

# OpenEHR in HiGHmed

Experiences from a Modelling Journey



Establishment of a **national infrastructure** to enable secondary use of data within and across hospitals

Facilitating **cross-institutional** data access, analytics, sharing and applications

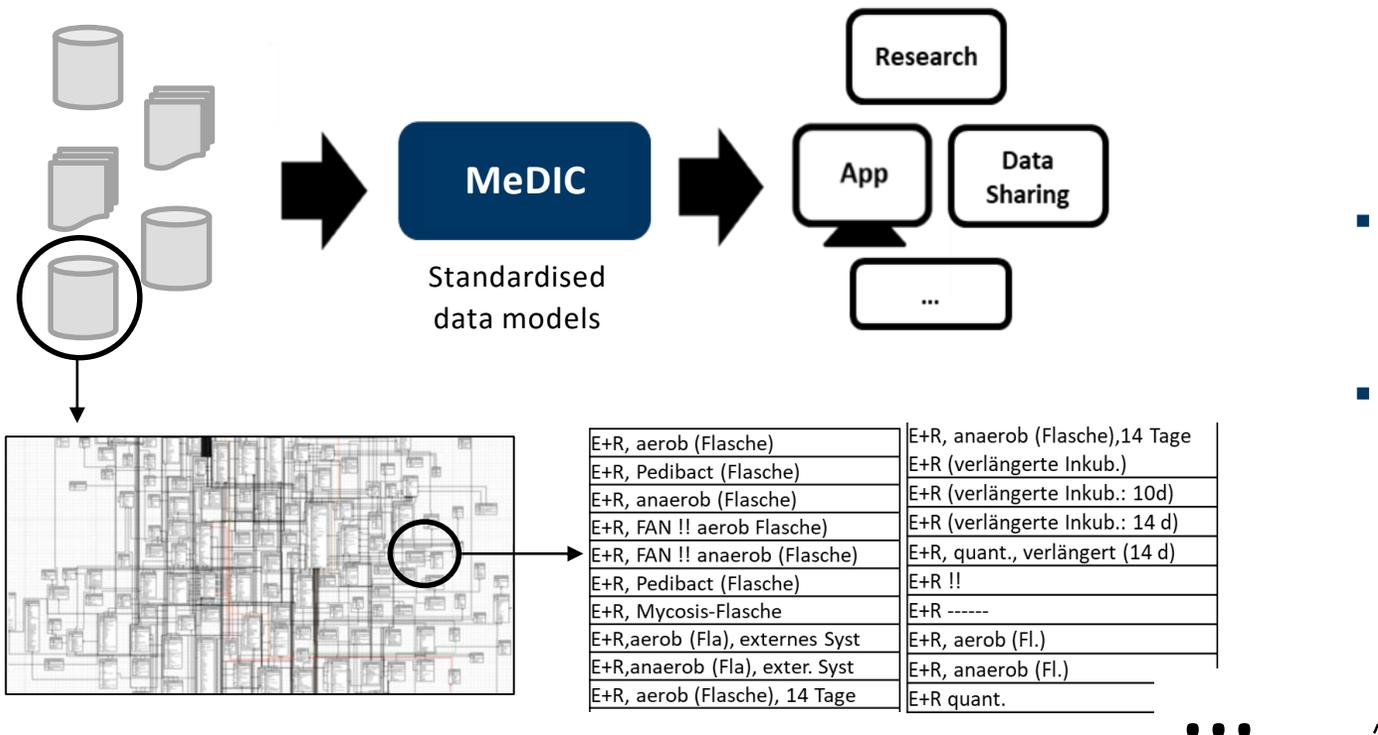
Development of semantically-enriched and interoperable **clinical information models**



2018

# First Impressions

## Integration of clinical routine data into standardised data models in the local Medical Data Integration Centres (MeDIC)



Modelling Balance

Primary Documentation

## OpenEHR Modelling in HiGHmed

### Modelling Framework

Organisational

Technical

### Modelling Activities

Workflows

Archetypes

Reviews

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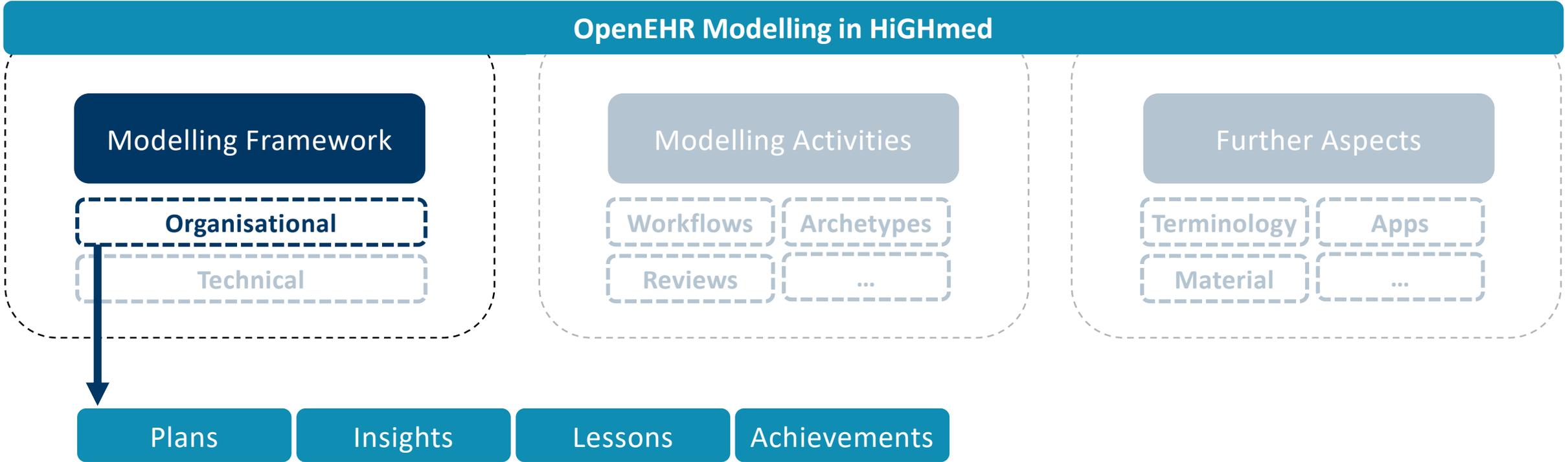
### Further Aspects

Terminology

Apps

Material

...



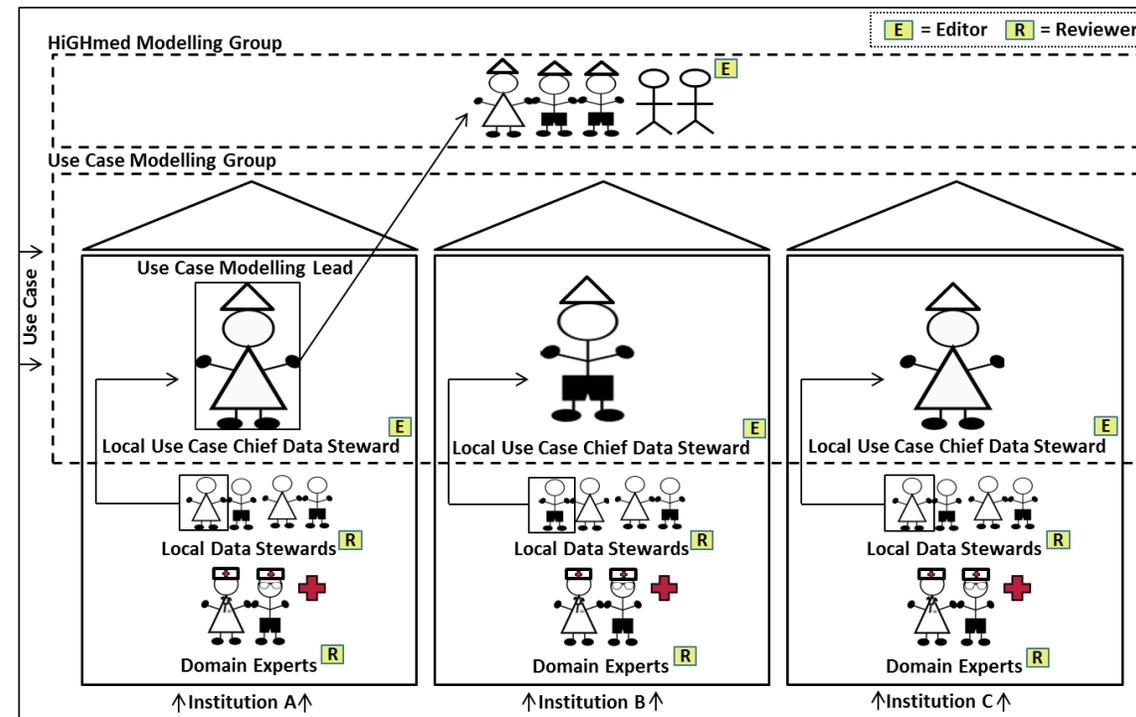
## Modelling Framework: Organisational

Plans

Insights

Lessons

Achievements



Oncology  
Cardiology  
Infection Control

Wulff A, Haarbrandt B, Marscholke M. Clinical Knowledge Governance Framework for Nationwide Data Infrastructure Projects. Stud Health Technol Inform. 2018;248:196-203.

## Modelling Framework: Organisational

Plans

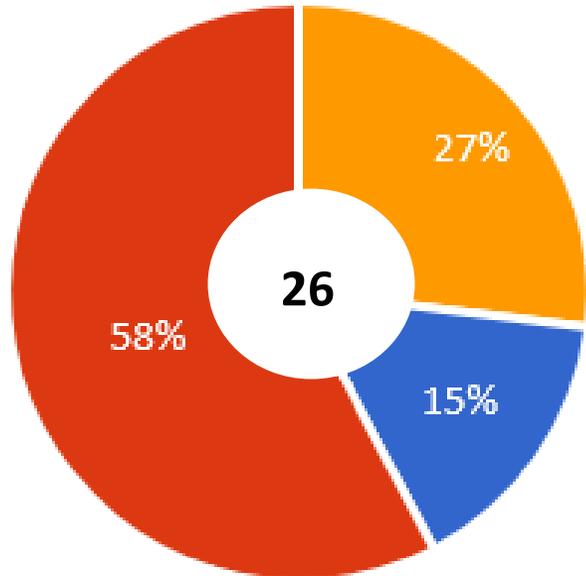
Insights

Lessons

Achievements

2019

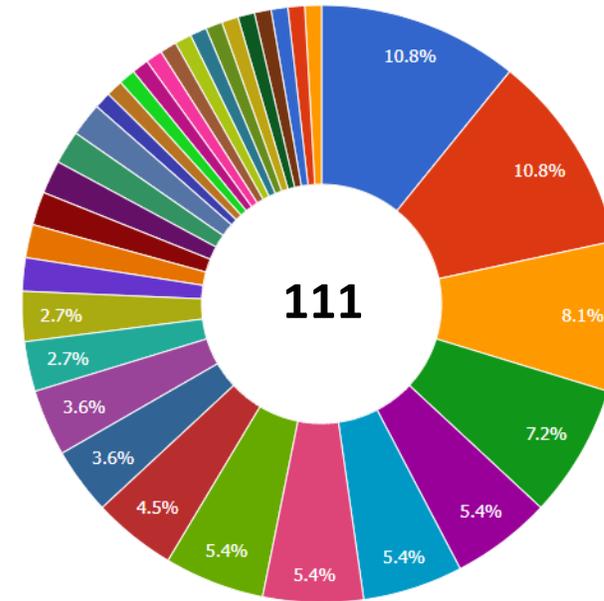
### Domain Experts



- Infection Control
- Cardiology
- Oncology

2025

### Domain Experts



- Infection Control
- Cardiology
- Oncology
- Audiology
- Administration
- General Practice
- Nephrology
- Public Health
- Clinical Genetics
- Pathology
- Transplantation
- Ambulatory Care
- Radiology/Medical Imaging
- Dentistry
- Gastroenterology and Hepatology
- General/Internal Medicine
- Intensive/Critical Care
- Preventive Medicine
- Sport & Exercise
- Anaesthesia
- Cardiothoracic Surgery
- Dermatology
- Emergency/Ambulance
- General Surgery
- Medical Administrator
- Neurology
- Neurosurgery
- Orthopaedic Surgery
- Otolaryngology/Ear, Nose & Throat
- Pharmacy
- Podiatry
- Respiratory
- Urology
- Vascular

## Modelling Framework: Organisational

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**Involvement of  
Medical Experts**



**Further  
Modelling Roles**



**Enabling Data  
Stewards to Start**

# Modelling Framework

## Modelling Framework: Organisational

Plans

Insights

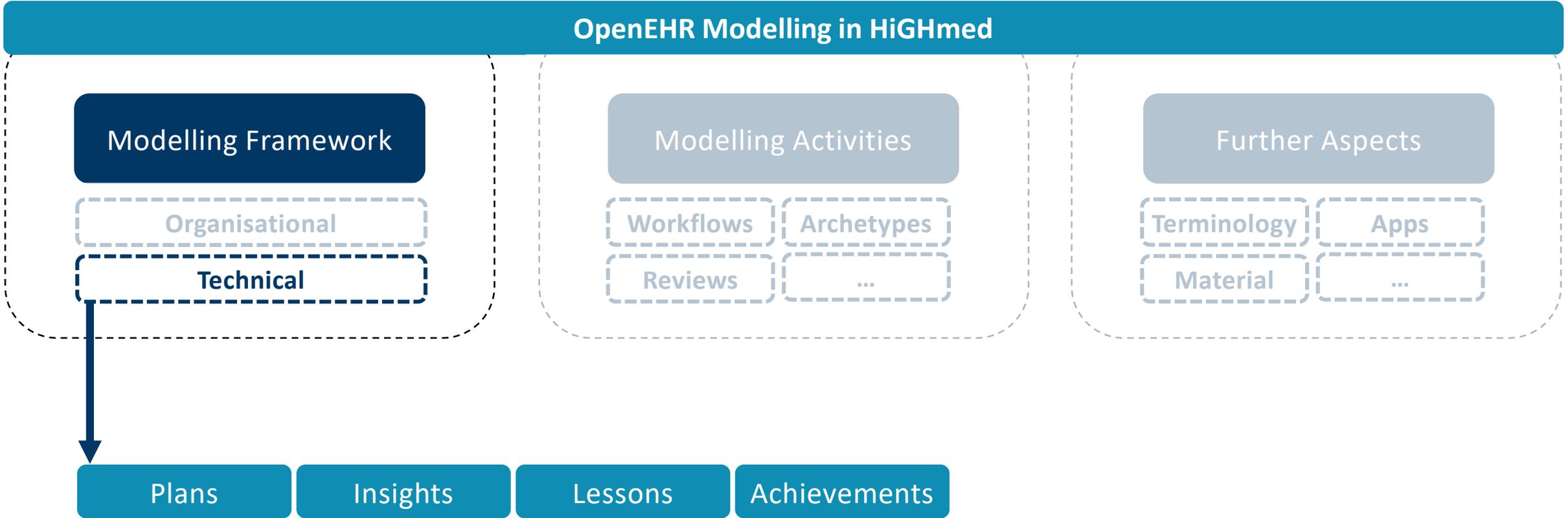
Lessons

Achievements

Medical and Technical Data Stewards

German openEHR Modelling Group

Further Roles, Collaboration and Projects



## Modelling Framework: Technical

Plans

Insights

Lessons

Achievements



### Clinical Knowledge Manager

Subdomains

Incubators

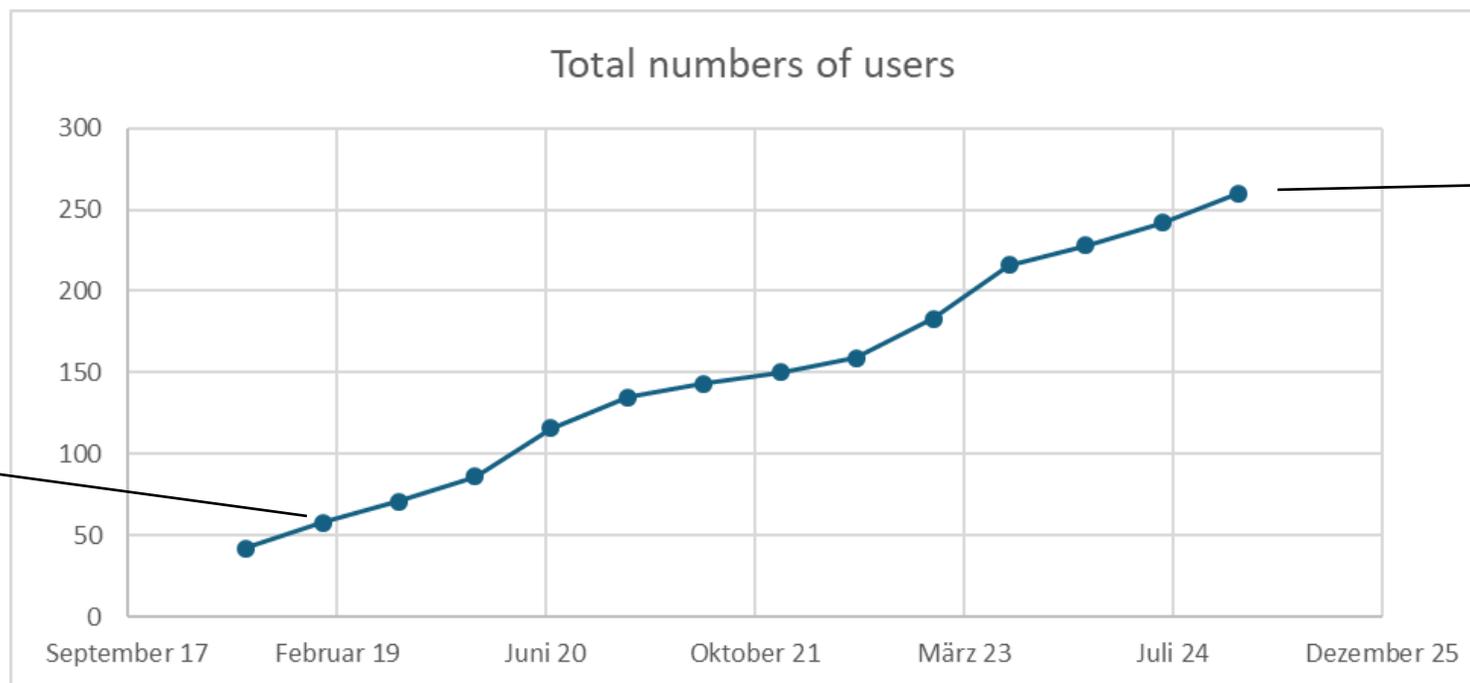
## Modelling Framework: Technical

Plans

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Lessons

Achievements



58

261

# Modelling Framework

## Modelling Framework: Technical

Plans

Insights

Lessons

Achievements



Clinical Knowledge Manager

(Back-) Referencing



Less used

Subdomains

Incubators

Need

Standards Mappings

Projects

Added

# Modelling Framework

## Modelling Framework: Technical

Plans

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Lessons

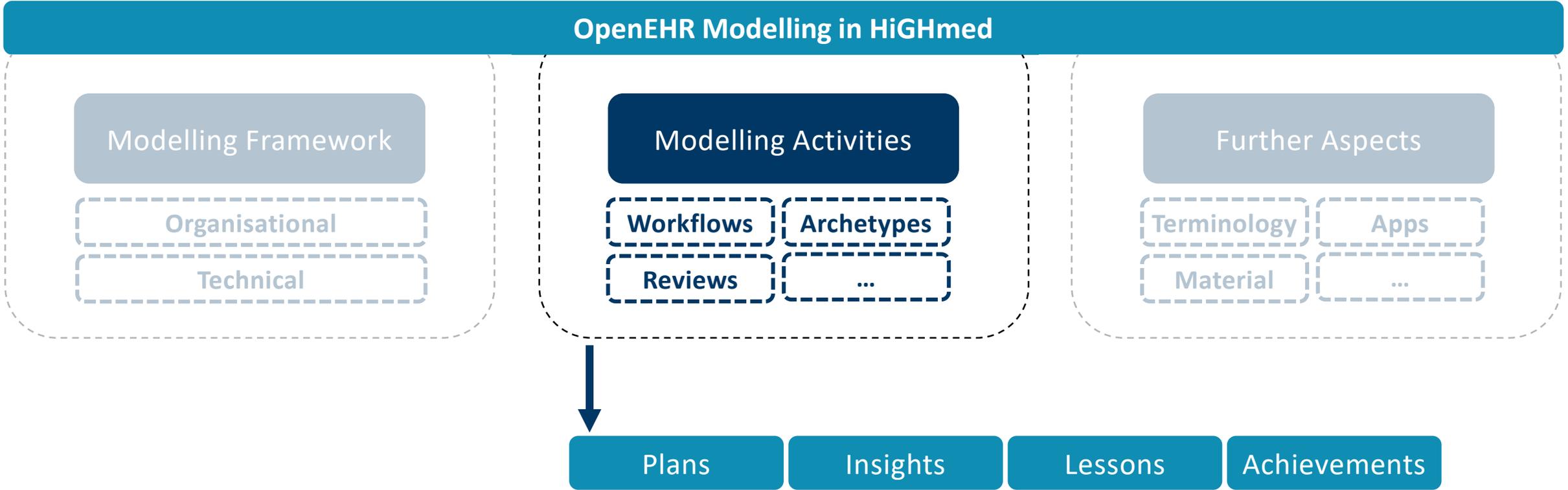
Achievements



Establishment and Active Usage of CKM



**Clinical Knowledge Manager**



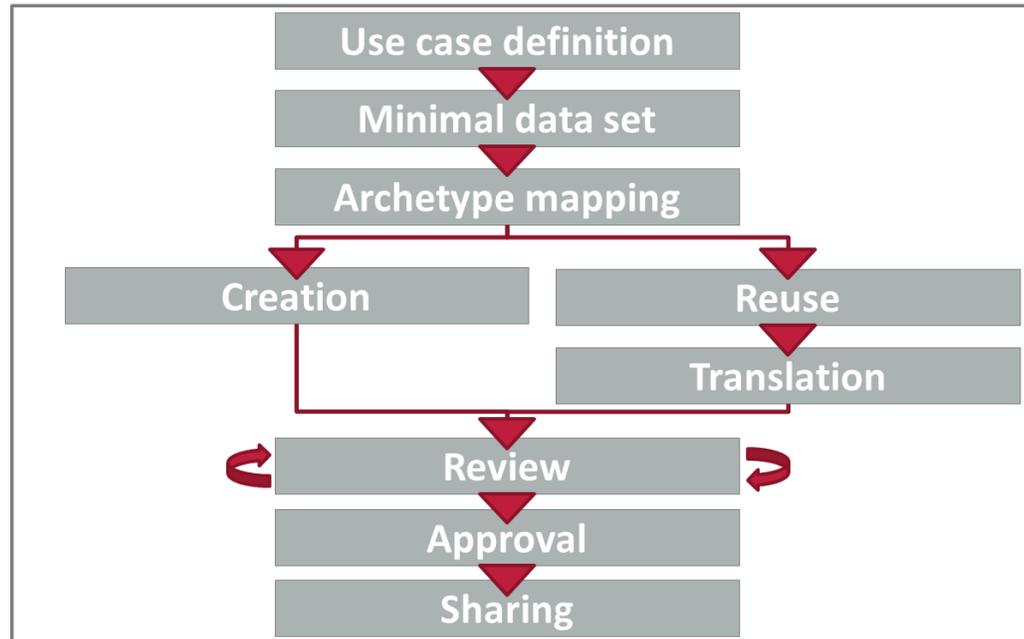
## Modelling Activities

Plans

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Achievements



**Modelling per Use Case**

**Focus on Templates**

**Reuse existing models**

Wulff A, Baier C, Ballout S, Tute E, Sommer KK, Kaase M, Sargeant A, Drenkhahn C; Infection Control Study Group; Schlüter D, Marschollek M, Scheithauer S. Transformation of microbiology data into a standardised data representation using OpenEHR. Sci Rep. 2021 May 18;11(1):10556

# Modelling Activities

## Modelling Activities

Plans

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2019

99

Archetypes

79%

Reuse Rate

23

Templates

2025

259

Archetypes

57%

Reuse Rate

114

Templates

# Modelling Activities

## Modelling Activities

Plans

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Lessons

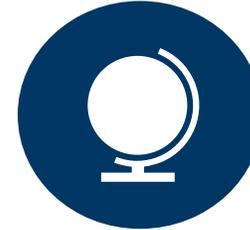
Achievements



**Prioritisation Shift  
to Archetypes**



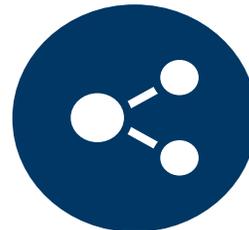
**Communication of  
Drafts and Duplicates**



**International  
Archetype Sharing**



**Metadata and  
Translation Guidelines**



**Terminology Bindings in  
Modelling Workflows**



**Standards Bridging in  
Modelling Workflows**



**Fixed Versions  
Called "Freezes"**

# Modelling Activities

## Modelling Activities

Plans

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Archetypes and Templates for Use Cases and  
Medical Informatics Initiative Core Data Set

# Modelling Activities

## Modelling Activities

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Archetypes and Templates for Use Cases and Medical Informatics Initiative Core Data Set

Complex Pattern Modelling

scientific reports

**OPEN** Transformation of microbiology data into a standardised data representation using OpenEHR

Antje Wulff<sup>1,21</sup>, Claas Baier<sup>2,21</sup>, Sarah Ballout<sup>1</sup>, Erik Tute<sup>1</sup>, Kim Katrin Sommer<sup>1</sup>, Martin Kaase<sup>3</sup>, Annela Sargeant<sup>4</sup>, Cora Drenkhahn<sup>5</sup>, Infection Control Study Group<sup>1</sup>, Dirk Schlüter<sup>2</sup>, Michael Marschollek<sup>1,21</sup> & Simone Scheithauer<sup>3,21</sup>

Wulff A, Baier C, Ballout S, Tute E, Sommer KK, Kaase M, Sargeant A, Drenkhahn C, Infection Control Study Group, Schlüter D, Marschollek M, Scheithauer S. Transformation of microbiology data into a standardised data representation using OpenEHR. Sci Rep. 2021 May 18;11(1):10556

# Modelling Activities

## Modelling Activities

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Archetypes and Templates for Use Cases and Medical Informatics Initiative Core Data Set

Complex Pattern Modelling

Fast Track Modelling

COVID-19 GECCO DATASET



# Modelling Activities

## Modelling Activities

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Archetypes and Templates for Use Cases and Medical Informatics Initiative Core Data Set



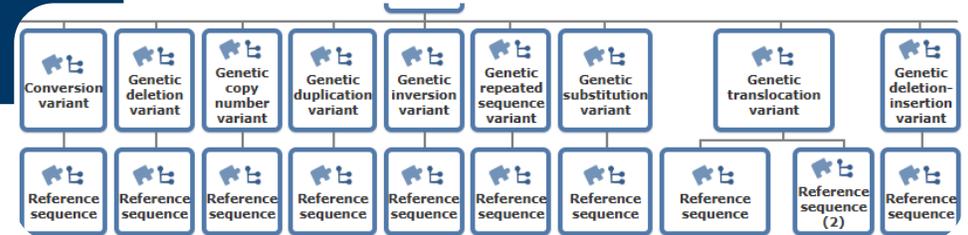
Complex Pattern Modelling

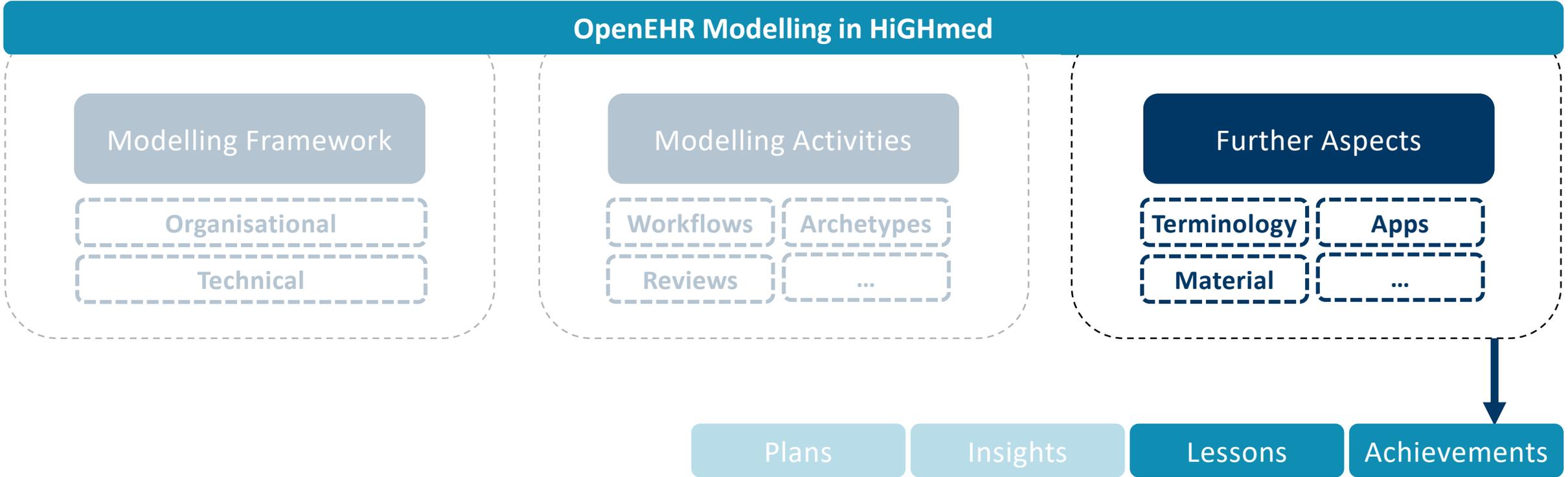


Fast Track Modelling



Successful International Collaboration (Oncology, Genomics)





## Further Aspects

Plans

Insights

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Achievements



**Archetype  
Query Language**



**Need for  
Workshops**



**Licensing and  
Copyrights**

## Further Aspects

Plans

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Set-up of Terminology Server and  
Integration in CKM

## Further Aspects

Plans

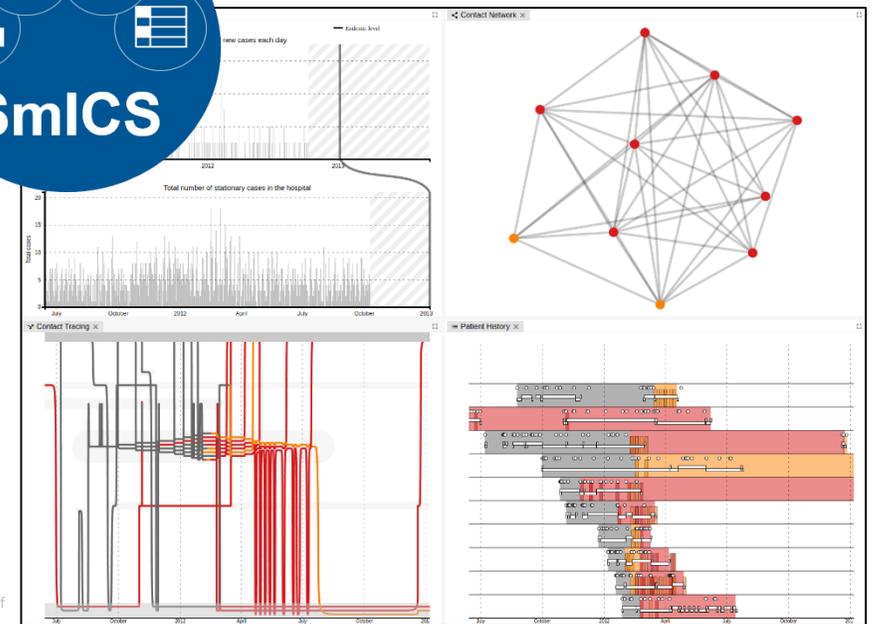
Insights

Lessons

Achievements

Set-up of Terminology Server and Integration in CKM

Design of Interoperable Applications



Biermann, P. et al. Towards digital infection control: an open source, standards-based smart infection control system for monitoring and detection of nosocomial bacterial clusters, contact networks and epidemiologic analysis, submitted 12/2024

## Further Aspects

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Set-up of Terminology Server and Integration in CKM

Design of Interoperable Applications

OpenEHR-based Documentation Modules

HiGHmed Medical Informatics  
Use Case Kardiologie

### Anamnese

Angaben zum Dokument

Datum: 06/12/2020  
Dokumentar: Dr. Mustermann

Patientendaten

Patienten-ID: 111111111  
Fall-Kennung: 123456  
Geschlecht:  Weiblich  Männlich  Divers  Nicht erhoben

Körperliche Untersuchung

Größe und Gewicht

Größe: 175 cm  nicht erhoben  
Gewicht: 80 kg  nicht erhoben

Ethnische Zugehörigkeit und Hautfarbe

Niereninsuffizienz  ja  nein  unbekannt  nicht erhoben

### Kardiale Diagnosen

Koronare Herzkrankheit  ja  nein  unbekannt  nicht erhoben  
Zustand nach Myokardinfarkt  ja  nein  unbekannt  nicht erhoben  
Kardiomyopathie  ja  nein  unbekannt  nicht erhoben  
Zustand nach Dekompensation  ja  nein  unbekannt  nicht erhoben

Erstdiagnose Herzinsuffizienz (Jahr) 2003  unbekannt  nicht erhoben

NYHA-Klasse derzeit  I  II  III  IV  unbekannt  nicht erhoben

Belastungsdyspnoe  ja  nein  unbekannt  nicht erhoben  
Ruhedyspnoe  ja  nein  unbekannt  nicht erhoben  
Vorhofflimmern-/flattern  ja  nein  unbekannt  nicht erhoben  
Herzklappenerkrankung  ja  nein  unbekannt  nicht erhoben

### Bisherige kardiovaskuläre Interventionen

Interventionelle koronäre Revaskularisation  ja  nein  unbekannt  nicht erhoben

Periphere Revaskularisation  ja  nein  unbekannt

## Further Aspects

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Set-up of Terminology Server and Integration in CKM

Design of Interoperable Applications

OpenEHR-based Documentation Modules

Workshops, Materials, Courses

HiGHmededucation

HiGHmed-Konsortium

<https://education.highmed.org/>



Secondary use of data based on openEHR models is valuable

Reusing archetypes and global contribution of models is key

International archetype sharing and bridging standards are fostered



2025

# Thank you!

**Prof. Dr. Antje Wulff**

Big Data in Medicine

Department of Health Services Research

Faculty VI Medicine and Health Sciences

Carl von Ossietzky Universität Oldenburg