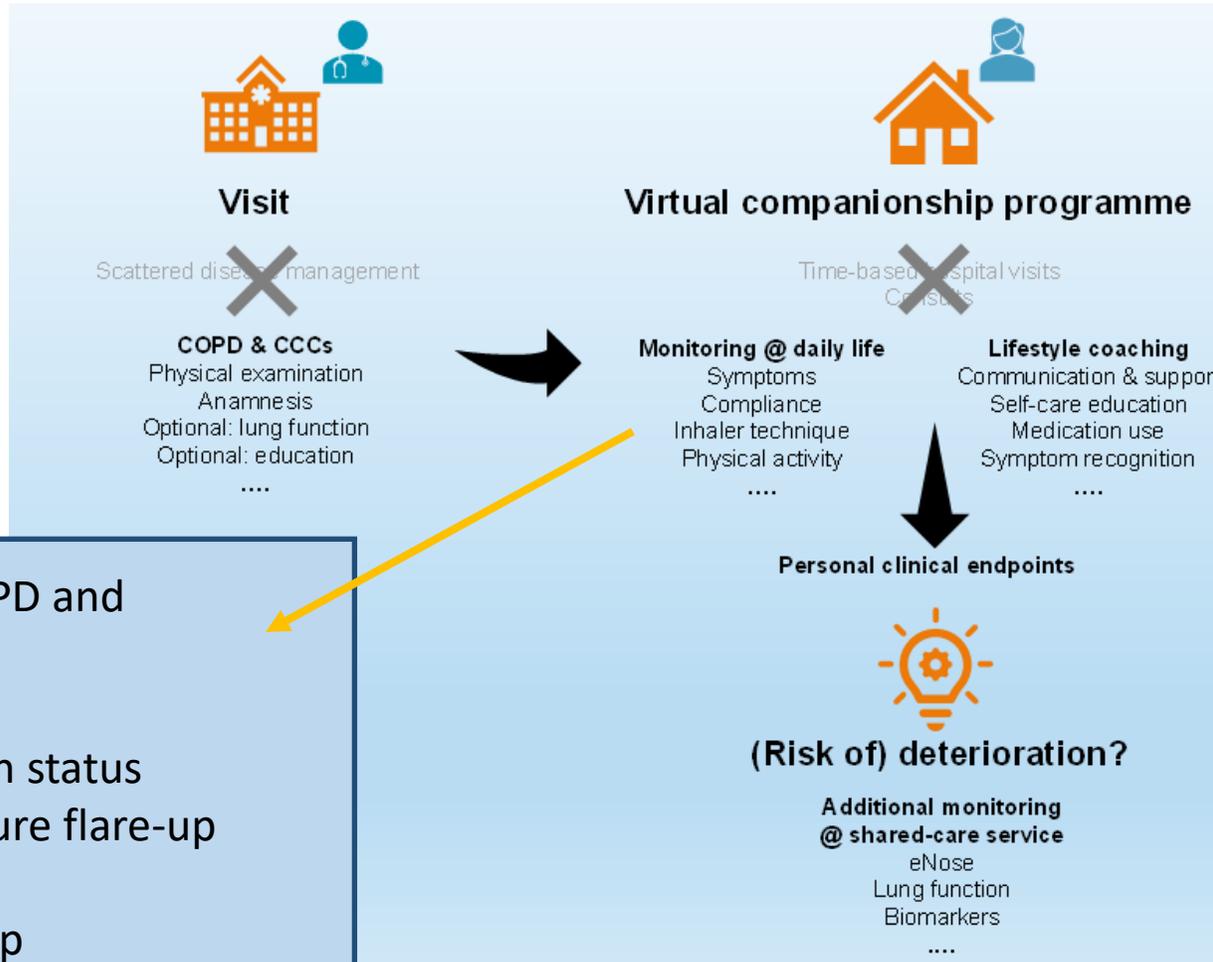
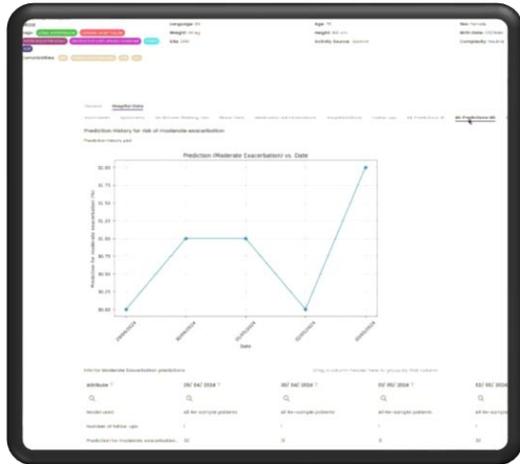
ATOS IT SOLUTIONS AND SERVICES IBERIA SL (ATOS)

ROESSINGH RESEARCH AND DEVELOPMENT BV (RRD)

INNOVATION SPRINT (ISPRINT)



RE-SAMPLE Goals

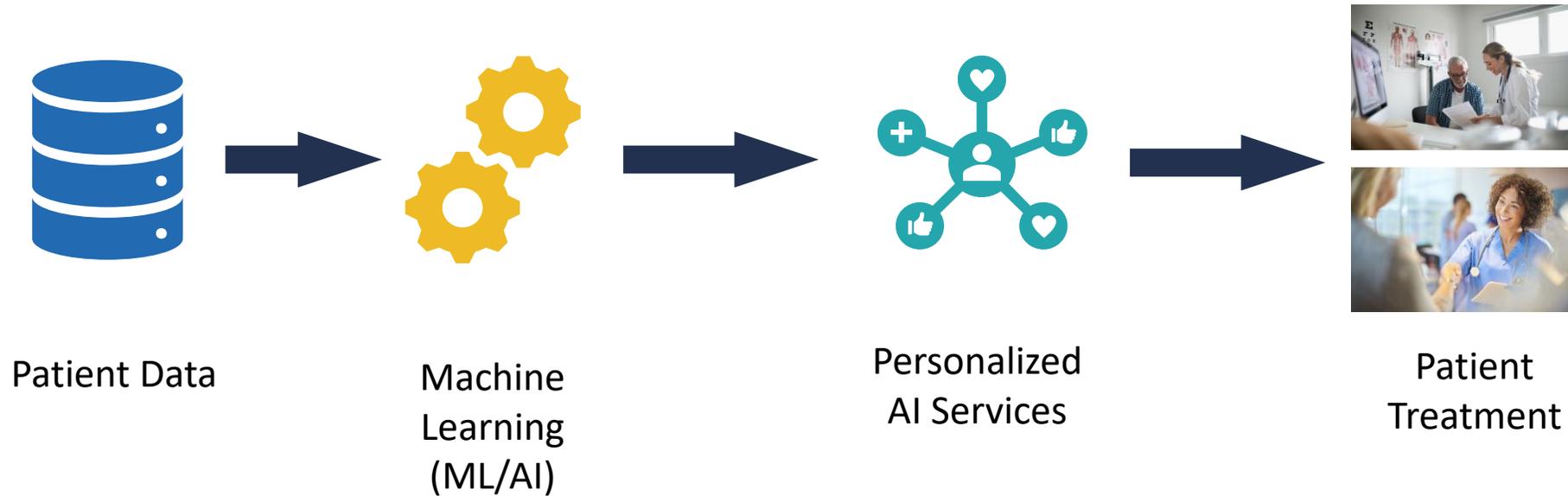


Monitor status of COPD and comorbidities

- COPD exacerbation status
- Chronic Heart Failure flare-up
- Anxiety flare-up
- Depression flare-up

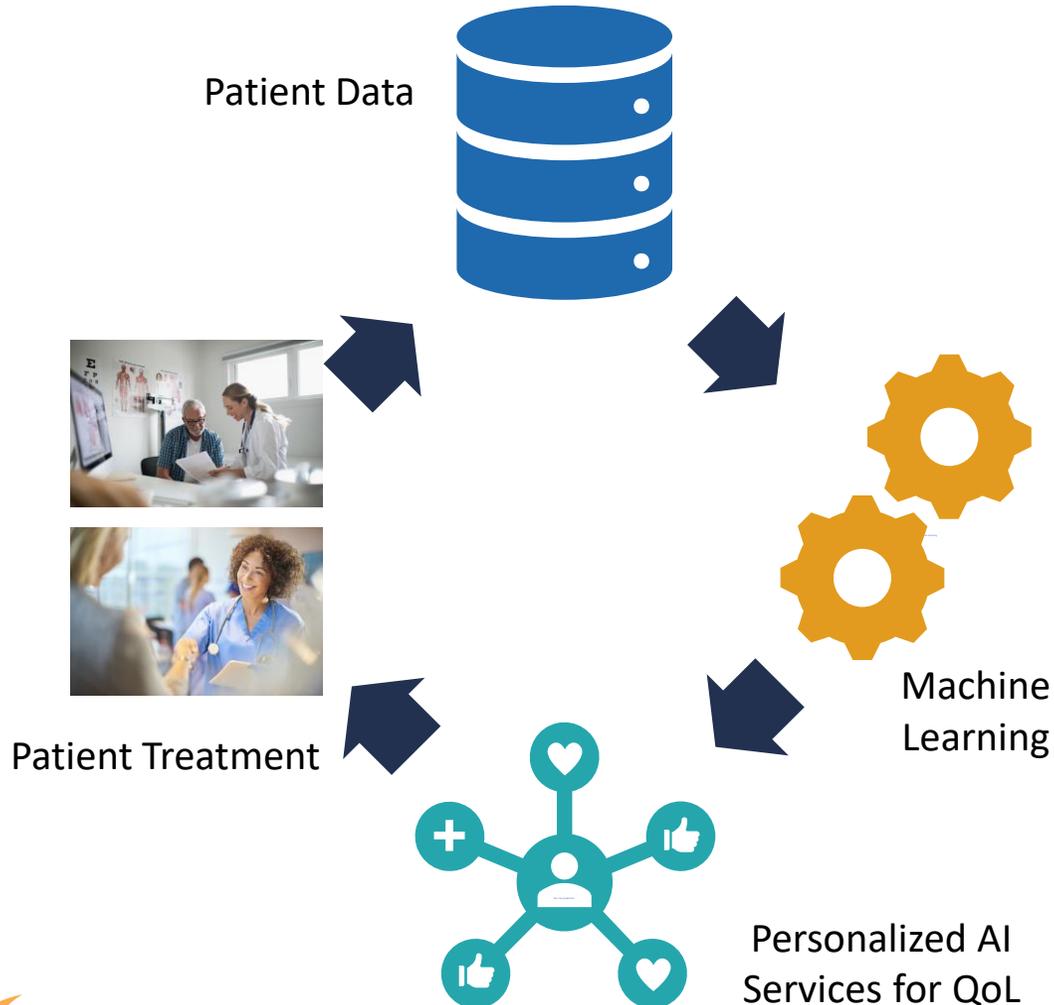


Data-driven ML-based Support for Personalized Healthcare



1. Patient Data collection and curation
2. Machine Learning Model Training
3. Use personalized AI services for patient treatment

Continuous Data Collection and Learning



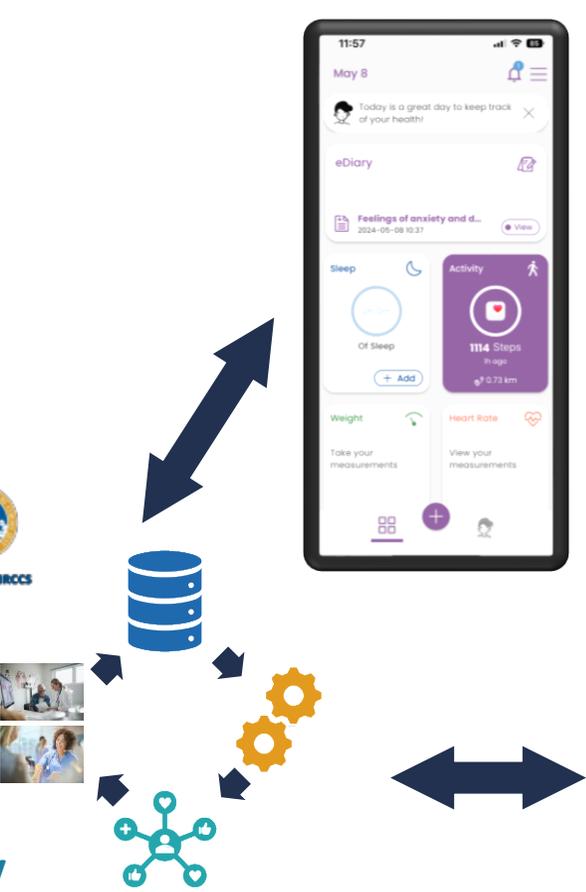
(Interacting) Sources of Requirements

-  Privacy of processed data
-  Security of systems and communication
- UX** Usability in Clinical Practice

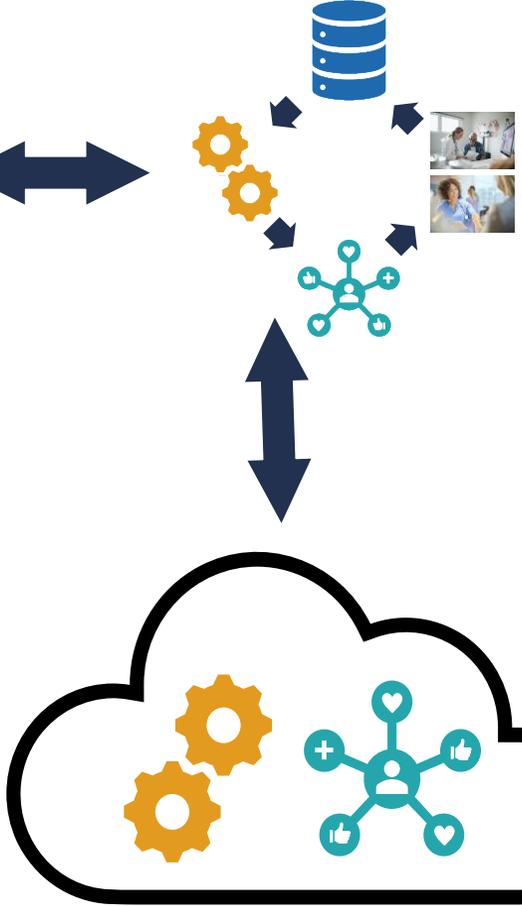
Cooperative. Distributed. Open.



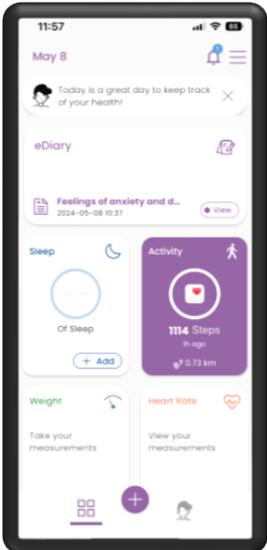
Rome, Italy



Enschede, The Netherlands



Tartu, Estonia

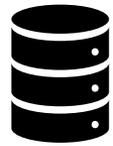


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Open challenges

Technical

Data harmonization & Data availability



- ✓ High effort in system integration for hospital IT departments
- ✓ Questionnaire answers are filled in voluntarily by patients

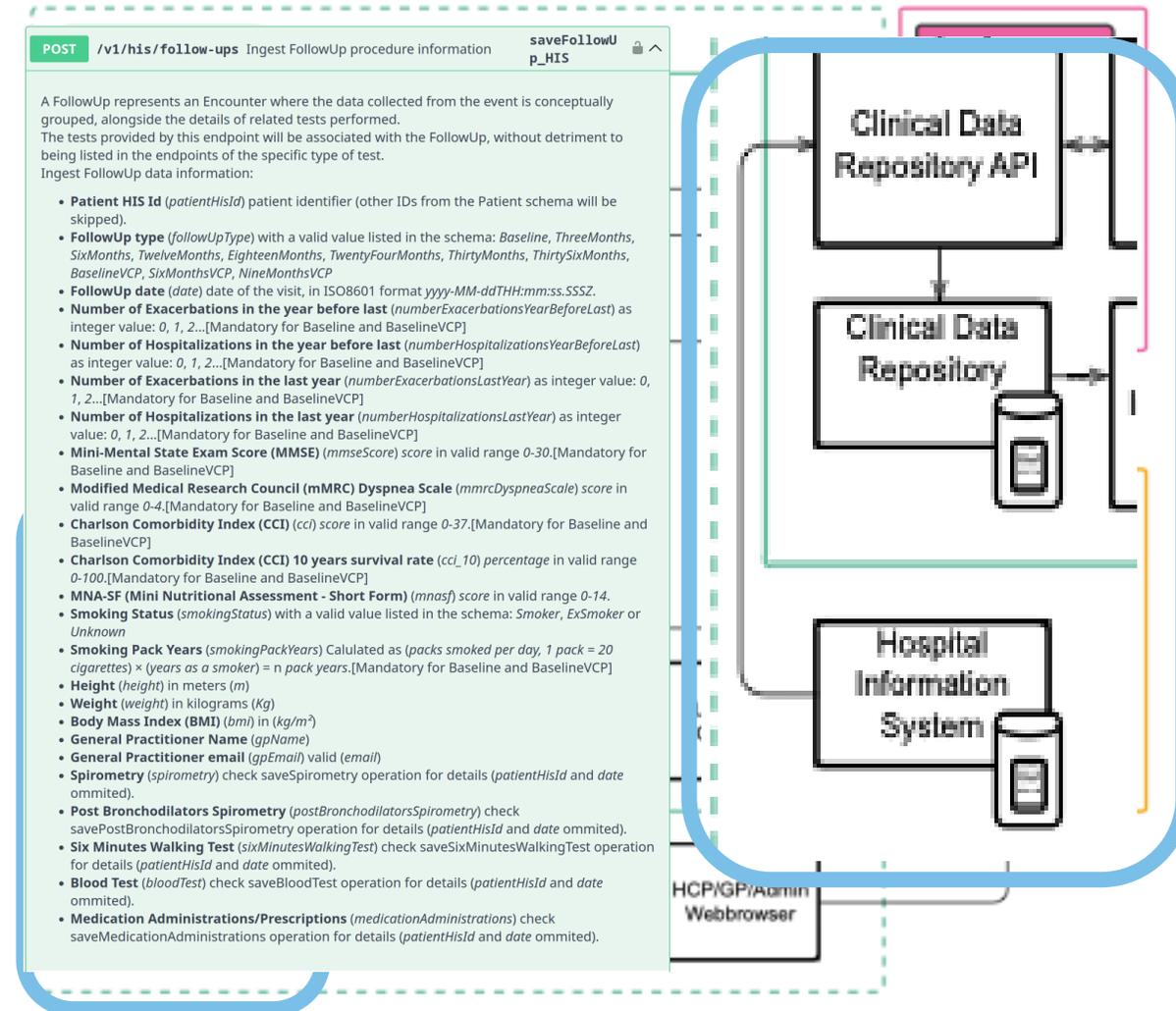


Operational

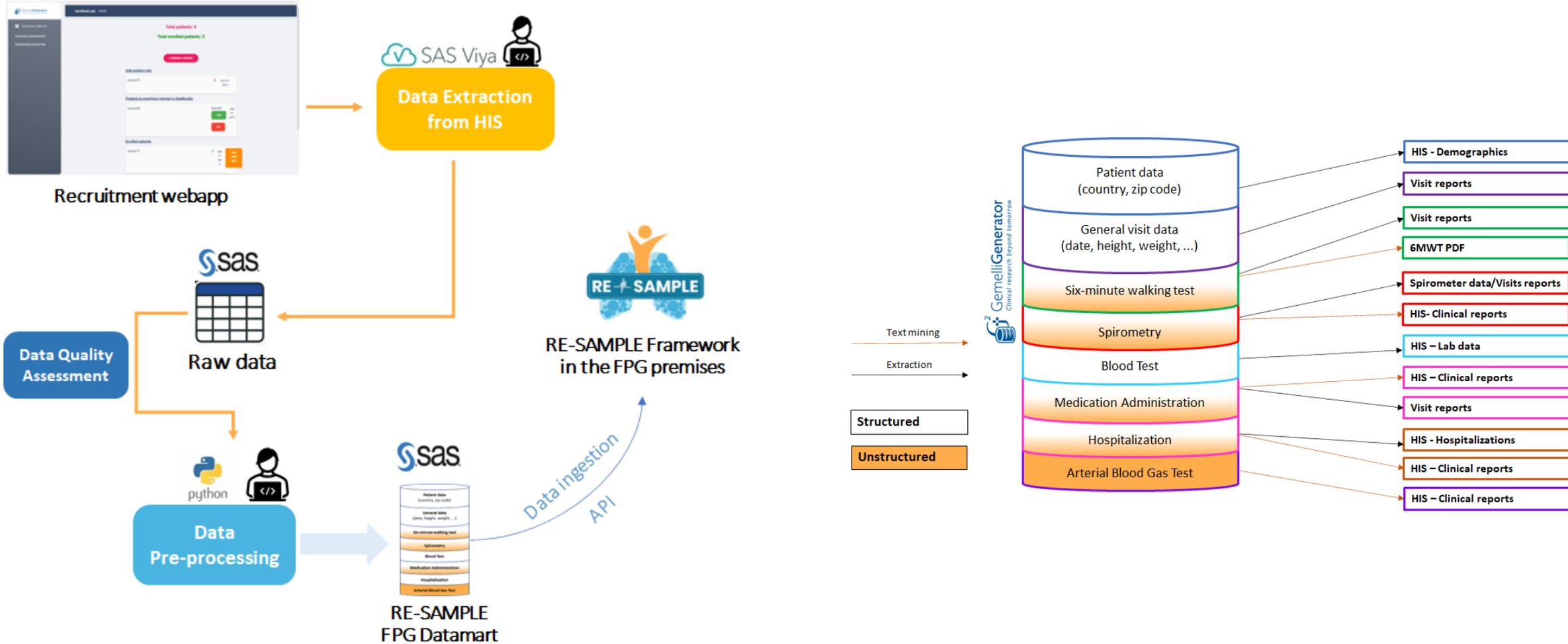
- ✓ Clinician engagement in the use of digital tools and analytics
- ✓ Clinician workload increase or necessity for additional clinical personnel: patient monitoring, alert management

Support Integration into local Hospital ITs

1. Internally used HL7 FHIR
 - Interface build using OpenAPI 3.0
 - Schema-based data ingestion validation
 - Client-Code-generation for variety of programming languages
2. Nevertheless, problems to interface HIS
 - a) Data not available digitally or no data export available
 - b) Data available, but in different form, requiring adjustment/computation.

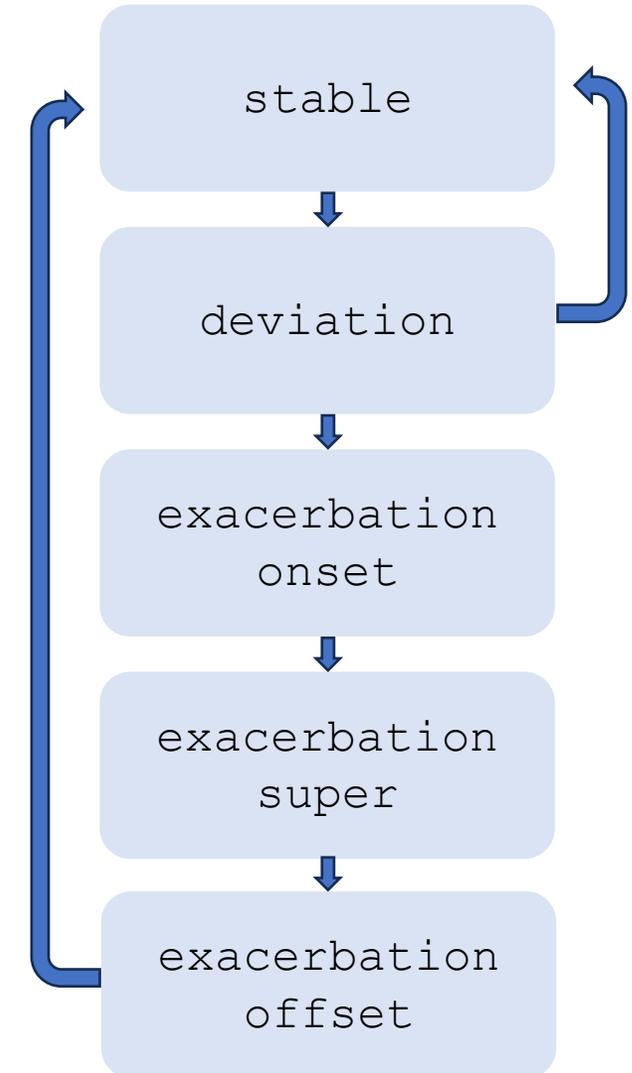


GEM Infrastructure



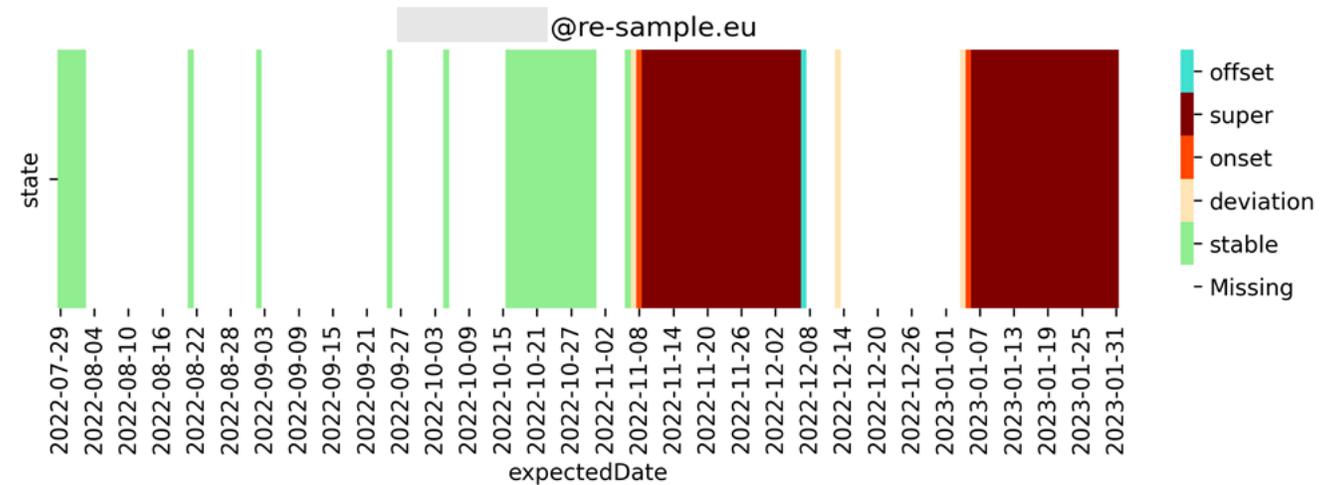
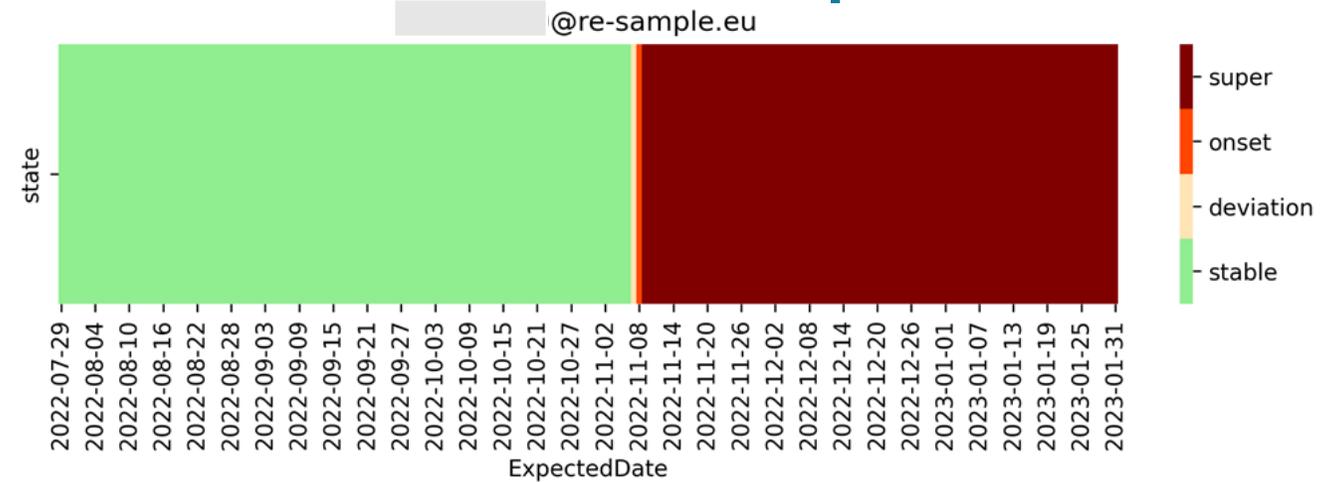
Overview of exacerbations in COPE-III protocol

1. Patient is in `stable` state
2. If patient has more symptoms than usual and lung symptoms questionnaire score is ≥ 110 patient **for 2 consecutive days** enters `deviation` state
3. If this repeats on the next day, patient enters `exacerbation onset` state
4. On the next day, patient enters `exacerbation super` state (tagged with severity of symptoms)
5. When the patient is better (**3 answers** with score 0 or **7** with < 10), patient enters `exacerbation offset` state
6. Patient enters `stable` state



... and happens what somehow was to be expected

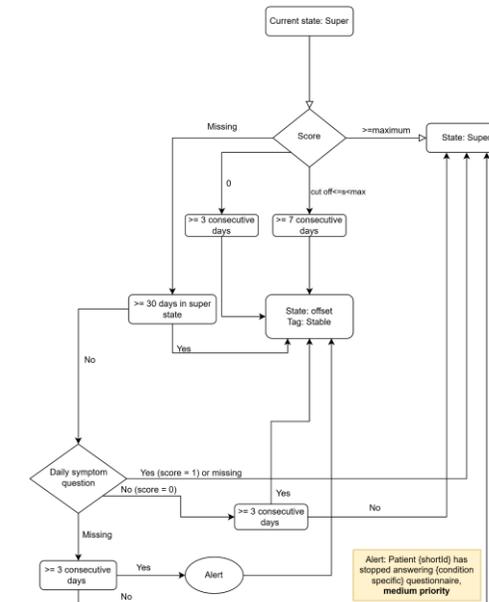
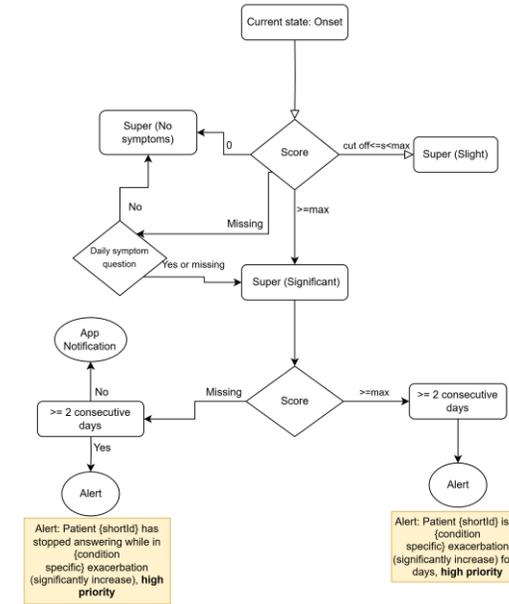
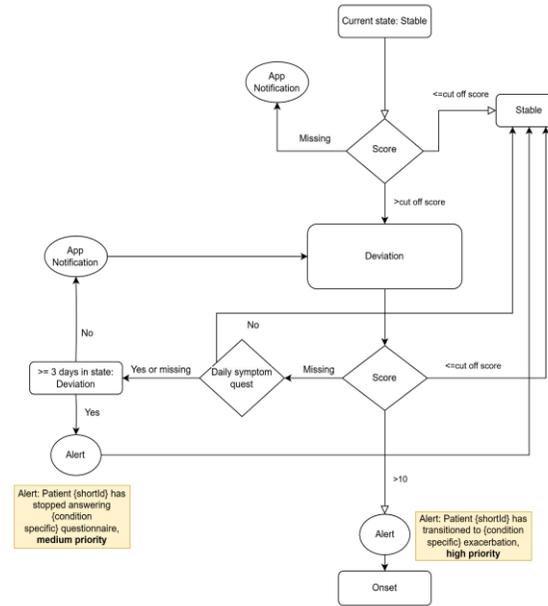
- Patients are **stuck in state** if they stop **answering** the questionnaires or the **composites**.
- Avoid risk to expose non-compliant information to both patients and clinicians.



Technical solution

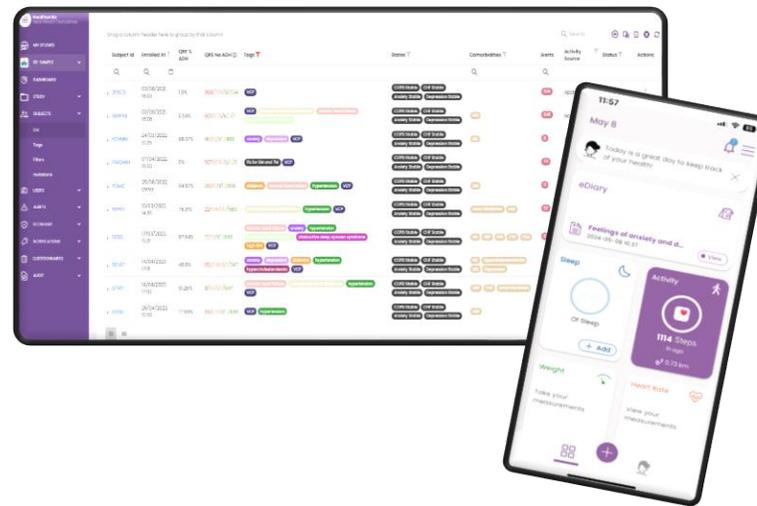
COPE III algorithm

- state transition
- missing data handling process



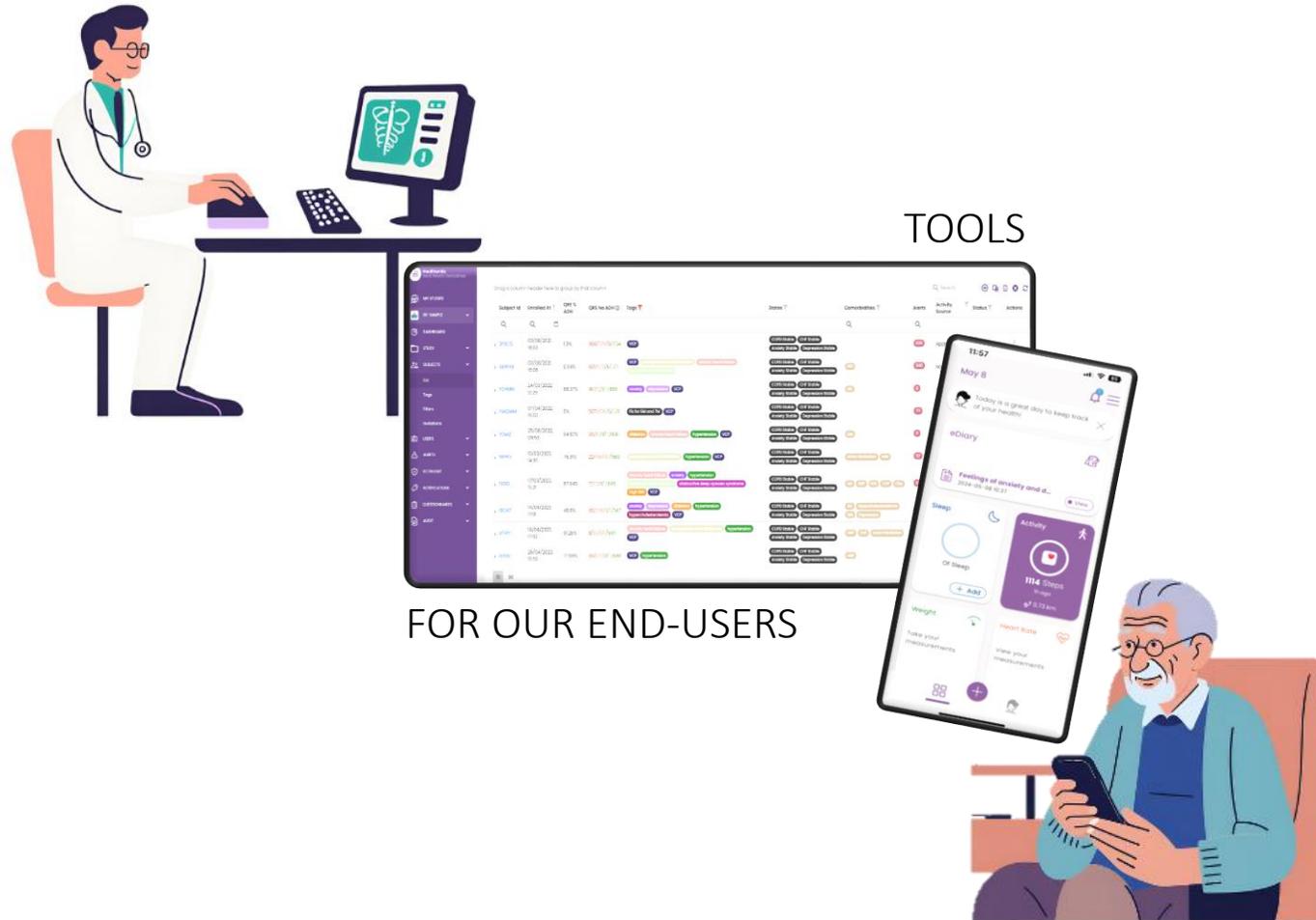
Integration into healthcare

TOOLS



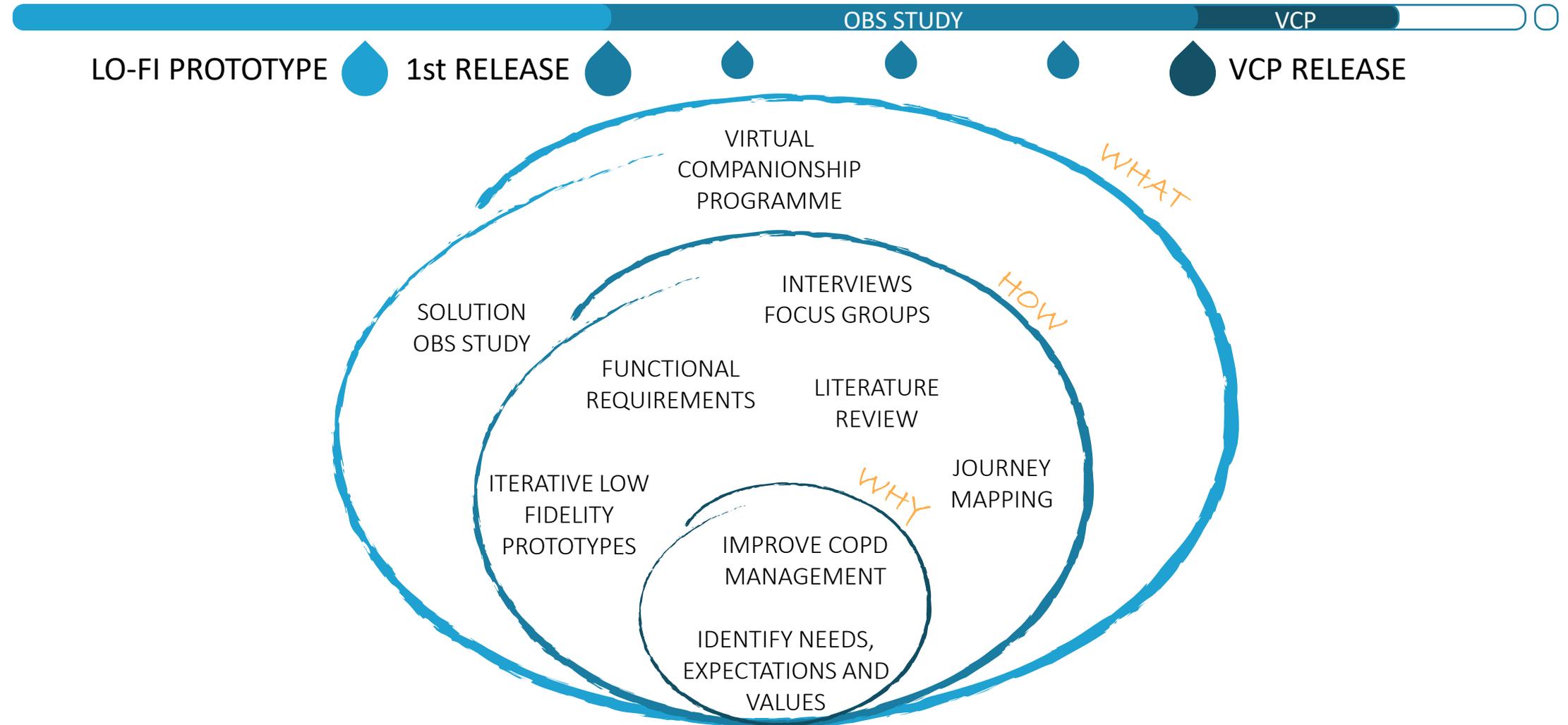
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Integration into healthcare



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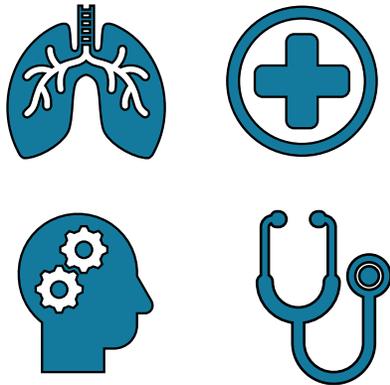


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Integration into healthcare

OBS STUDY

VCP



WHAT?

SUPPORT MATERIAL
TRAINING SESSION
COACHING



HOW?

CHANGE MANAGEMENT
remapping processes, roles and responsibilities



Patient Journey



AI, Trustworthiness, Ethics, Risks

- ✓ Ethical Committee approval and informed consent
- ✓ Onboarding phase
- ✓ Improved understanding of the pathology
- ✓ Improved engagement in the care pathway
 - PT-HCP relationship
 - Self-management
- ✓ Patient-centred design
- ✓ Improved disease management through continuous monitoring and collection of new types of data
- ✓ Personalized treatments
- ✓ RE-SAMPLE process as a whole is privacy compliant
- ✓ AI models transparency and accuracy
 - AI outcomes integrated in a clinical dashboard co-designed with the clinicians
- ✓ 3 European pilot sites NL, IT, ET with diverse COPD disease stages and complex chronic conditions
- ! Digital divide

AUTONOMY

BENEFICENCE

NONMALEFICENCE

JUSTICE



Thank you very
much!



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