HiGHmed Medical Informatics

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Bundesministerium für Bildung und Forschung

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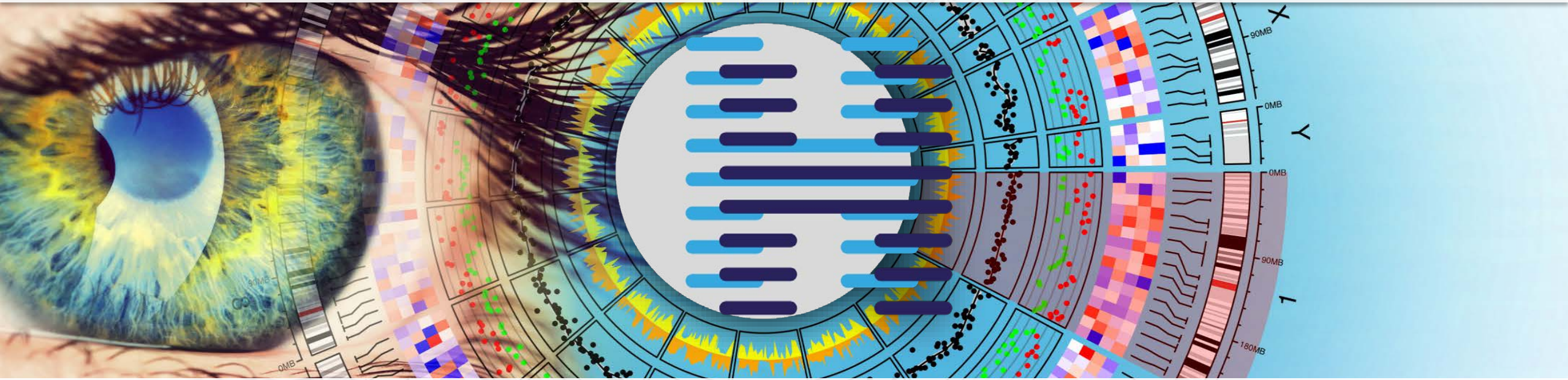
MII-Symposium 2022

Infection Control: Ausbruchsfrüherkennung und personalisierte Infektionsprävention 05.10.2022



Michael Marschollek, Simone Scheithauer* & Infection Control Team

*Klinische Use Case Sprecherin, Universitätsmedizin Göttingen, Institut für Krankenhaushygiene und Infektiologie

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Conflict of Interest:

- **research-grants:**

BMBF: B-FAST; GenSurV, MolTraX, PREPARED, (CollPan) / NUM; Medizininformatikinitiative (HiGHmed, Use Case Infection Control); RISK PRINCIPE; BMBF Professorinnenprogramm; VW Vorab/MWK Niedersachsen (MRE-TRAVIK); BMG Innovationsfond INSIST / RetoCdiff / InnoBri; UMG Nachlaß Grun; MWK: EdUMG, Opti-ITS; MWK/EFRE: PraeInfekt

- **lecture/advisory/review:**

KRINKO (RKI); Aufsichtsrat HZI Braunschweig; Wissenschaftlicher Beirat Medizinische Fakultät Uni Bielefeld, Plasma for Life Aufsichtsrat; DFG Gutachter Forschungscampus und Nachwuchsgruppen, Expertengremium postoperative Wundinfektionen IQTIG; MWK Bayern u. Baden Würtemberg, Astellas, Braun, **Brill, Hartmann,** 3M, MSD, Pfizer, Ophardt

During last 5 y indicated in bold

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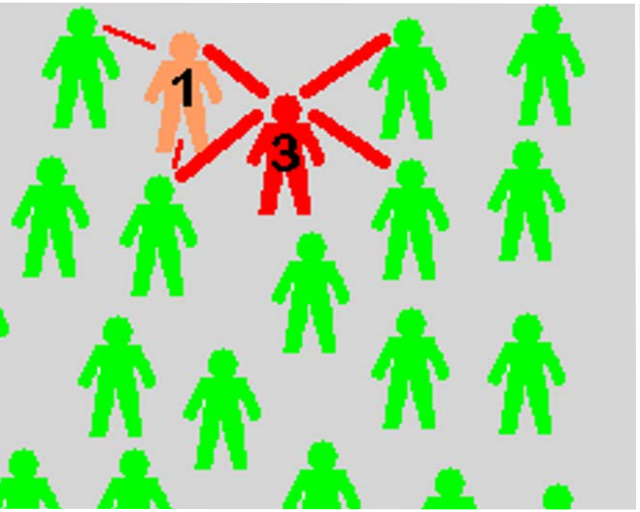
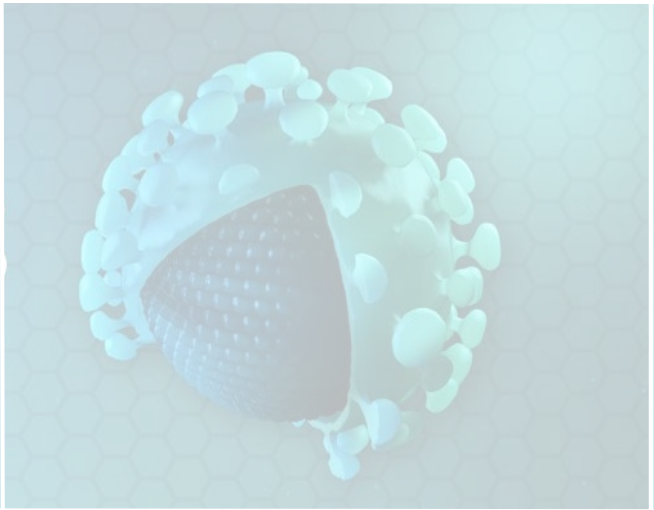
What to expect today



WHAT (did we do)

2

SmICS (Use Case Infection Control)



Where (to go)

4

RISK PRINCIPE

WHY (did we react)

1

The problem

What else

3

CoSurv-SmICS
KDS Mikrobiologie

Bildquellen: www,forbes.com; www.pixaby.com; www.snoopy.com

The problem/issue

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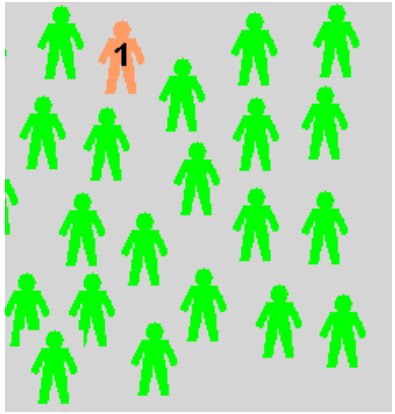
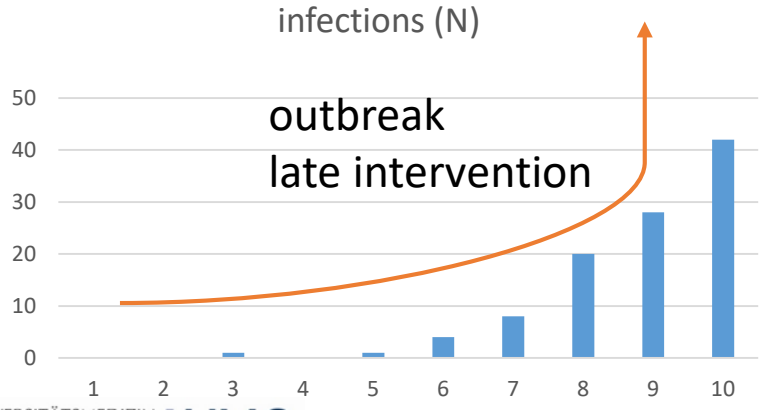
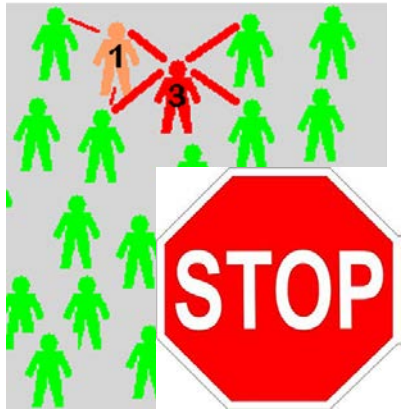
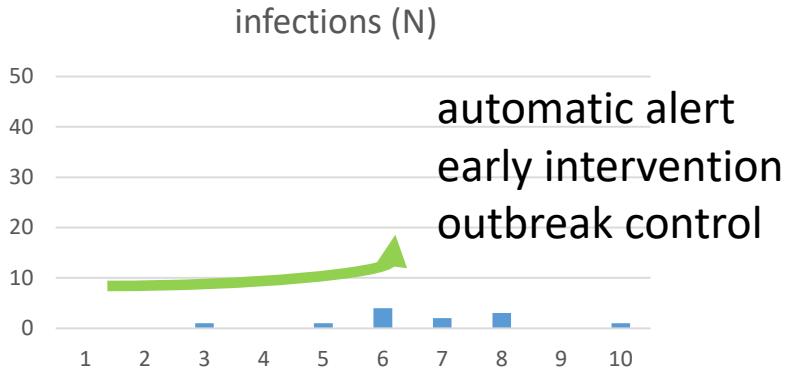
Current





Aim





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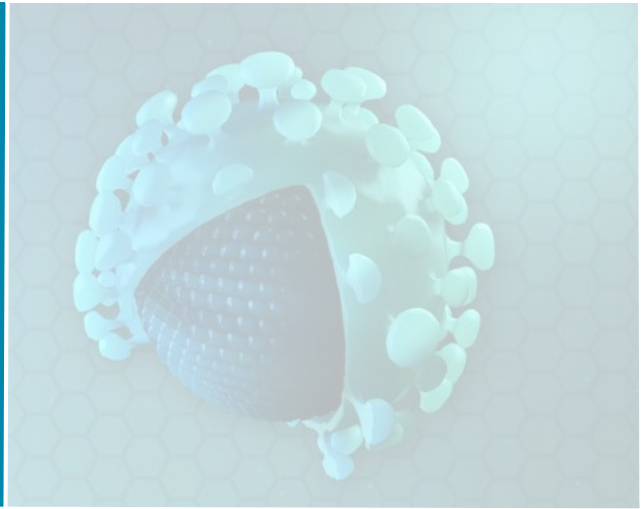
Bildquellen: www.pixaby.com

What to expect today

WHAT (did we do)

2

SmICS (Use Case Infection Control)



Where (to go)

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RISK PRINCIPE

WHY (did we react)

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Bildquellen: www,forbes.com; www.pixaby.com; www.snoopy.com

What did we do: SmICS Smart Infection Control System
(Use Case Infection Control: Hospital Outbreak detection)

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- **Our hypothesis:** Medical informatics can improve pathogen/(infection) surveillance in a way, that transmissions, rare constellations, clusters, etc. can be identified earlier, more sensitively, more stably and more precisely
- **Clinical-methodological implication:** Change of the first step of the alert from person-assisted search to automation; use of IC expertise for verification

Our solution:
SmICS

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Use Case Infection Control: Ausbruchsfrüherkennung

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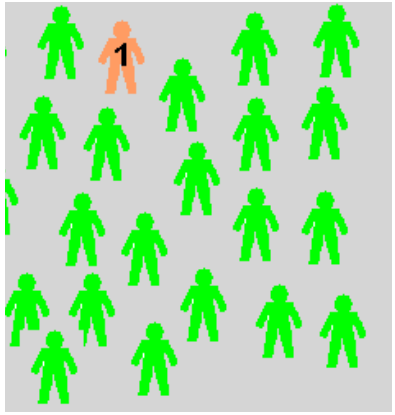
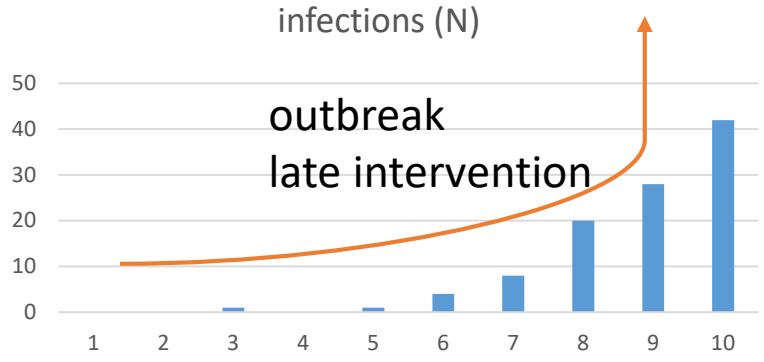
Current

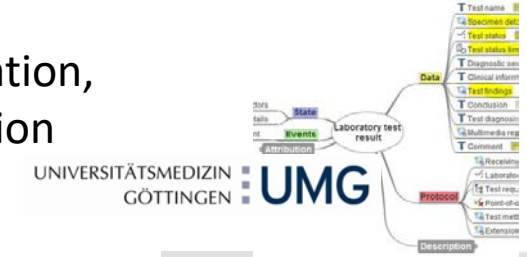




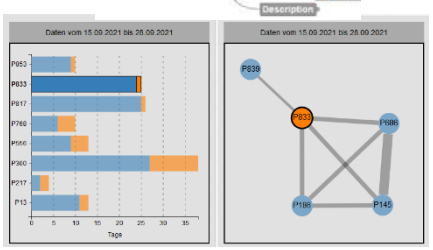
Solution: SmICS

Smartes Infection Control System

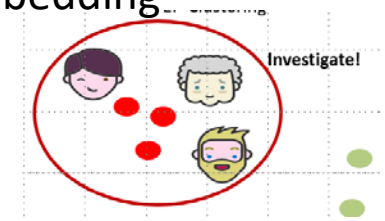
data aggregation,
standardization
archetypes



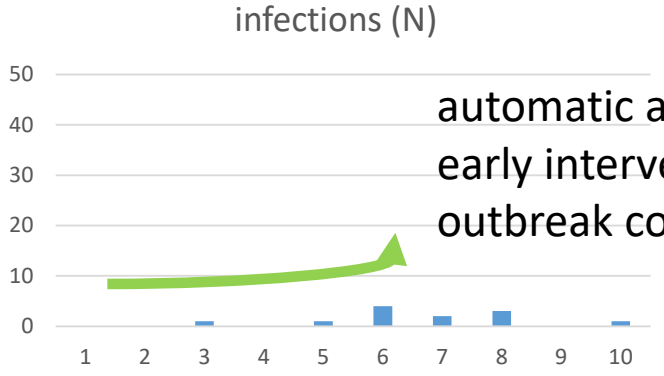
interactive
visualization
dashboard



algorithms, joint embedding
machine learning
decision support



Aim



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Benutzerhandbuch SmICS

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Use Case Leitung: Simone Scheithauer, Michael Marschollek
Technische Leitung SmICS: Pascal Biermann, Antje Wulff

Infection Control Study Group: Simone Scheithauer[1]; Martin Kaase[1]; Nicolas Reinoso-Schiller[1]; Sabine Rey[2]; Markus Suhr[2]; Dirk Schlüter[3]; Claas Baier[3]; Michael Marschollek[4]; Antje Wulff[4,5]; Sarah Ballout[4], Pascal Biermann[4], Vanessa M. Eichel[6]; Nico T. Mutters[6,7]; Klaus Heeg[8]; Angela Merzweiler[9], Petra Gastmeier[10]; Michael Behnke[10]; Luis Alberto Peña Diaz[10]; Sylvia Thun[11,12]; Roland Eils[11]; Alexander Mellmann[14]; Hauke Tönnies[14]; Martin Dugas[15]; Michael Storck[15]; Tom Baumgartl[16,17]; Tatiana von Landesberger[17]; Eric Windler[16]; Felix Müller[16] , Cora Drenkhahn[18]; Benjamin Gebel[19]; Thorsten Klingen[20]; Stephan Glöckner[20] , Benedikt Zacher[21]; Tim Eckmanns[21]; Timo Sztyler[22]; Brandon Malone[22]

[1] *Institute of Infection Control and Infectious Diseases, University Medical Center Göttingen (UMG), Georg-August University Göttingen, Göttingen, Germany.*
[2] *Institute of Medical Informatics, University Medical Center Göttingen (UMG), Georg-August University Göttingen, Göttingen, Germany*
[3] *Institute for Medical Microbiology and Hospital Epidemiology, Hannover Medical School, Hannover, Germany*
[4] *Peter L. Reichertz Institute for Medical Informatics of TU Braunschweig and Hannover Medical School, Hannover, Germany*

SmICS Visualisierung Startansicht

- Patientenhistorie
- Epidemiologische
- Kontaktnetzwerk
- Detektionalgorithmus
- Detailansicht
- Statistik
- Kontaktnachverfolgung

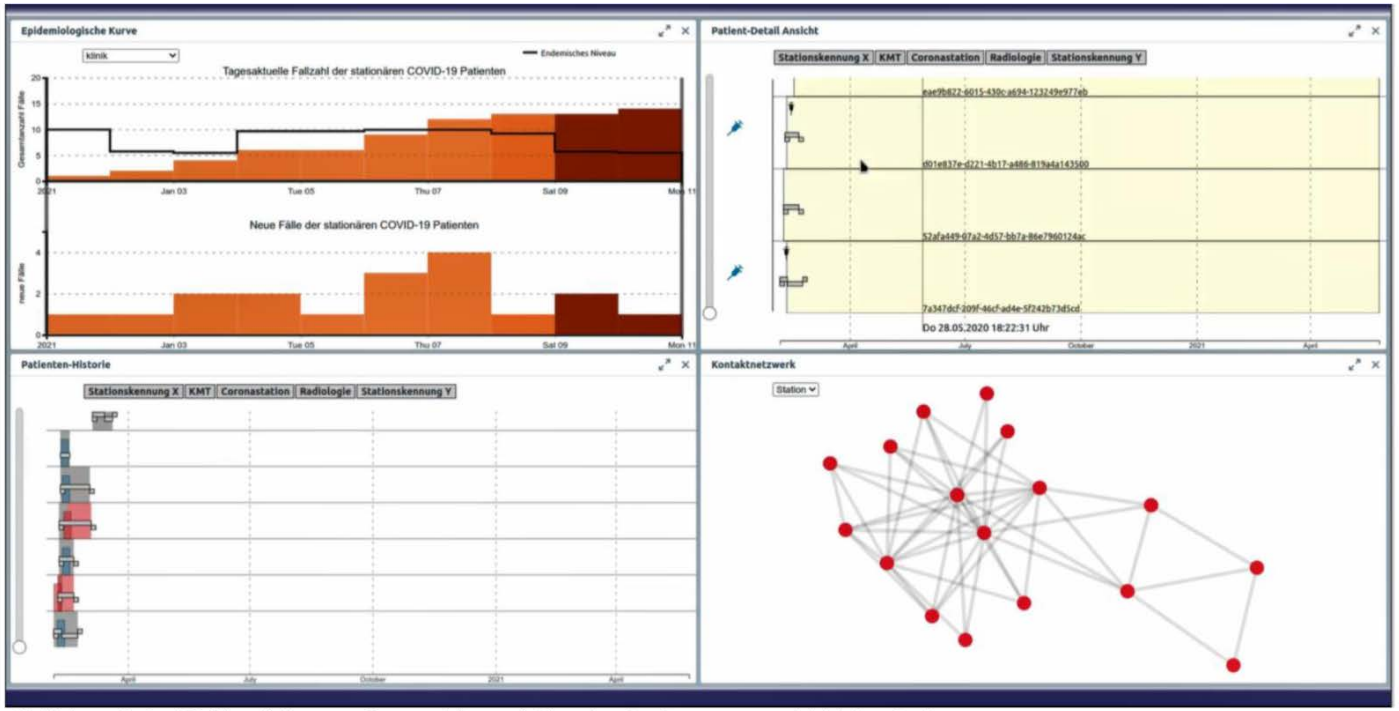

Abbildung 5: SmICS Visualisierung - Startansicht nach Eingabe der Parameter und initialem Laden

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SmICS: Patientenhistorie

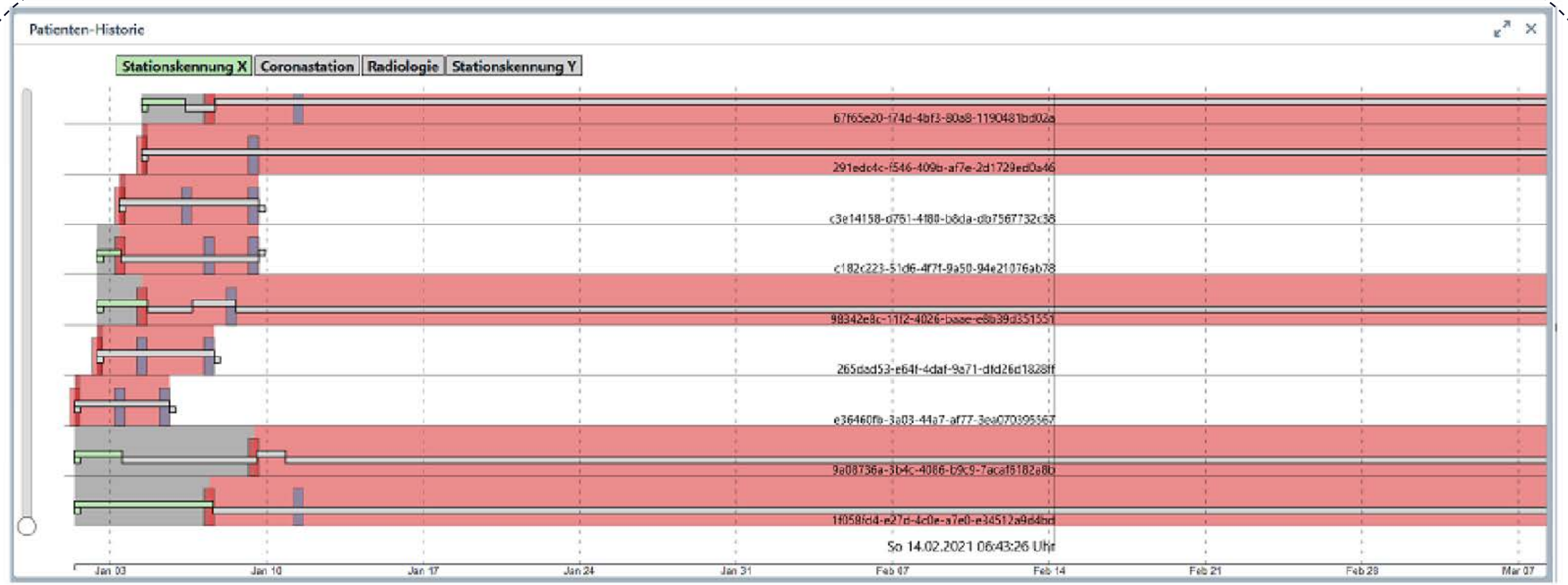
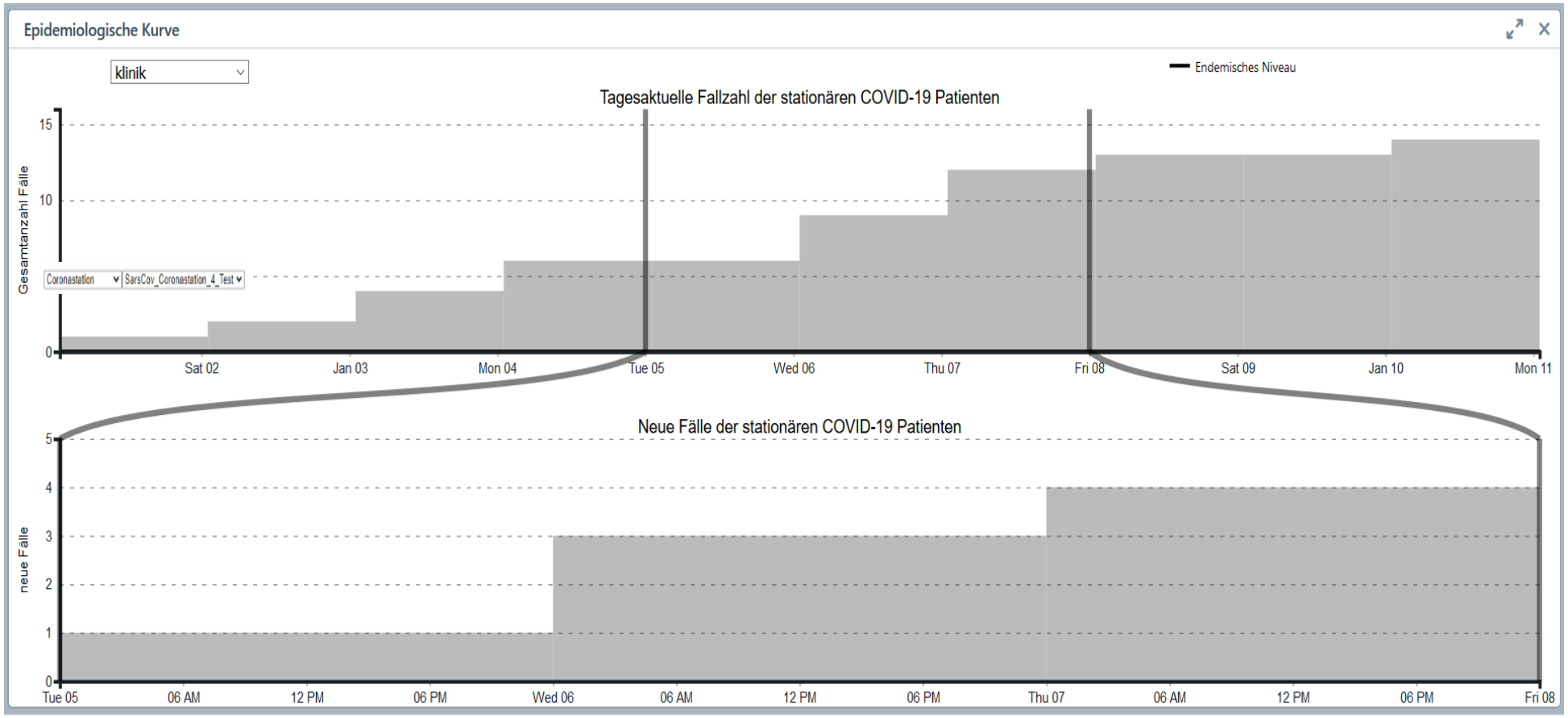


Abbildung 7: Patienten-Historie mit Anzeige der Patienten-IDs (Mouse Over)

SmICS: Epidemiologische Kurve



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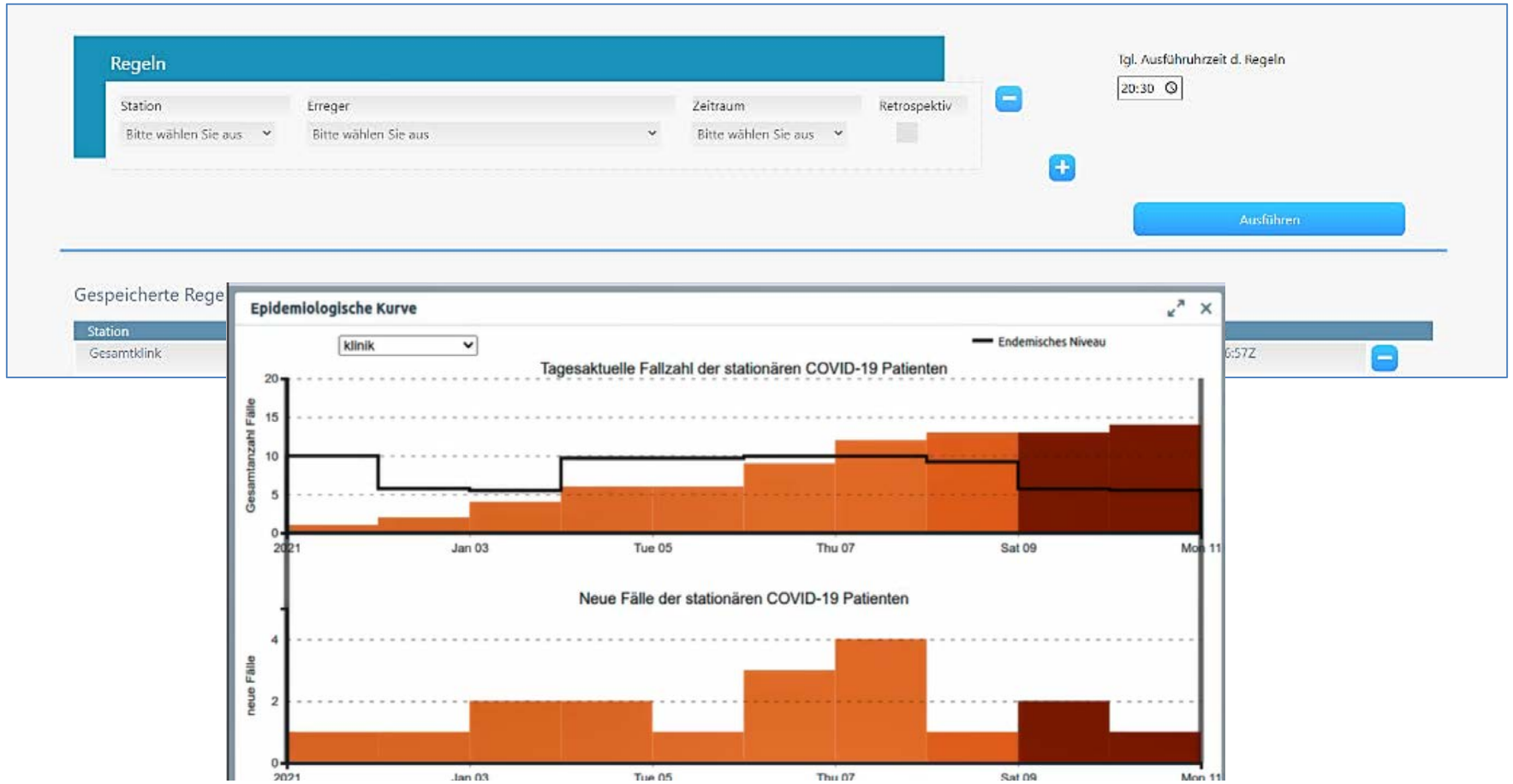
SmICS V1.0.3: Detektionsalgorithmus



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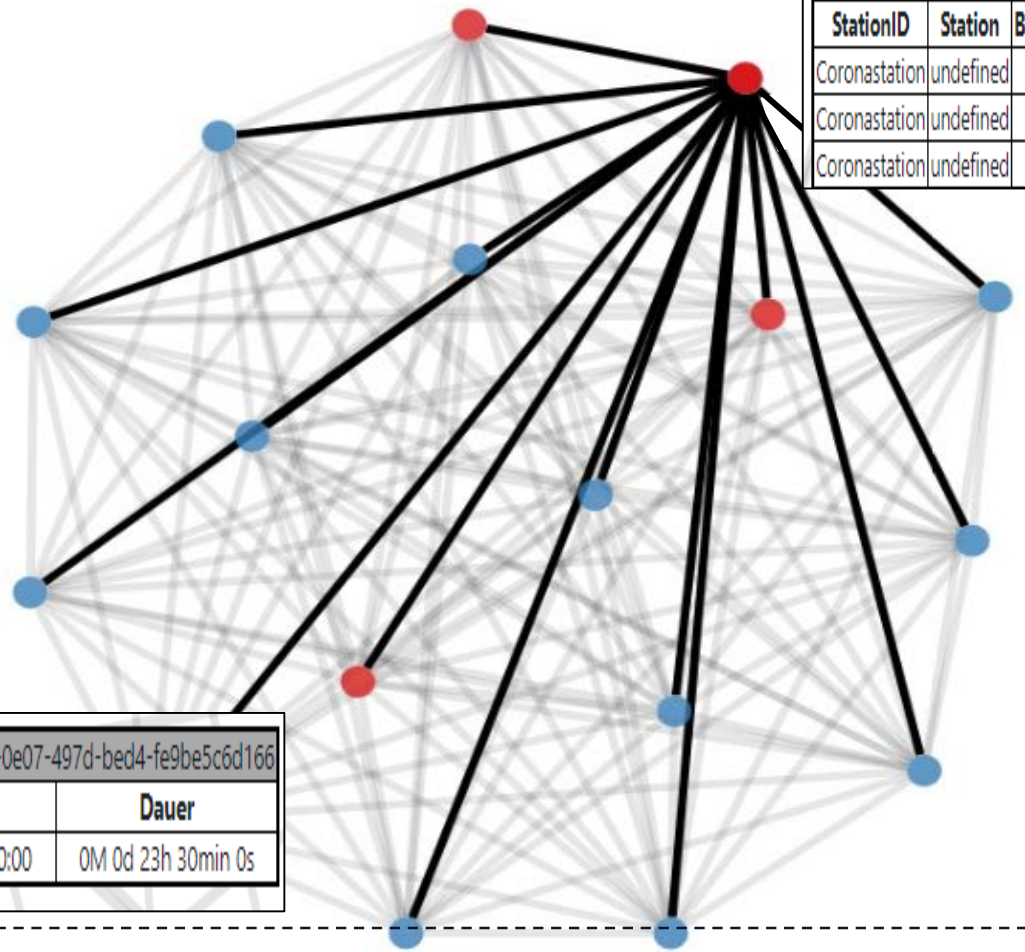
SmICS: Kontaktnetzwerk



Bewegungen von 96cdcae3-6c08-4eb7-8e41-45b012bf61d4

StationID	Station	Bewegungstyp	Bewegungsart	Beginn	Ende	Dauer
Coronastation	undefined	Aufnahme	Diagn./Therap.	Sa 02.01.2021 09:00:00	Sa 02.01.2021 09:00:00	-
Coronastation	undefined	Wechsel	Diagn./Therap.	Sa 02.01.2021 09:00:00	Do 07.01.2021 15:00:00	0M 5d 6h 0min 0s
Coronastation	undefined	Entlassung	Diagn./Therap.	Do 07.01.2021 15:00:00	Do 07.01.2021 15:00:00	-

Kontakt von c74f6215-4fc2-42a5-a3ad-f92536ca64dc und 23cdde3c-0e07-497d-bed4-fe9be5c6d166

StationID	Beginn	Ende	Dauer
Coronastation	Mo 04.01.2021 15:30:00	Di 05.01.2021 15:00:00	0M 0d 23h 30min 0s

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SmICS: Interaktion /Queries

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SmICS

Statistik (Prototyp) | Visualisierung | Kontakterfassung klin. Personals (Prototyp) | RKI Konfigurationen (Prototyp)

Bitte beachten Sie: Die retrospektive Auswertung (4) ist ein sehr zeit- und rechenintensiver Prozess, der nur im Ausnahmefall oder zu Analysenzwecken gewählt werden sollte.

Regeln

Tgl. Ausfführuhrzeit d. Regeln

19:15

Station	Erreger	Zeitraum	Retrospektiv
47	Bitte wählen Sie aus	Bitte wählen Sie aus	

- Bitte wählen Sie aus
- Methicillin-Resistant Staphylococcus aureus (MRSA)
- Klebsiella pneumoniae
- Escherichia coli
- Acinetobacter baumannii
- Methicillin-Susceptible Staphylococcus aureus (MSSA)
- SARS-CoV-2

Ausführen

Gespeicherte Regeln

Station	Erreger	Zeitraum	Retrospektiv	Erstellungsdatum
Stationskennung X	SARS-CoV-2	1	False	2021-08-25T18:12:54Z

Smart Infection Control System

HiGHmed Kontakt

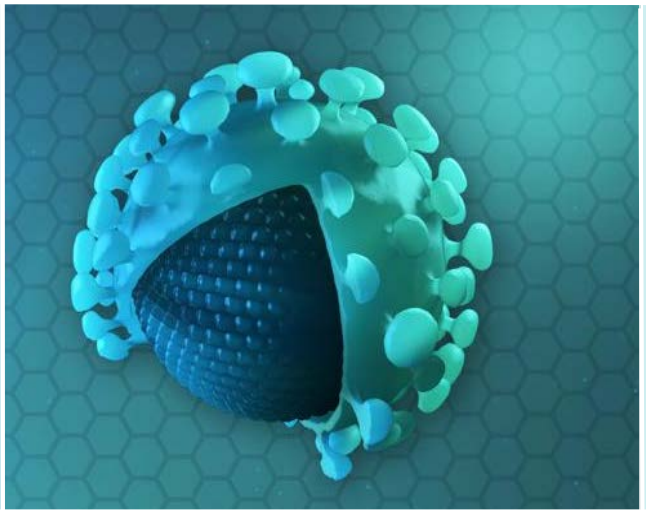
Abbildung 20: Detektionsalgorithmus – Wahl eines Erregers.

What to expect today

WHAT (did we do)

2

SmICS (Use Case Infection Control)



Where (to go)

4

RISK PRINCIPE

WHY (did we react)

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The problem

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CoSurv-SmICS
KDS-Mikrobiologie

Bildquellen: www,forbes.com; www.pixaby.com; www.snoopy.com

3. a. Spin Off: Co-SurV-SmICS

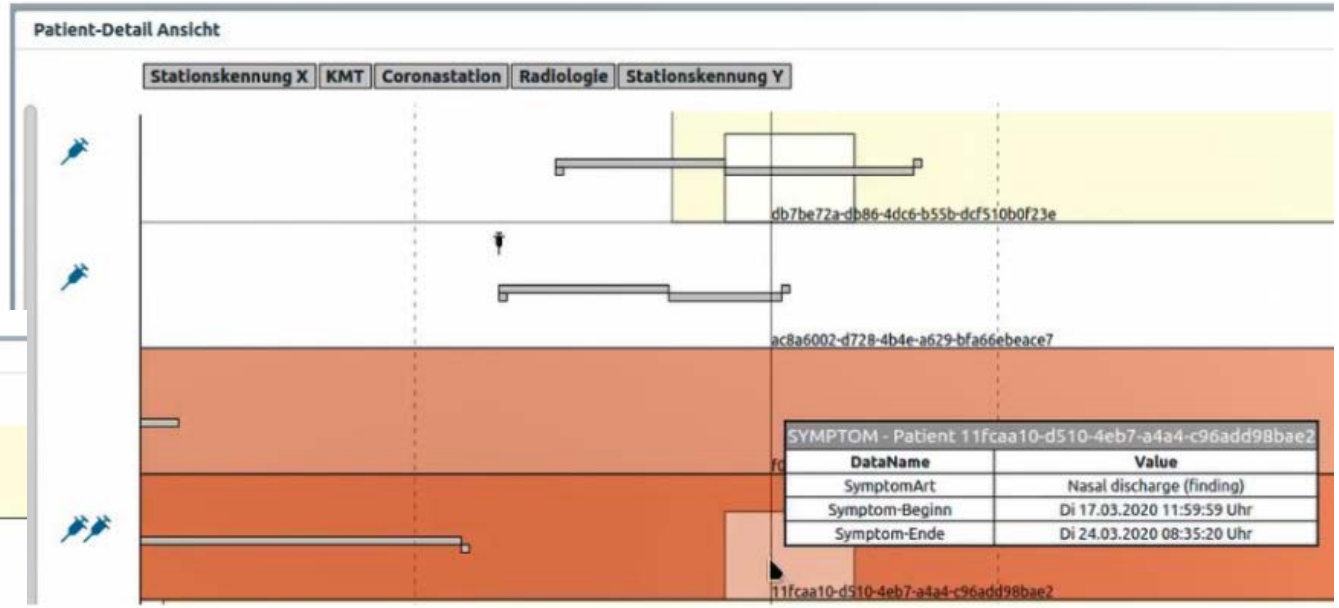

Abbildung 14: Patienten-Detailansicht - Symptome

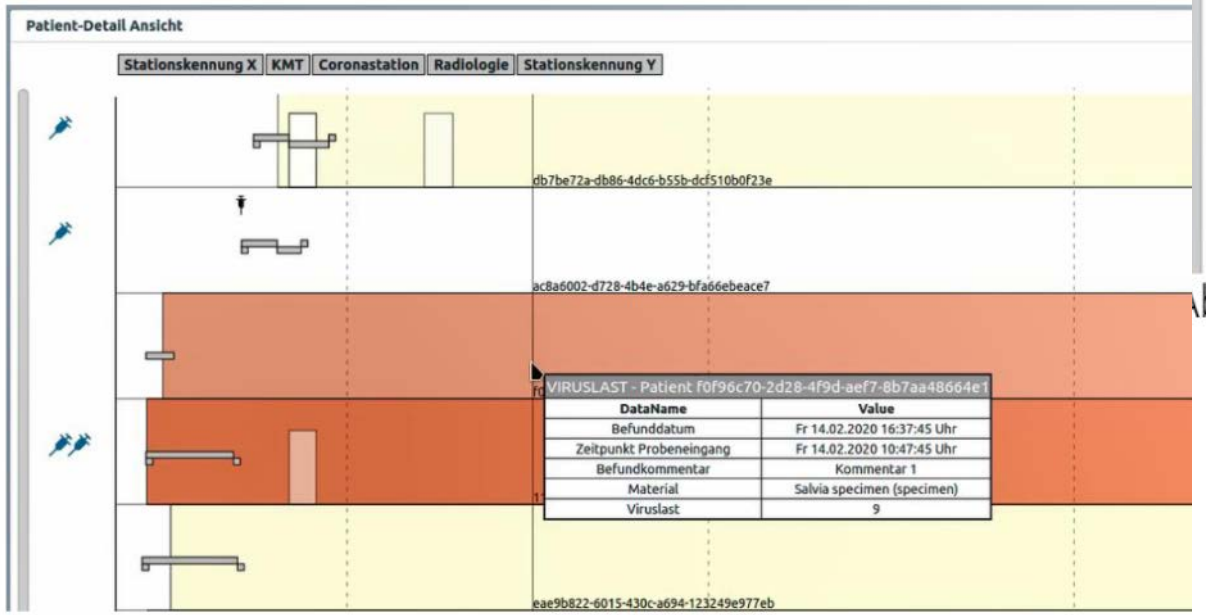

Abbildung 11: Patienten-Detailansicht - Darstellung quantitatives Ergebnis (ct-Wert)

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3.b. Spin off: Kerndatensatz Erweiterungsmodul Mikrobiologie

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- Konsortienübergreifend abgestimmte Datensatzmodellierung abgeschlossen
  - Basis: OpenEHR-Template „Mikrobiologischer Befund“ und Minimal Data Set aus dem Infection Control UseCase sowie Vorarbeiten aus HELP Use Case
  - Erweitert um detailliertere Angaben zu Mikroskopie, Kultur, Molekulare Diagnostik, Serologie/Immunologie, Genetische Untersuchung
- Umsetzung in FHIR und Erweiterung des openEHR Modells in Arbeit

➢ Hervorragende Voraussetzung für die Arbeit in RISK PRINCIPE und dem konsortienübergreifenden Datenaustausch im Kontext Mikrobiologie und Infektionskontrolle

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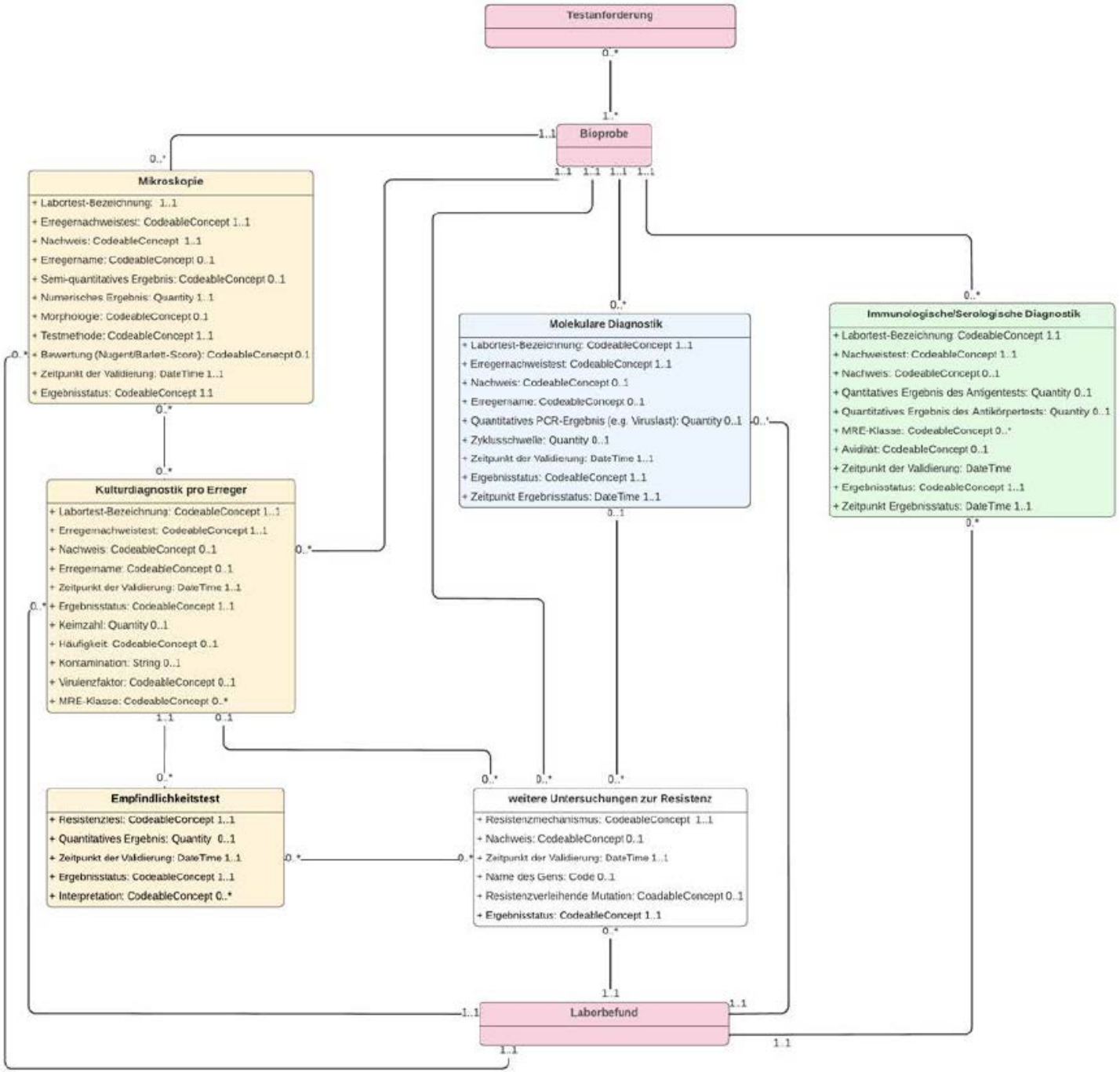

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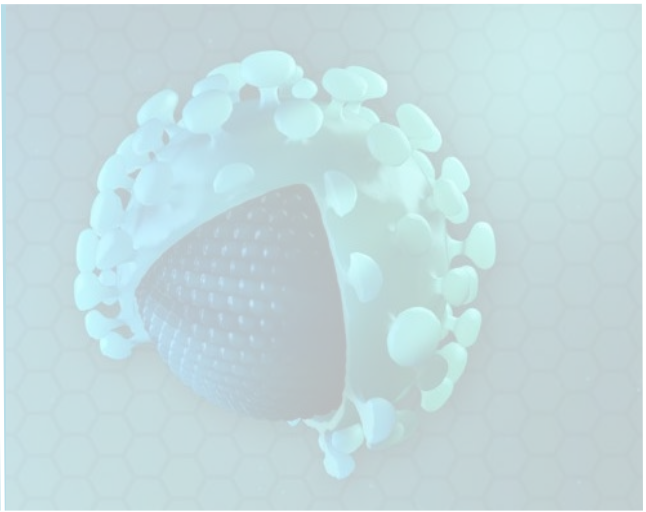
What to expect today

WHAT (did we do)

2

SmICS (Use Case Infection Control)



Where (to go)

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RISK PRINCIPE

WHY (did we react)

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CoSurv-SmICS
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Bildquellen: www,forbes.com; www.pixaby.com; www.snoopy.com

MII-3: RISK PRINCIPE - Konsortienübergreifender Use Case
RISK Prediction for Risk-stratified INfection Control and PrEvention

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The overarching goal is to develop and implement data-driven, risk stratified infection control in order to reduce hospital-onset bacteremia most effectively and efficiently.

Therefore, the main objective of our use case consists of two tasks:

i) using patient data to generate a patient or patient group-specific risk profile transferrable into a computerized application

ii) establishing and validating an automated surveillance system.

RISK PRINCIPE will be developed using the example of hospital-onset bacteremia episodes.

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MII-3: RISK PRINCIPE - Konsortienübergreifender Use Case
RISK Prediction for Risk-stratified INfection Control and PrEvention

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O. Kurzai, UKW

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RISKI PRINCIPE AIM

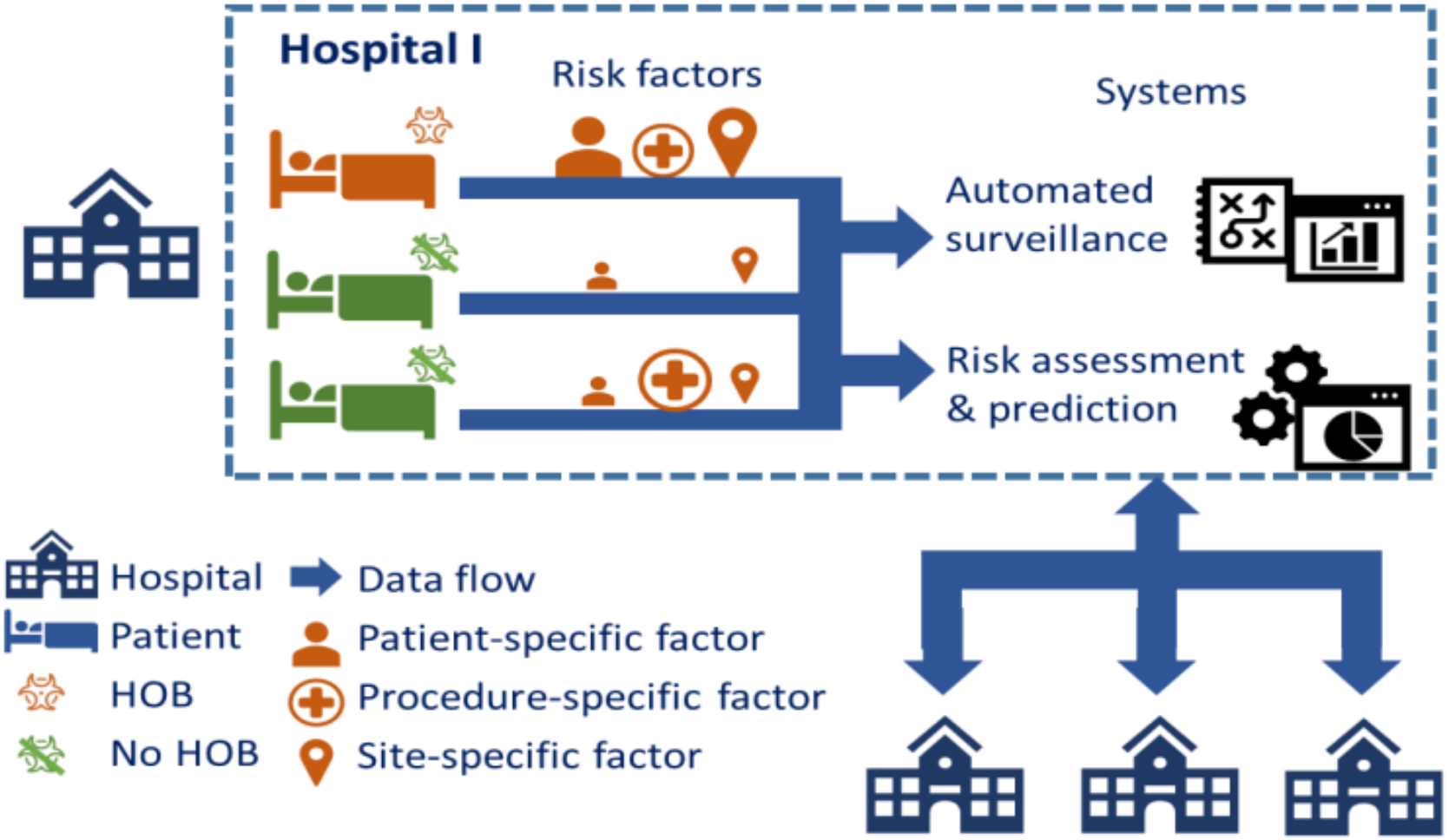

Figure 2: Schematic representation of project goals. Patient data in each hospital will be used to derive patient-specific, procedure-specific, and site-specific factors. These will be used by risk assessment and prediction models and apps as well as for models and apps of automatic surveillance. Aggregated risk factors will be exchanged to update and improve models and surveillance across hospitals.

Hospital-Onset Bacteraemia

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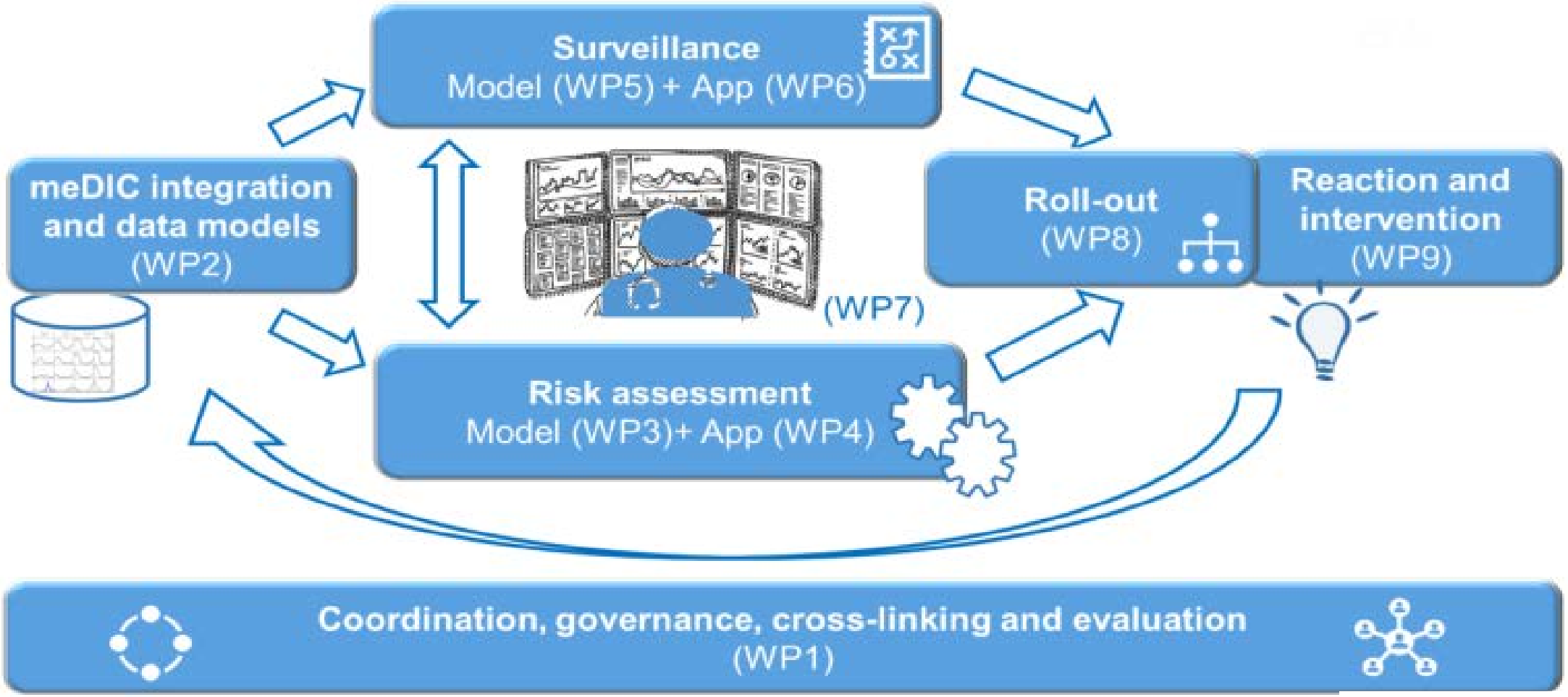

Figure 1: Project overview: Work packages and their relationships are displayed

Thank YOU for your attention!

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"What's natural is the microbe.
All the rest-heath, integrity, purity (if you like)-is a product of the human will,
of a vigilance that must never falter. The good man, the man who infects hardly anyone,
is the man who has the fewest lapses of attention."
Albert Camus

Thanks to the BMBF

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