



miracum/ CALM-QE

Medical Informatics in Research and Care in University Medicine

Use Case 2: AAT-Deficiency, COPD, Pneumonia, Asthma, COVID-19

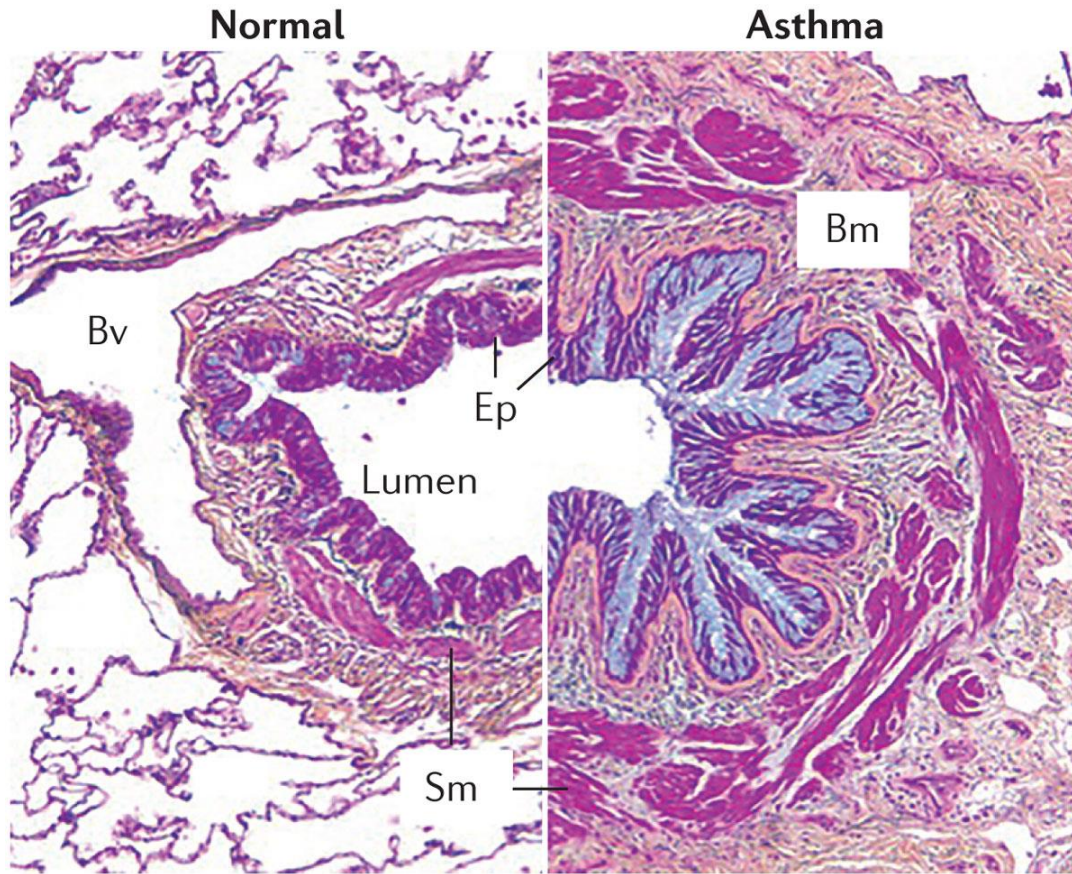
Harald Renz, MD

Institute of Laboratory Medicine and Pathobiochemistry, Molecular Diagnostics Philipps University
Marburg University Hospital Giessen and Marburg GmbH

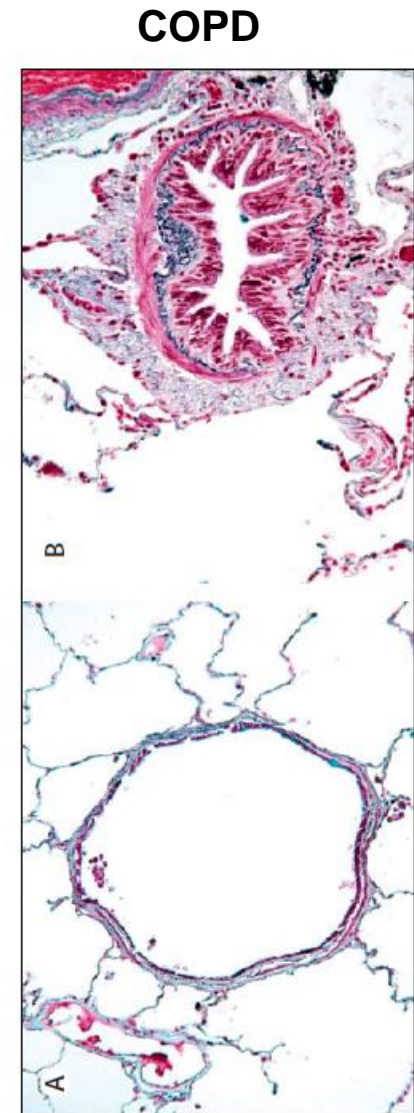
Harald.Renz@uk-gm.de



Histopathology of Asthma and COPD



Nature Reviews | **Disease Primers**



Decramer et al., Lancet, 2012

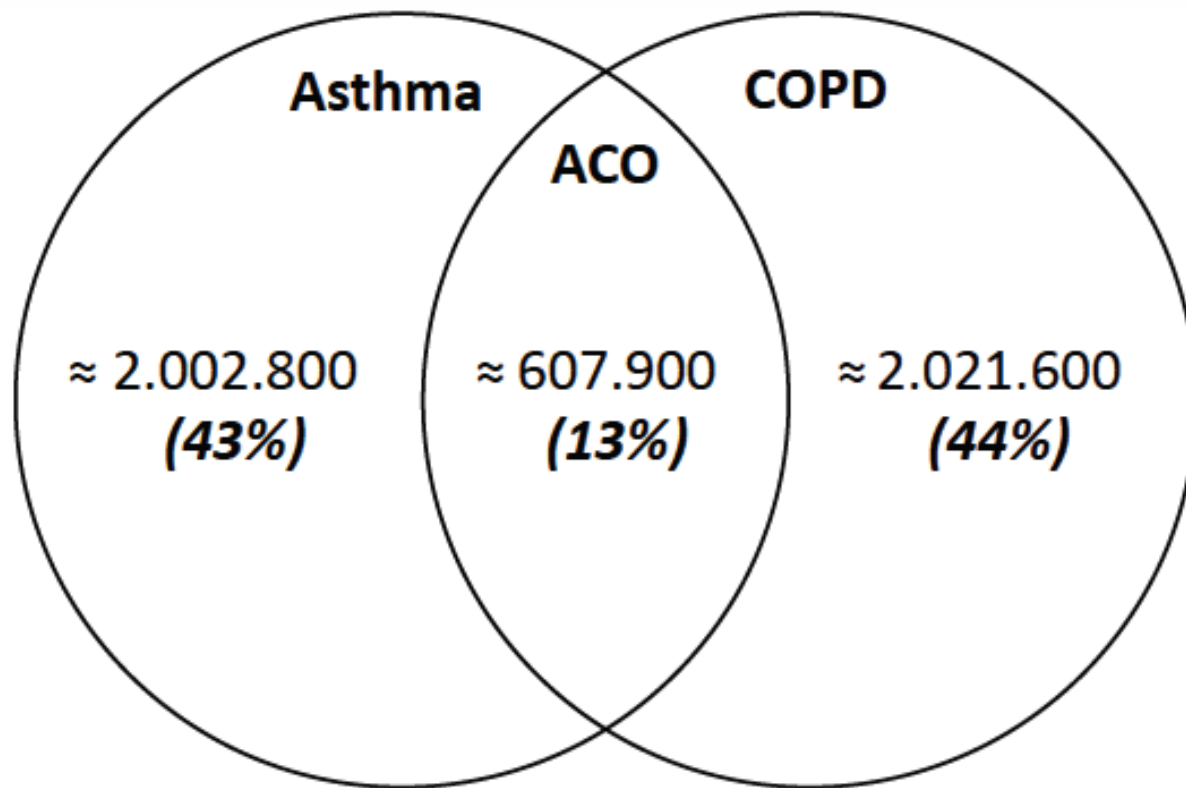
Gene-Environment Interaction in Chronic Inflammatory Disease



Renz H, von Mutius E, et al. Nature Immunology 2011;12:273-7.

Renz H, Autenrieth IB, Brandtzeag P, Cookson WO, Holgate S, von Mutius E, et al. JACI 2011;128(6):25-49.

M2Q diagnoses of asthma and COPD based on nationwide contractual medical billing data for 2017



Access and use of in- and outpatient data (WP1)

EXISTING DATA

- Diagnosis
- Co-morbidities
- Age, gender
- Laboratory data
- Duration of hospital stay
- Mortality
- Hours on ventilation



ADDITIONAL DATA

- Lung function
- Medication
- Virology
- Microbiology
- 6MWD
- FeNO
- Chest-CT



WP6



University
Hospital
Inpatient



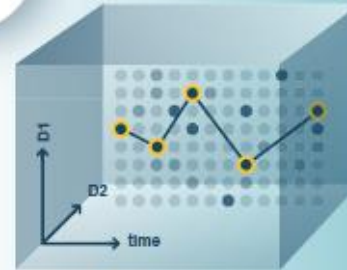
University
Hospital
Outpatient

WP7

REAL
WORLD
DATA

WP2

RISK
PREDICTION
MODEL



CosycoNet
2.700 COPD patients
5+ years

Training the models



CLINICAL
OUTCOMES

- Exacerbation
- Lung function
- Quality of live
- Length of hospital stay
- Hospitalisation
- Mortality

Challenge :Overcoming obstacles to obtain data suitable for analysis

Running analysis on extracted data without considering sources of bias

- missing data (at random, systematic)**
- implausible data**
- unknown variables or information, not controlled for, and possibly not equally distributed between groups of comparison**
- limitation in available data**

need to combine data for better phenotyping/mapping/etc.

UC2: Clinicians meet Bioinformaticans onsite und remote - Frankfurt, November 2021



Susetta Neurath-Finotto	Gernot Rohde	Bernd Schmek	Timm Greulich	Claus Vogelmeier	Harald Binder	Nattika Jugkaeo	Kapil Karki
Patrick Fischer	Alan Race	Adelaine Makoudjou	Stefanie Schild	Susanne Seuchte	Frederik Trinkman	Abischa Vengadeswaran	Achim Michel-Backofen

Use Case 2: Major Pulmonary Disease

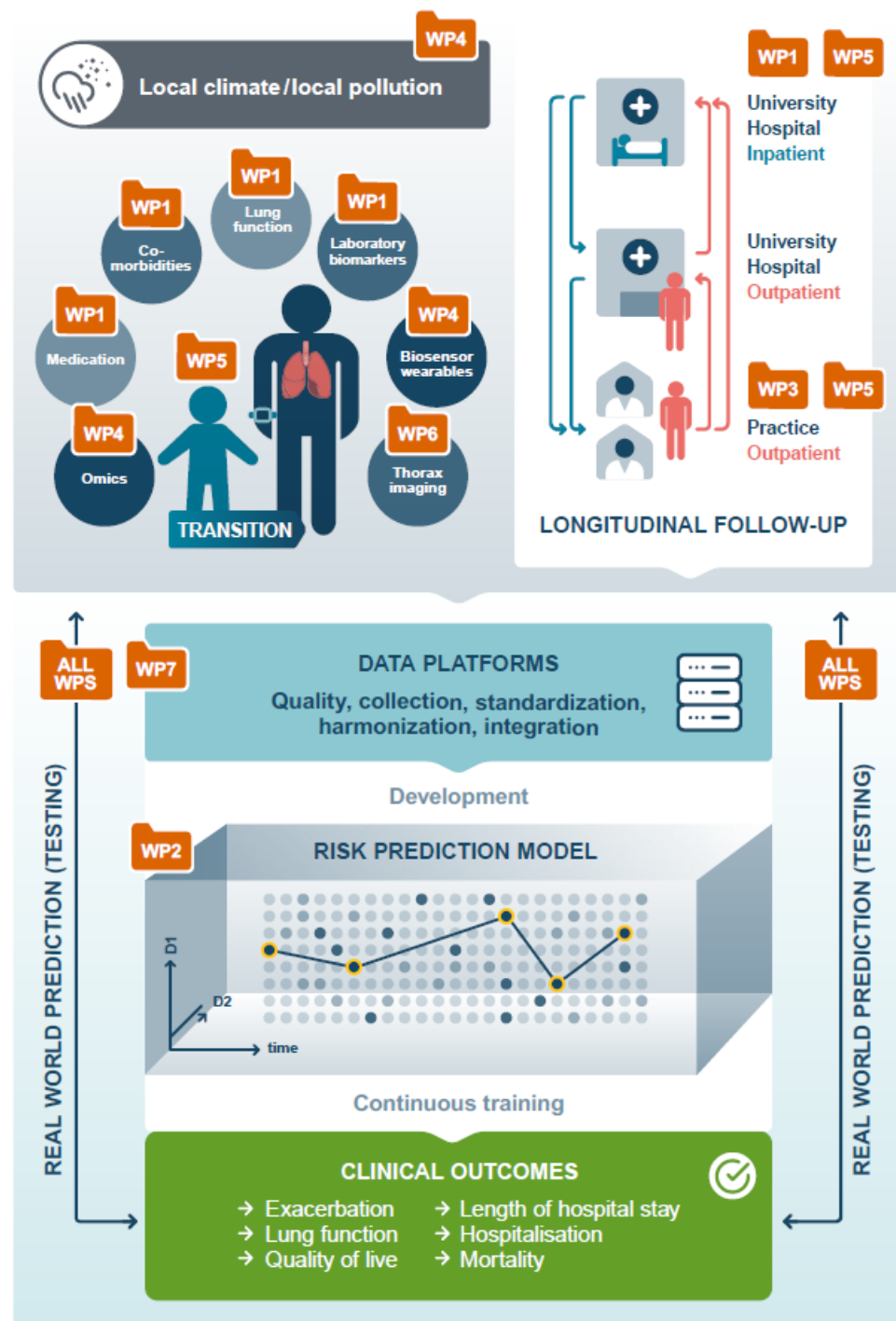
- **Alpha-1 antitrypsin deficiency (AAT):**
 - **Co-morbidities in COPD with / without AAT-deficiency**
 - **Comparison to register-studies**
- **COPD:**
 - **Predictors for length of hospital stay & mortality**
 - **Descriptive analysis**
- **Pneumonia:**
 - **Differences in diverse parameters between pneumonia, COPD, overlap and sepsis**
 - **Differences in outcome: length of hospital stay & mortality**
- **Asthma:**
 - **Predictors for length of hospital stay**
 - **Multivariate analysis by Cox Proportional Hazard Model**
 - **COVID-19**

Publikationen

- **Skevaki, Rohde, Seidemann, Grünewaldt, Renz et al.
Comorbidity defines asthmatic patients' risk of COVID-19 hospitalization: A global perspective
JACI 2022**
- **Zöller et al.
Alpha-1-Antitrypsin-Deficiency is associated with a lower cardiovascular risk: an approach based on federated learning**
- **Weckler et al.
Blood eosinophil count predicts disease severity in hospitalised community-acquired pneumonia**

**COPD and asthma:
longitudinal and cross-
sectoral real-world data for
machine learning application
for quality improvement and
knowledge acquisition**

**CALM-QE
2023 – 2027
(12,3 Mio €)**



CALM-QE 2023 - 2027

Coordinated by:



Partners:



Stakeholders



Coordination:

Harald Binder (Freiburg), Harald Renz (Marburg)

Bioinformatics:

Hans Kestler (Ulm), Frank Ückert (Hamburg), Christian Seidemann (Marburg), Daniela Zöller (Freiburg), Roland Eils (Berlin), Thomas Ganslandt (Erlangen), Konstantin Strauch (Mainz)

Clinical pneumology:

Roland Buhl (Mainz), Sebastian Fähndrich (Freiburg), Gernot Rohde (Frankfurt), Daiana Stolz (Freiburg), Christian Taube (Essen), Anna Dittrich (Hannover), Katharina Blümchen (Frankfurt)

COSYCONET:

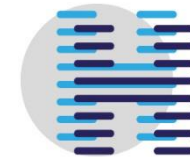
Robert Bals (Homburg/Saar), Bernd Schmeck (Marburg)

Private Practice

Timm Greulich (Marburg) et al.

DIFUTURE

Data Integration for Future Medicine



HiGHmed
Medical Informatics



miracum
Medical Informatics in Research and Care in University Medicine



Smart Medical Information
Technology for Healthcare

Access and use of in- and outpatient data (WP1)

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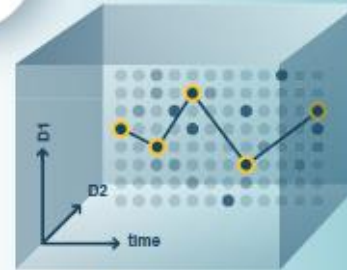
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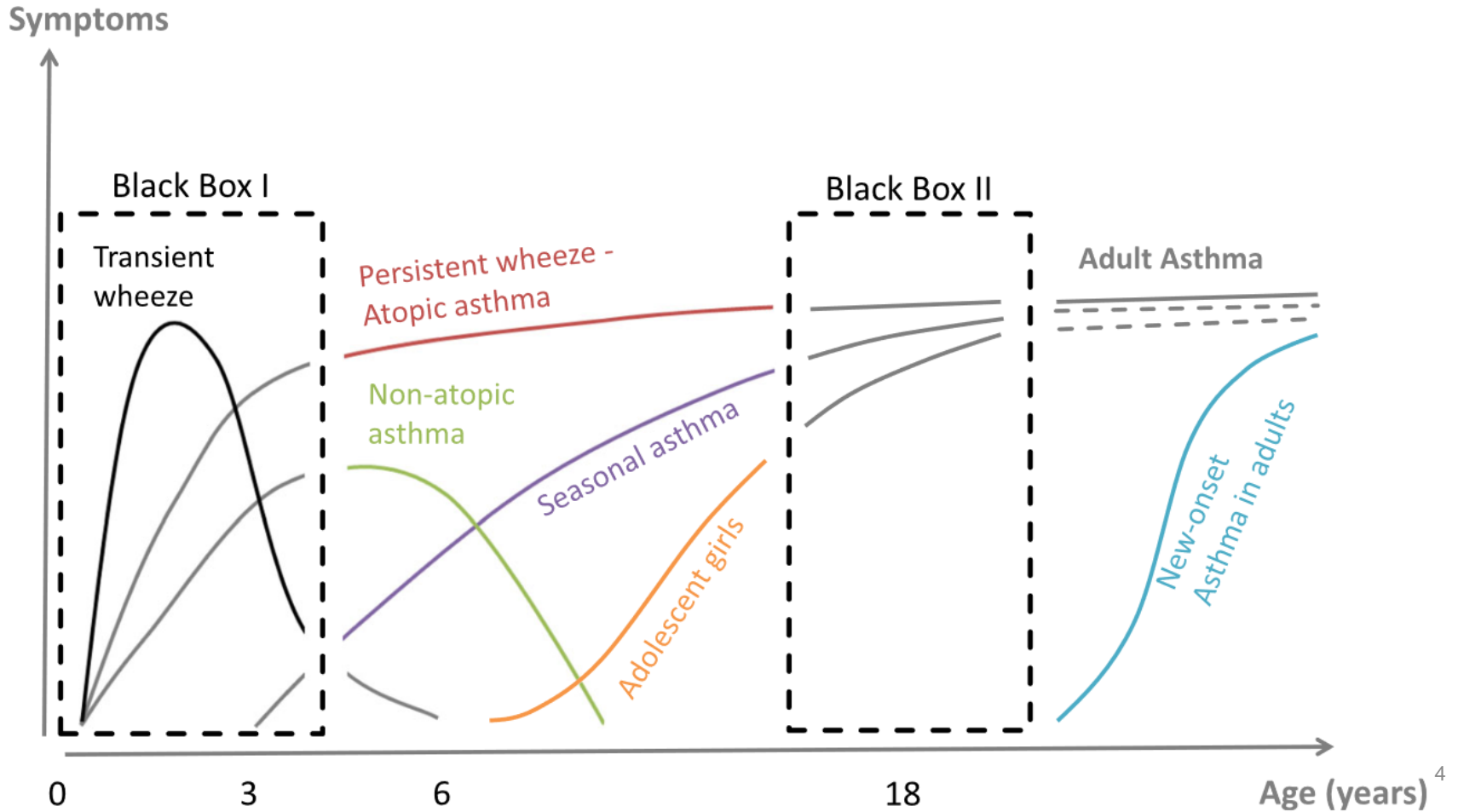
Training the models



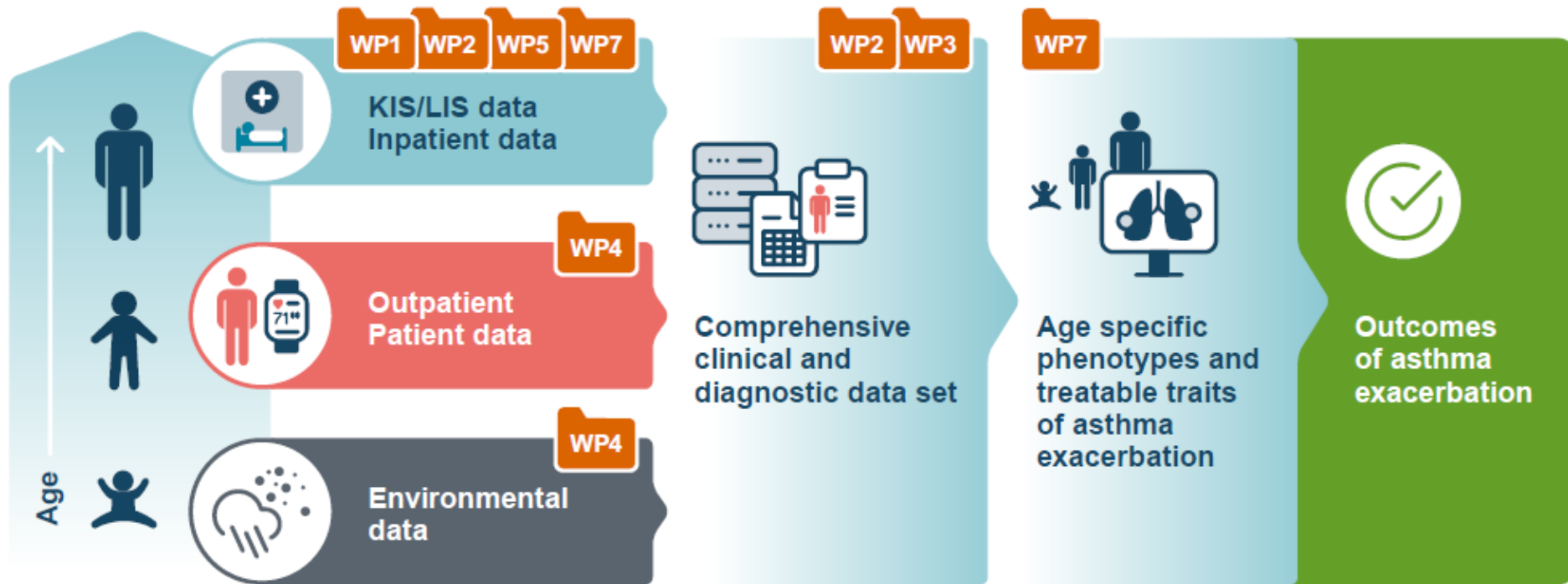
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Asthma/Wheezing-Phenotypes across all ages: ALLIANCE



Age-specific treatable traits of asthma exacerbation – pediatric perspective (WP5)



Pediatric and Adult Pulmonology - Private Practices -

A Zoom meeting interface displaying a grid of 10 participants and a shared screen. The participants are arranged in a 3x3 grid, with the bottom-right cell empty. The shared screen, located in the top-middle position, shows a large conference room with many people seated at long tables. The interface includes a top bar with a green heart icon and a 'Ansicht' button. The bottom bar contains controls for muting, video, chat, screen sharing, recording, reactions, and apps, along with a 'Verlassen' button.

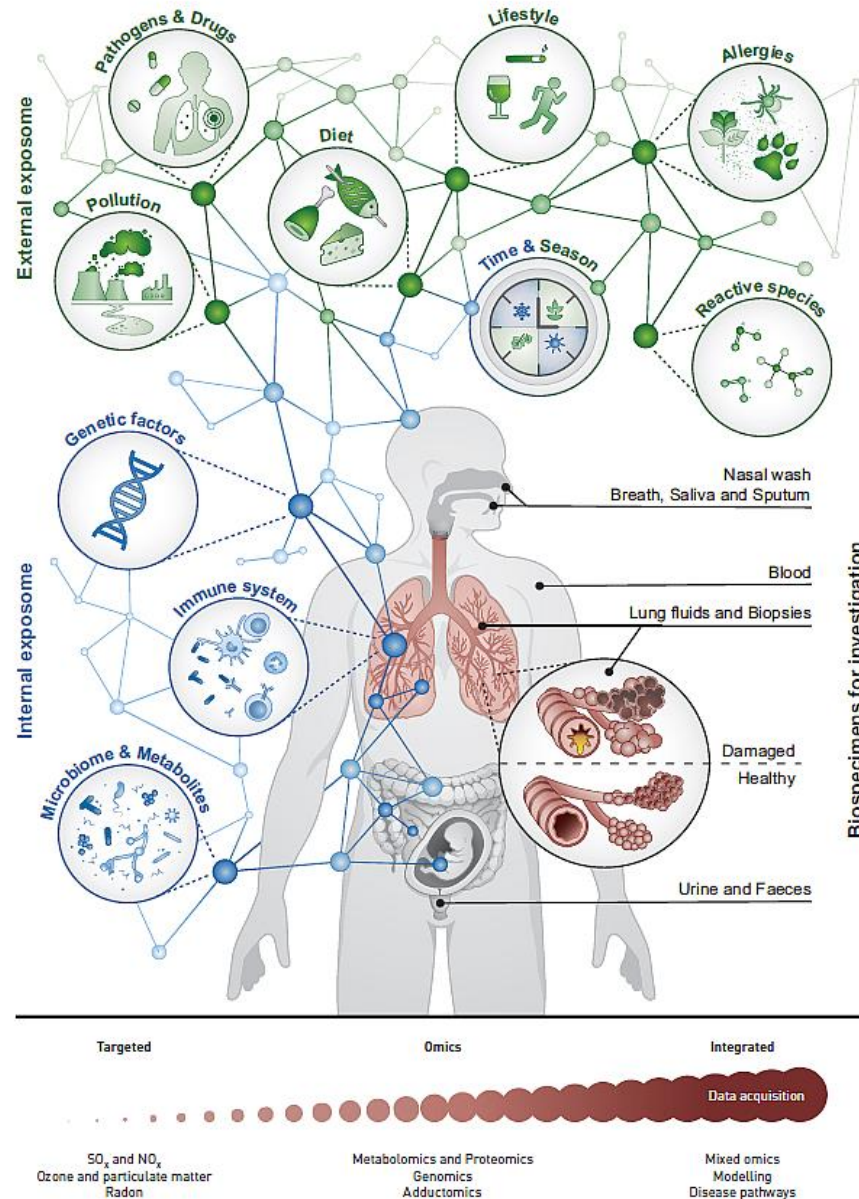
Participants (from top-left to bottom-right):

- konradb
- CALM QE (Marburg)
- Timm Greulich
- Anne-Mieke Winstroth
- J.Winkler
- Ehlers
- Jasmin Thierfelder-Matuszak
- iPhone von Dirk (2)
- Sabine Waage
- A. Michalowski

Bottom Bar Controls:

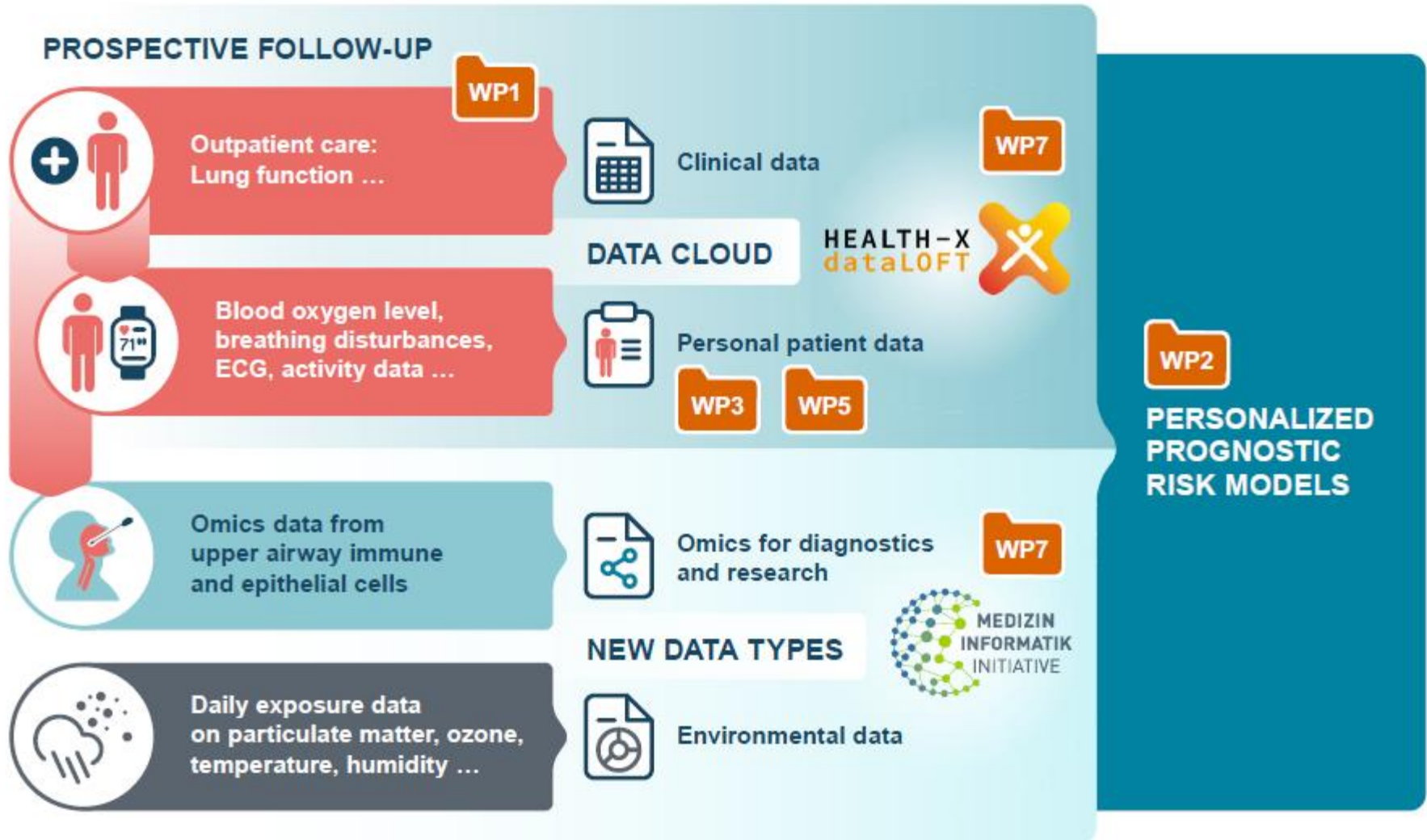
- Stummschalten
- Video beenden
- Teilnehmer 10
- Chat
- Bildschirm freigeben
- Aufzeichnen
- Reaktionen
- Apps
- Verlassen

The role of gene – environment interactions in lung disease: the urgent need for the exposome

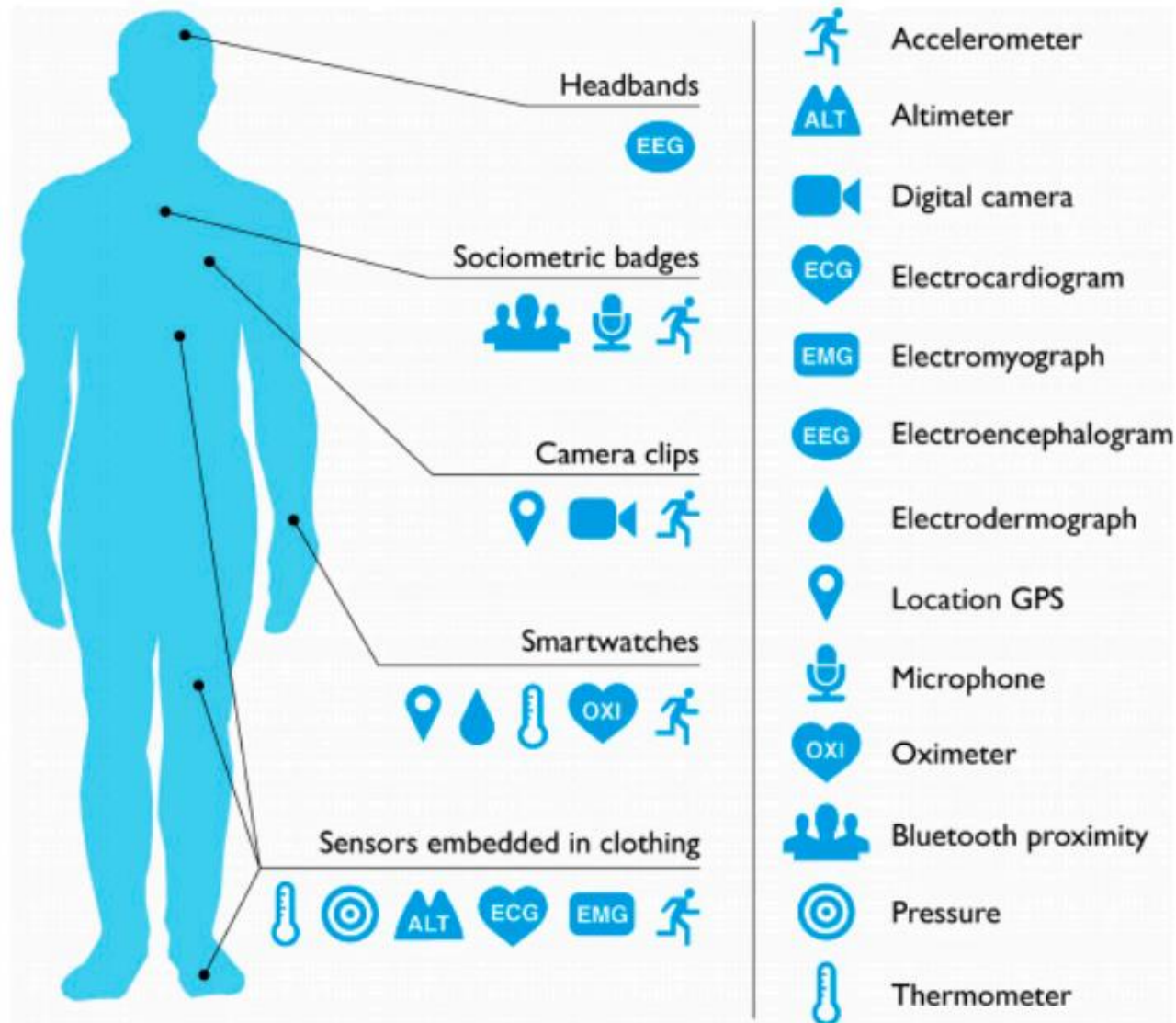


*Wheellock et al,
European Resp
Journal 2020*

Integrating personal health data with environmental data for secondary prevention (WP4)

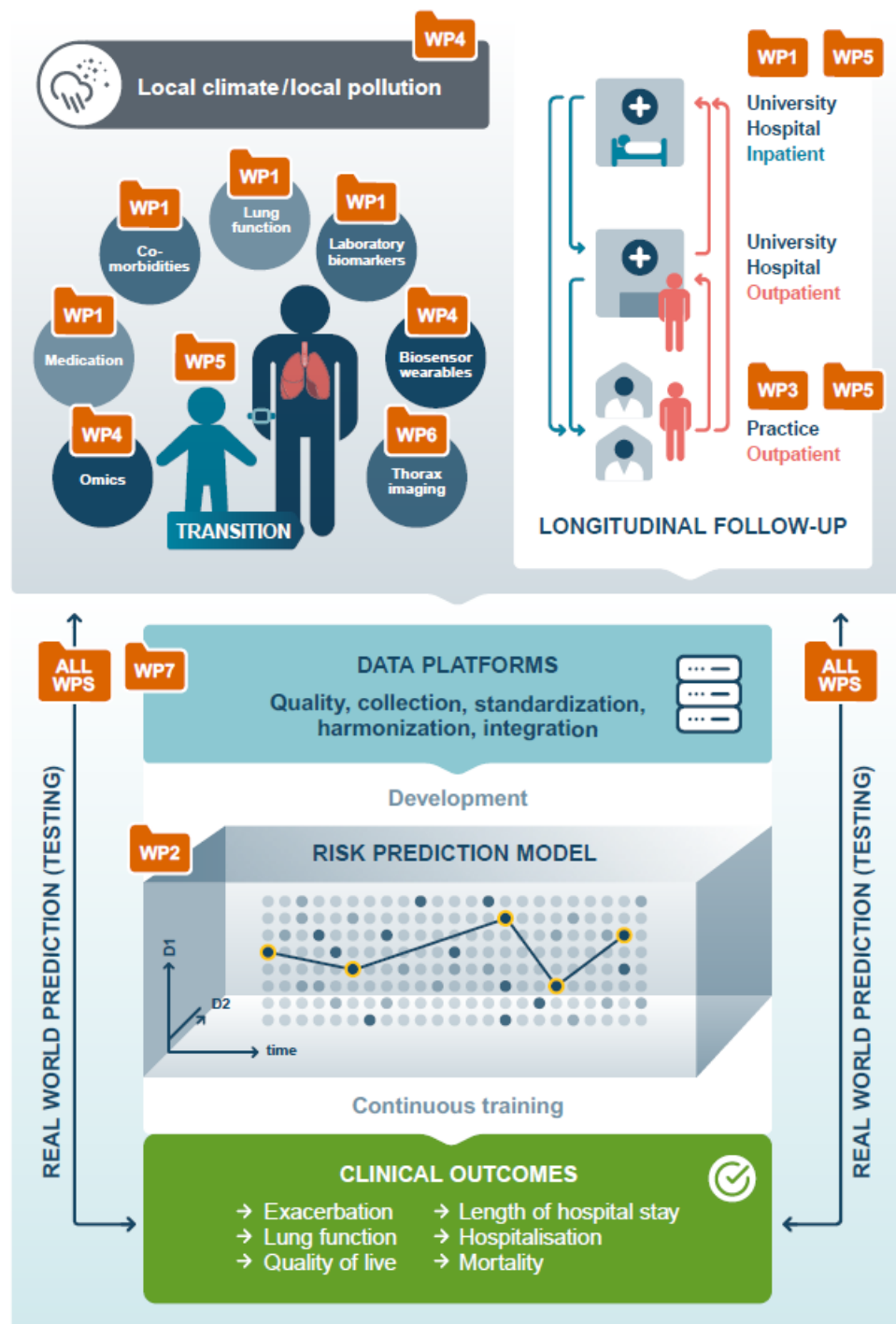


Wearable devices and their attached locations on the human body



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CALM-QE Retreat 28./29.09.2023-Marburg

