

Bringing clinical and research data together for the benefit of patients

SPHN | Swiss Personalized Health Network

PHRT | Personalized Health and Related Technologies

Dr. Thomas Geiger, Managing Director SPHN

Prof. Bernd Wollscheid, Chair PHRT Executive Committee

Thinking end-to-end...

1) PROJECT PLANNING
“What data are available and are they fit-for-purpose?”



2) PROJECT INITIATION
“Requirements to use the data?”

2



3) DATA PREPARATION
“Are data interoperable and de-identified?”

3



4) DATA TRANSFER AND ANALYSIS
“Where can I analyze sensitive data?”

4

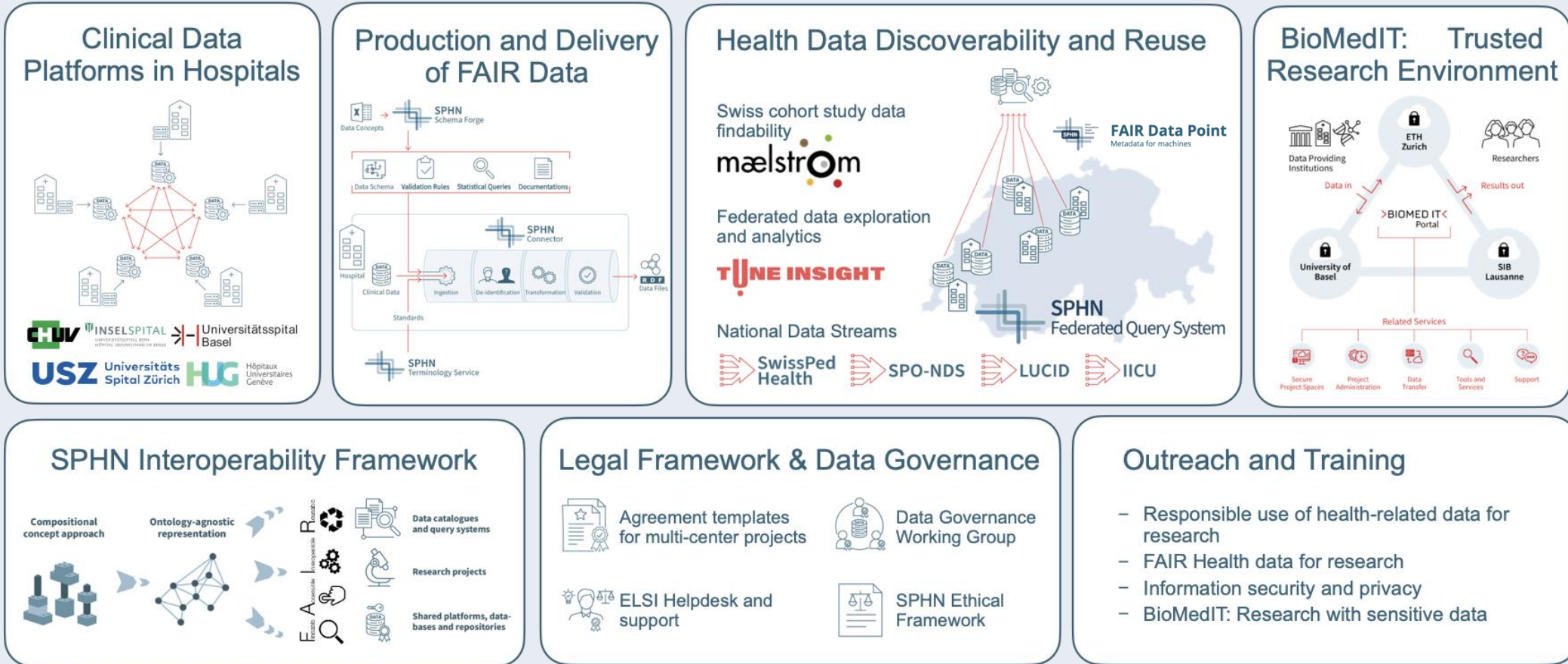


5) DATA REUSE
“How can I make data accessible to other researchers?”

5



Established SPHN data infrastructures and services

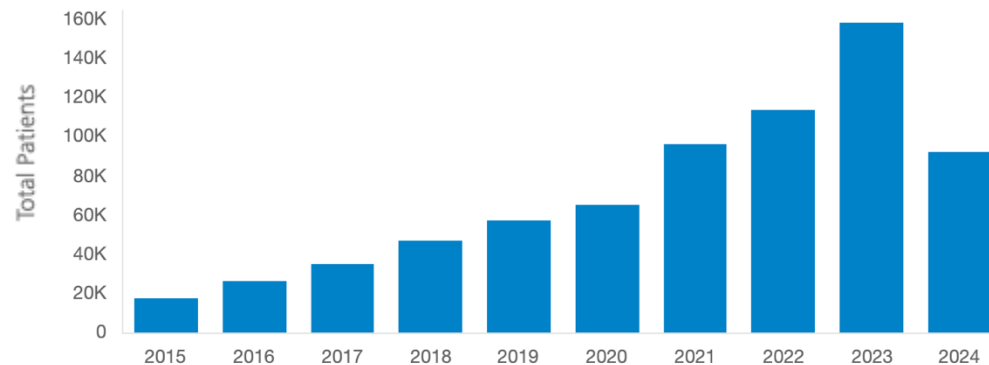


From Health Data Discoverability...

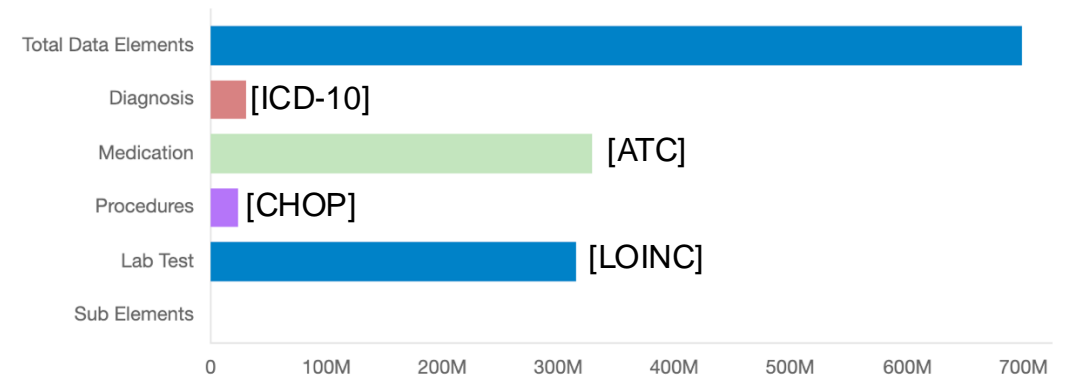
Federated Query System

- > **710'000 patients** (general consent), 5 hospitals
- > **699'000'000 data elements**: *Demographics, Diagnoses, Procedures, Medication, Laboratory tests and values*

New Patients admitted to Hospital per Year

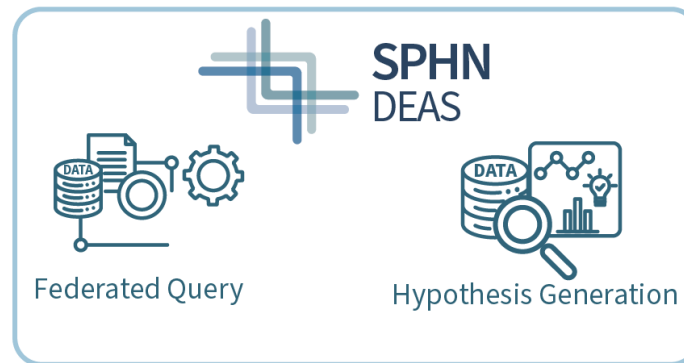


Data Element Distribution by Category

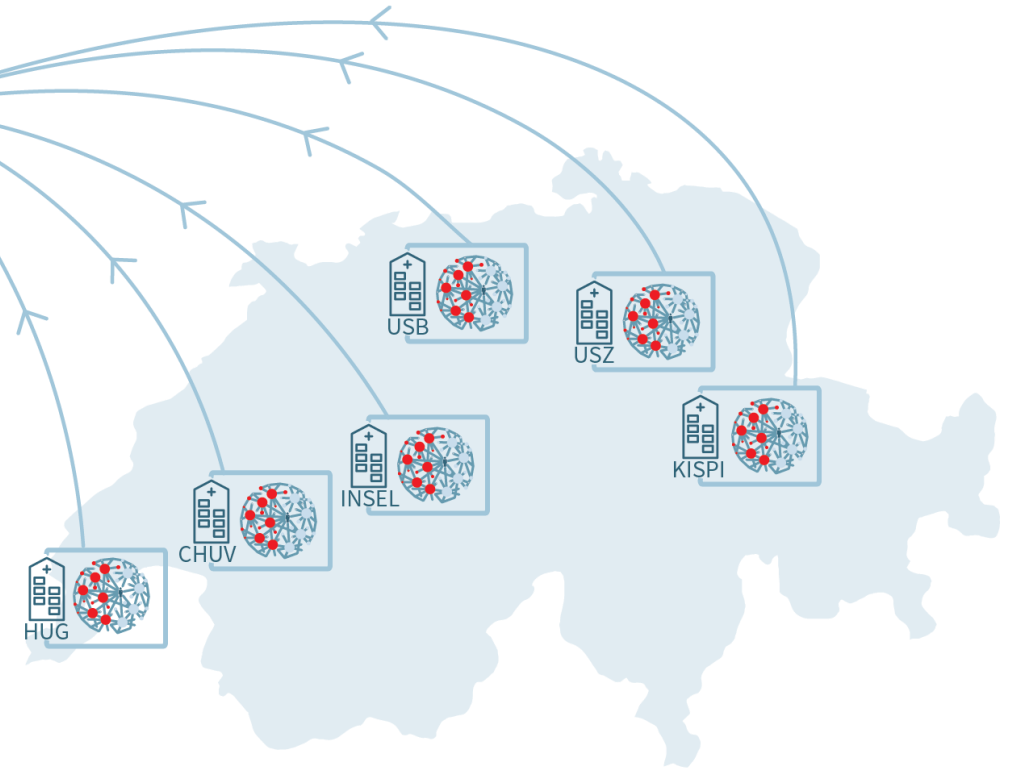


... to Federated Data Exploration

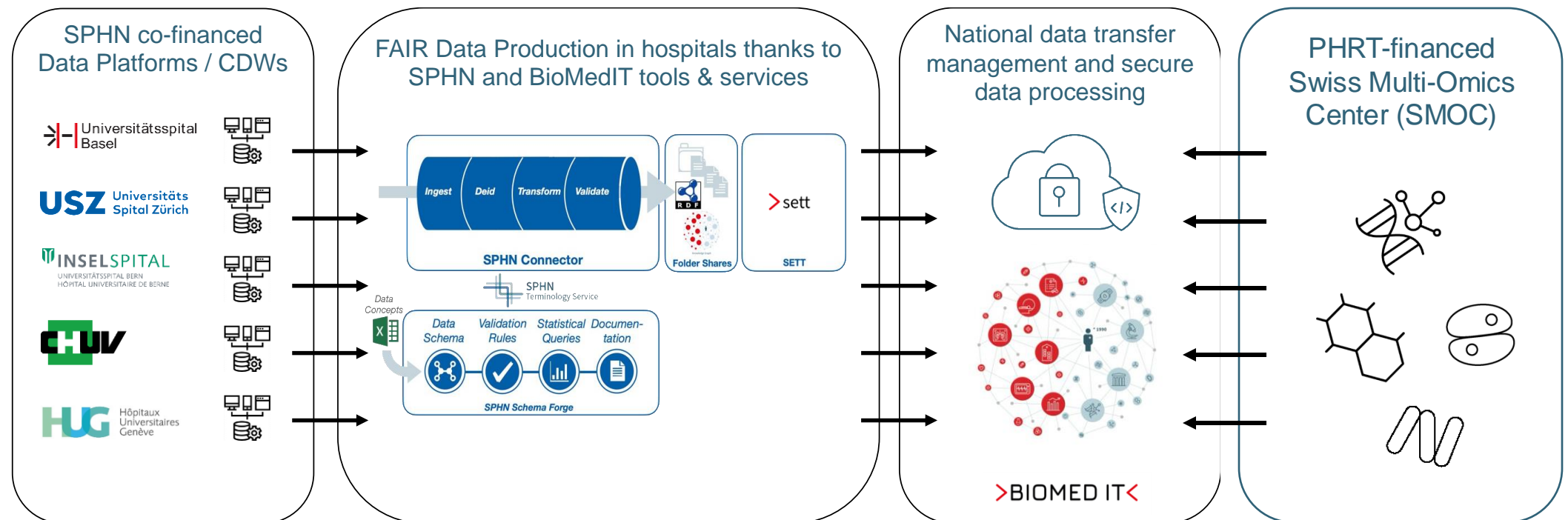
Data Exploration & Analysis System (2025)



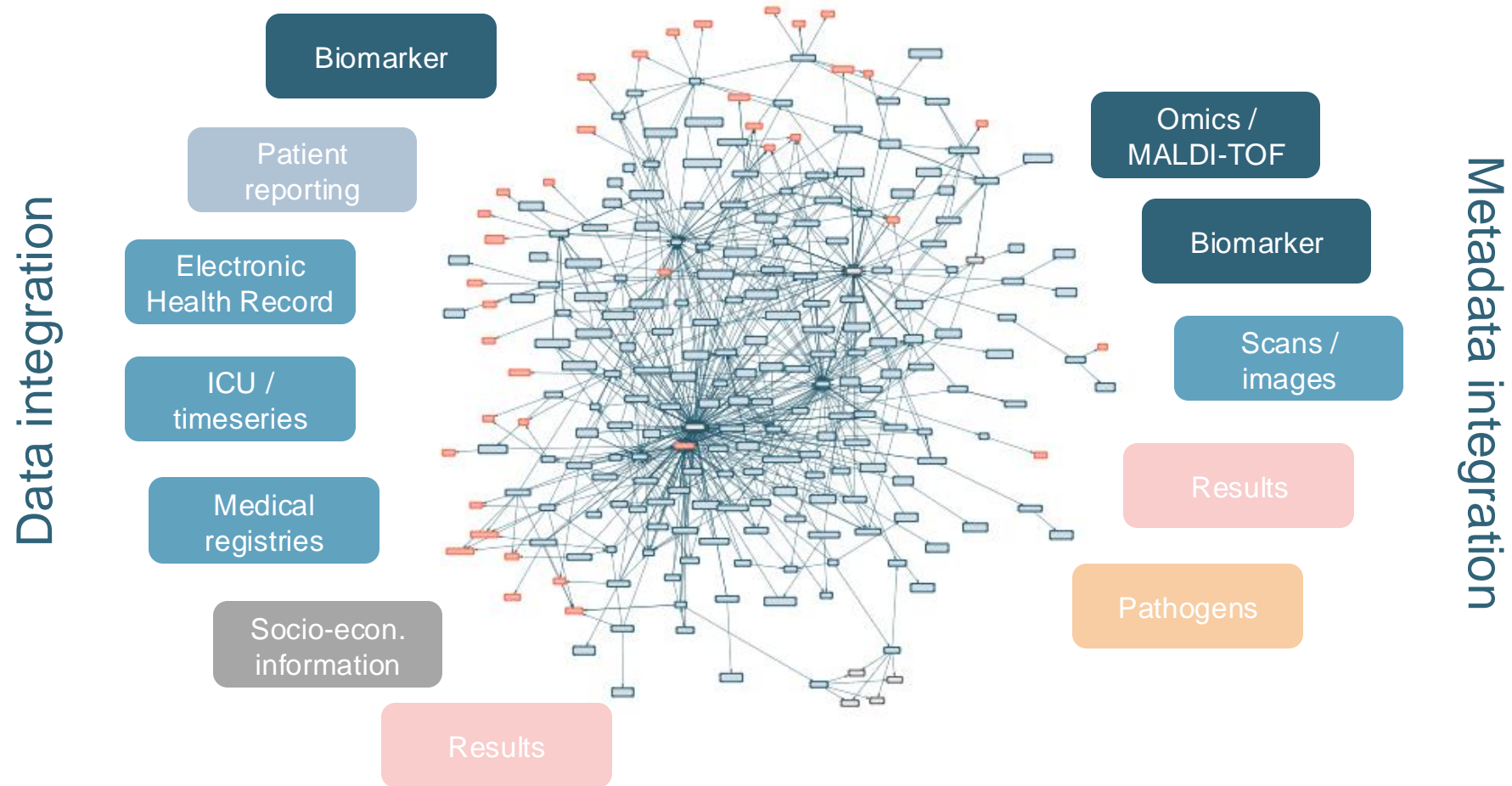
- Full SPHN Dataset (>165 clinical parameters)
- All patients with General Consent since 2018 from 6 hospitals
- Value distribution and survival curves of patient cohorts
- Fully privacy preserving, powered by **TUNE INSIGHT**




Bringing it all together - National Data Streams (NDS)



NDS - reusable, meaningful and growing Knowledge Graphs



SPHN-PHRT National Data Streams



IICU

Strategic Focus Area
Personalized Health
and Related Technologies

Personalized, data-driven prediction and assessment of infection-related outcomes in Swiss ICUs (IICU)

Main PIs: Prof. Dr. Adrian Egli (UZH) & Prof. Dr. Catherine Jutzeler (ETHZ)

Duration: 01.09.2022 - 31.08.2025 (36 months)

Award: CHF 5 Mio

[Lay summary](#) | [More information](#)



SPO-NDS

Strategic Focus Area
Personalized Health
and Related Technologies

Swiss Personalized Oncology National Data Stream (SPO-NDS)

Main PIs: Prof. Dr. Olivier Michelin (CHUV) & Prof. Dr. Bernd Bodenmiller (ETHZ)

Duration: 01.09.2022 - 31.08.2025 (36 months)

Award: CHF 5 Mio

[Lay summary](#) | [More information](#)



SwissPed Health

Strategic Focus Area
Personalized Health
and Related Technologies

Pediatric personalized research network Switzerland (SwissPedHealth) – a Joint Pediatric National Data Stream

Main PIs: Prof. Dr. Luregn Schlapbach (University Children's Hospital Zurich) & Prof. Dr. Julia Vogt (ETHZ)

Duration: 01.09.2022 - 31.08.2025 (36 months)

Award: CHF 5 Mio

[Lay summary](#) | [More information](#)



LUCID

Strategic Focus Area
Personalized Health
and Related Technologies

LUCID, Low Value of Care in Hospitalized Patients, a National Data Stream on Quality of Care in Swiss university hospitals

Main PIs: Dr. Marie Méan (CHUV) & Dr. Guillaume Obozinski (EPFL)

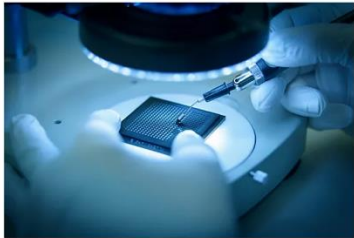
Duration: 01.09.2022 - 31.08.2025 (36 months)

Award: CHF 5 Mio

[Lay summary](#) | [More information](#)

Personalized Health and Related Technologies (PHRT)

- Strategic focus area of the ETH domain synergizing with SPHN



Translational Technology

A translational technology program that intends to advance innovative technologies pioneered in the ETH Domain for clinical application. It is intended that some of these technologies could form the basis for second-generation platforms.



Research Projects

Personalized health related research projects with direct relevance for the patient. These projects will be carried out in collaboration with and jointly funded by complementary programs such as SPHN. Joint PHRT-SPHN projects ("Driver projects") are funded via this channel.



- **125+ inter-disciplinary projects supported**
 - **incl. National Data Streams (NDS)**



Educational Program

An educational program on the PhD and postdoc level to train the next generation of scientists in personalized health research.



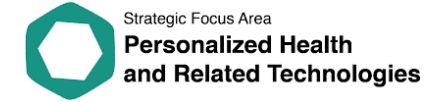
Platform Centers / Hubs

Platform Centers / Hubs to generate high-quality, high-volume individualized molecular profiling data from patients and clinical cohorts. The generated data is intended to directly inform clinical decisions. Second-generation technology platforms will primarily arise from ETH technologies developed in the first phase.

- **How can ETH infrastructure, technology & research catalyze the transformation of the healthcare system?**

Patient (Data) journey

Bringing patients' clinical and research data together



CLINICAL DATA

E.g. Clinical patient data is gathered by clinics according to SPHN interoperability standards and stored in a secure Clinical Research Database systems.

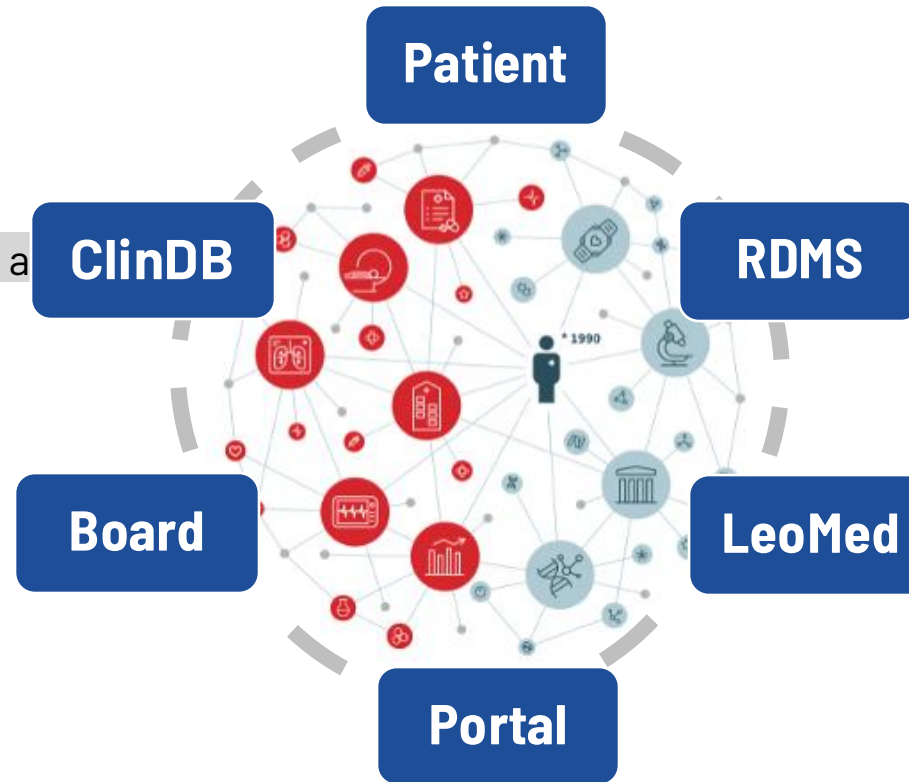
E.g. Molecular (Tumor) Board feedback, treatment, relapse, etc, longitudinal patient info is recorded to develop new therapeutic options for patients.

E.g. Patient owns the data & shares the data with consortium partners via informed consent

RESEARCH DATA

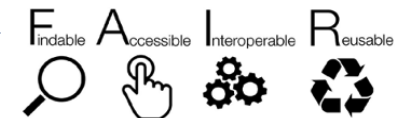
E.g. Structured research data generated by SMOC and others is stored, analyzed, and visualized in a secure Research Data Management System.

E.g. Secure data processing infrastructure incl. LeoMed, ALPS etc

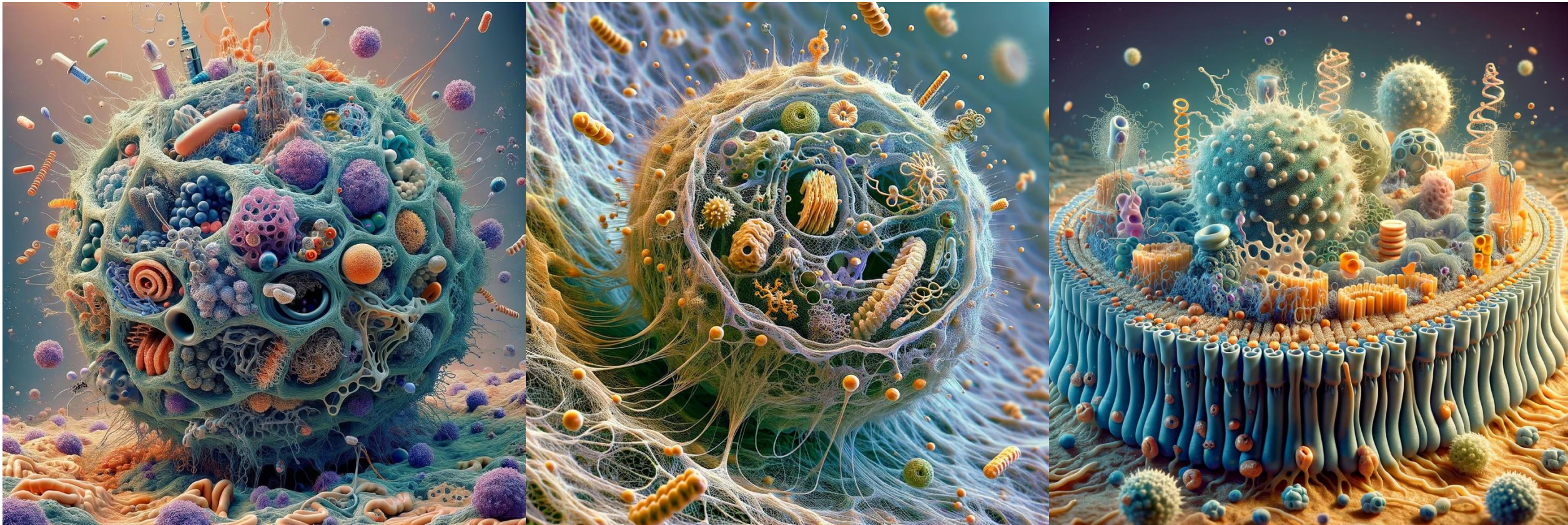


E.g. **FAIR Data ecosystem**

Entry point for "quick win" analyses and the development of predictive models for national and international clinical researchers



Wouldn't it be great if we could predict clinical outcomes based on multi-modal data?

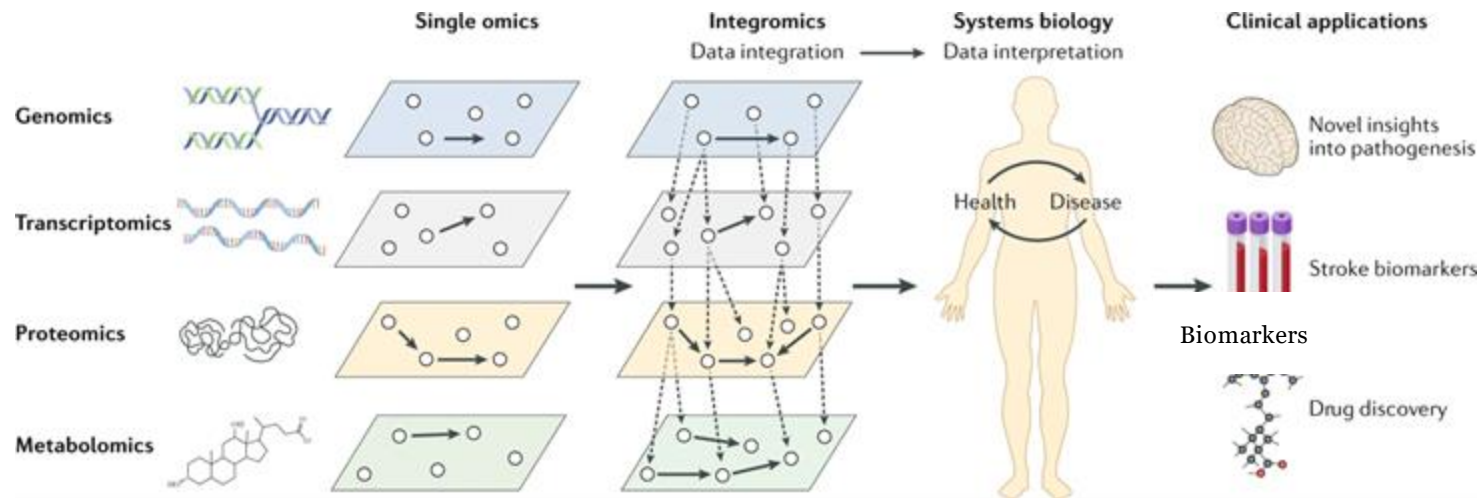


Chat GPT 4.0 / DALL-E, October 2024

“A highly detailed and accurate illustration of the cellular surfaceome and lipid rafts”

Personalized Health builds on the combination of clinical and molecular data

sd



J. Montaner et al., *Nat. Rev. Neurol.* (2020).

- Clinical samples cannot be regenerated.
- Turning clinical specimens into searchable and reusable digital biobanks would facilitate retrospective and highly-powered studies.
- Integrative analyses drive the discovery of mechanisms and novel targets.

- ***How can we digitize clinical biospecimens on a multi-modal level?***
 - ***How can we generate the required data layers necessary to predict drug response?***



WELCOME TO THE
ETH PHRT
Swiss Multi-Omics Center


INTEGRATED DIGITIZATION OF CLINICAL BIOSPECIMEN COHORTS ON THE MOLECULAR LEVEL

DNA | RNA | Protein | Metabolites | Lipids

LEARN MORE

<http://smoc.ethz.ch>

Hope for patients with a severe rare disease



ETH zürich

News & events | ETH Zurich | Studies at ETH Zurich | Doctorate | Research | Industry & Knowledge Transfer | Campus

Hope for patients with a severe rare disease

By combining the results of multiple molecular analyses, scientists can better diagnose the hereditary disease methylmalonic aciduria. There is also hope with regard to therapy.

- Methylnmalonic aciduria (MMA) is an inborn error of metabolism with multiple monogenic causes and a poorly understood pathogenesis.
- Physicians have relied mainly on DNA sequencing for genetic diagnosis of Methylnmalonic aciduria (MMA).
- This approach has led to repeated instances of the correct diagnosis being overlooked.

Network brings success

nature metabolism



Article

<https://doi.org/10.1038/s42255-022-00720-1>

Integrated multi-omics reveals anaplerotic rewiring in methylmalonyl-CoA mutase deficiency

Received: 11 April 2022

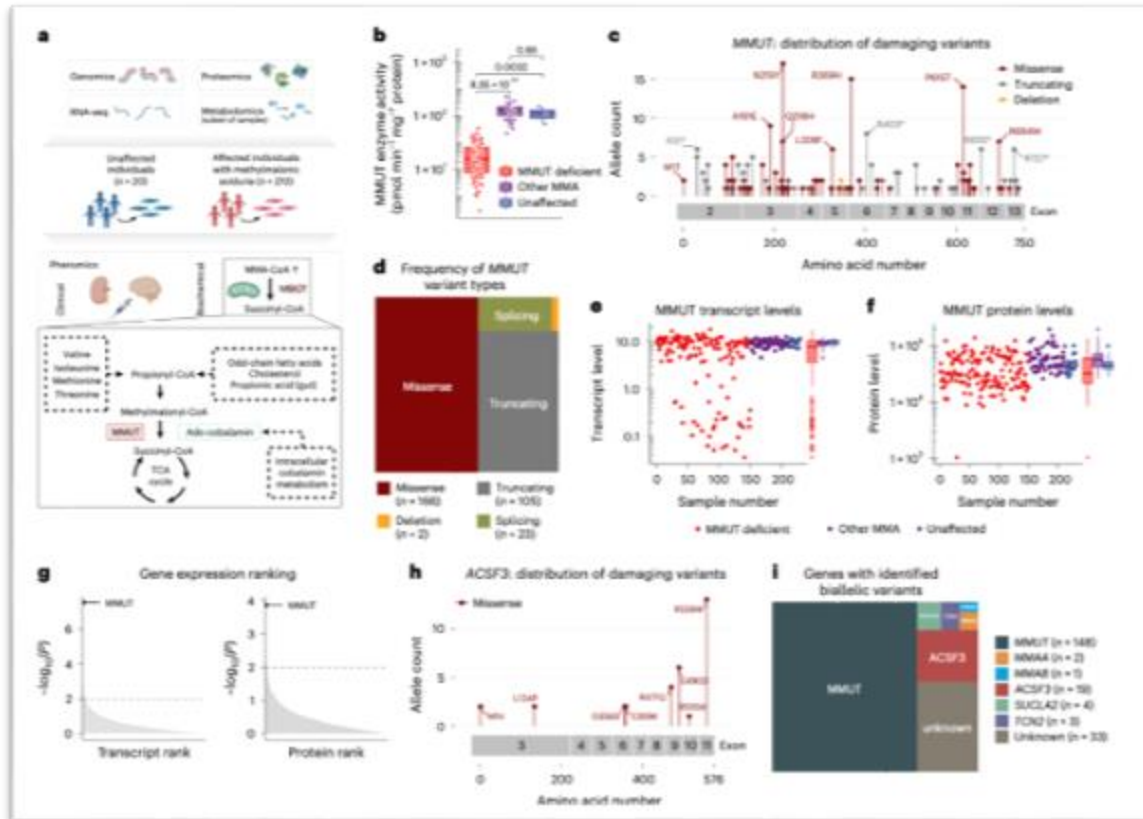
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Check for updates

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Multi-dimensional analysis enables new insights into disease biology



- 210 patient biopsies were studied in detail on the level of all of the genes (DNA) in the patient's cells, but also the RNA transcripts of these genes and many of the proteins.

- Integrative data analysis led to the development of a diagnostic strategy that correctly diagnosed 84 percent of the patients examined!

New approach not only to MMA therapy

News & views

Mechanisms of disease

Anaplerosis in action

Pamela Sara E. Head & Charles P. Venditti

Investigation of multi-omic changes and their effects on regulation of metabolic pathways confirm anaplerotic deficiencies in methylmalonic acidaemia, strengthening the need for future therapies aimed at replenishing intermediates of the tricarboxylic acid cycle.

- Moving forward, our new strategy will drastically increase the chances for patients to receive a correct diagnosis and allow the provision of the correct treatment at a much earlier stage.
- The **project was the precursor for the NDS SwissPedHealth**, which aims to increase diagnostic effectiveness, further extend the multi-omics approach to other genetic diseases, and harmonize the continuous clinical data flow.
- Strategy revolutionizes disease/cancer diagnosis, treatment, and management by leveraging state-of-the-art technology, interoperable data, and expertise from diverse fields.

- **The long-term objective is to create artificially intelligent, mechanistic disease models that translate patient data into precision diagnosis and treatment.**

Swiss Federated Genomics Network

Aim to align with the parallel ongoing genomics/multi-omics initiatives at the European level



Genome of Switzerland



Swiss fEGA repository



Genome of Europe



**European
Genomic Data
Infrastructure**



Swiss Federated Genomics Network



Pilot stage (2024)

- Clinical-grade **WGS of 1,000 population samples**

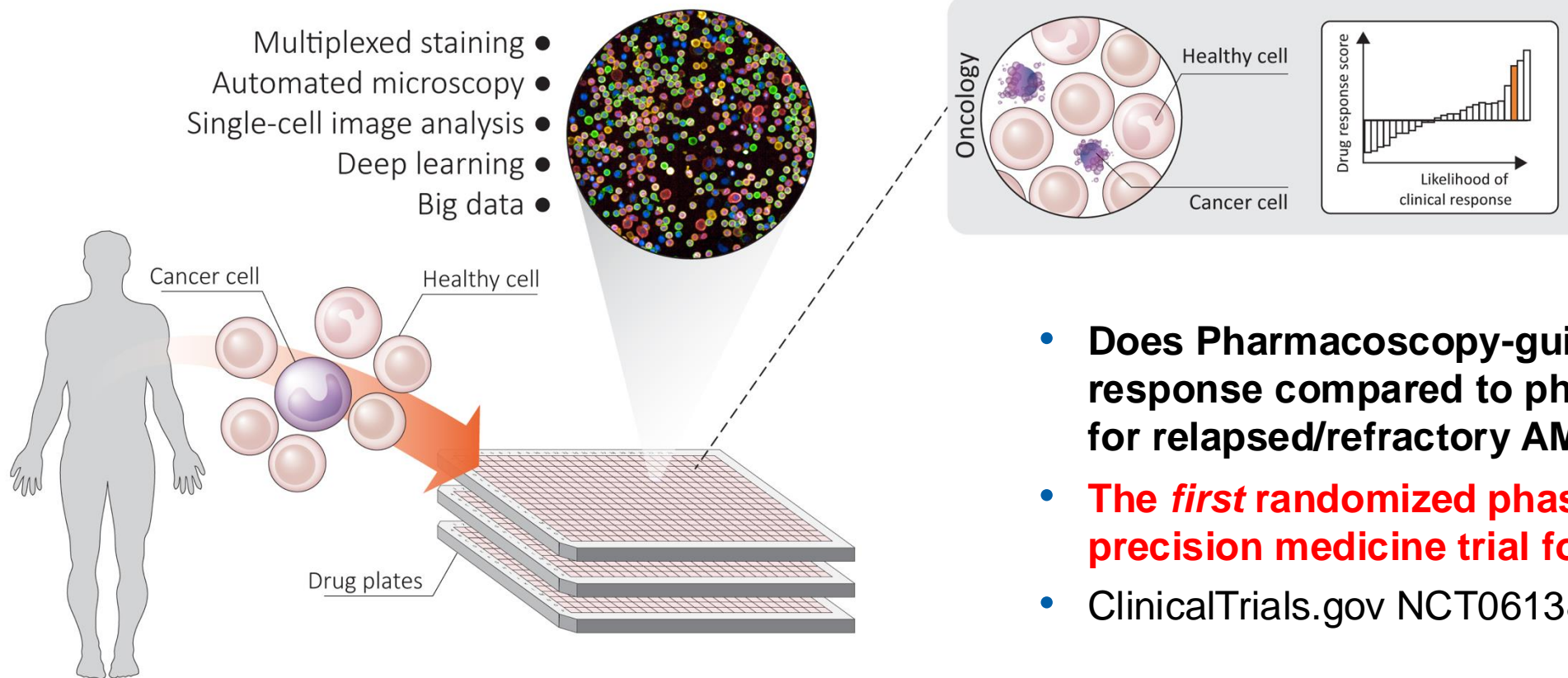


- Analysis and characterization of the pilot reference dataset
- Using pilot use cases proposed by the Genome of Europe
 1. Lookups of individual variants across the Genome of Europe
 2. Providing population distributions for polygenic risk scores
 3. Generating reference panels for ancestry-specific imputation

PHRT “RAPID” Trial

Pharmacoscopy-guided Clinical Standard-of-care in Relapsed/Refractory Acute Myeloid Leukemia (AML), a Randomized Phase-2 Clinical Trial

Pharmacoscopy: Personal image-based drug screening

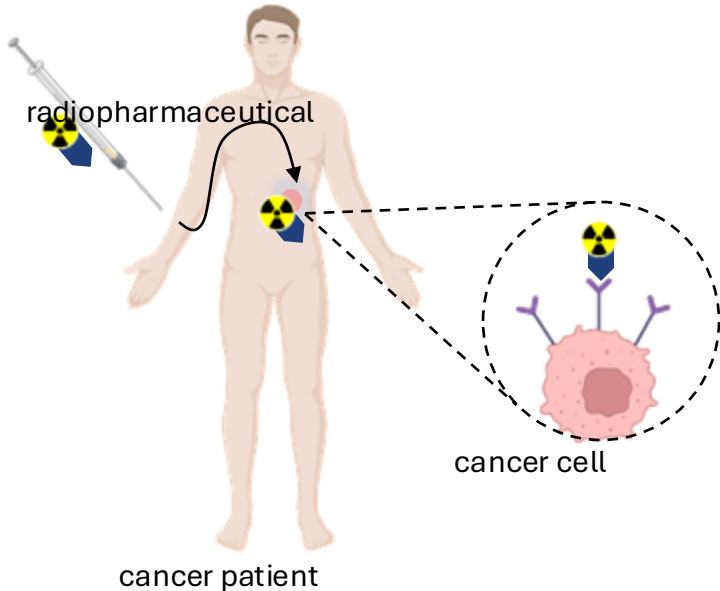


- Does Pharmacoscopy-guidance improve response compared to physician’s choice for relapsed/refractory AML patients?
- **The *first* randomized phase-2 functional precision medicine trial for AML.**
- ClinicalTrials.gov NCT06138990

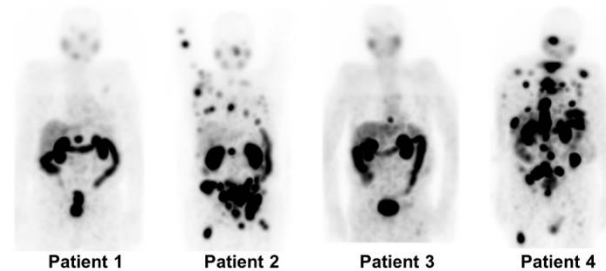
PHRT “PROGNOSTICS” Trial

PeRsOnalized theraGNOstics of metaStaTIC proState cancer, a Dose Identification/Escalation Phase Ia/b Clinical Trial

The consortium will test an innovative drug that precisely targets the tumor and emits radiation in its vicinity.



Radioligand therapy (RLT)



- Does a novel radioligand (^{161}Tb -SibuDAB) improve response compared to standard radioligand therapy (RLT) in patients with progressive metastatic castration-resistant prostate cancer (mCRPC)?
- **PSI is enabling the production of ^{161}Tb -SibuDAB (including the radionuclides)**
- [ClinicalTrials.gov NCT06343038](https://clinicaltrials.gov/ct2/show/study/NCT06343038)

Acknowledgements SPHN & PHRT

A big **“THANK YOU”** to the PHRT & SPHN “Implementation Team” across Switzerland and all of you being here today!

- Thank you to a new Swiss community of 1000+ researchers, clinicians, IT specialists & patients across Swiss clinical and research institutions.
- Thank you SERI & ETH domain, for a significant investment that enabled us to foster communication & collaboration between the diverse stakeholders in the Swiss healthcare system, driving structural changes and leveraging insights to benefit patients.
- Thanks to this community effort across stakeholders, we can now go full circle beyond scientific publications and translate data insights into new therapeutic choices for the benefit of patients validated in clinical trials.

Thanks to the enormous efforts by SPHN & PHRT boards, committees and office teams Switzerland is being recognized internationally as a driver in developing the

FUTURE OF MEDICINE