

Session 3. Infection Prevention & Control: What research to develop innovations to prevent/control infections in healthcare?

Key research achievements

Research towards sustainable strategies to ensure Infection Prevention and Control (IPC) during outbreaks and pandemics.

Updates and Priorities

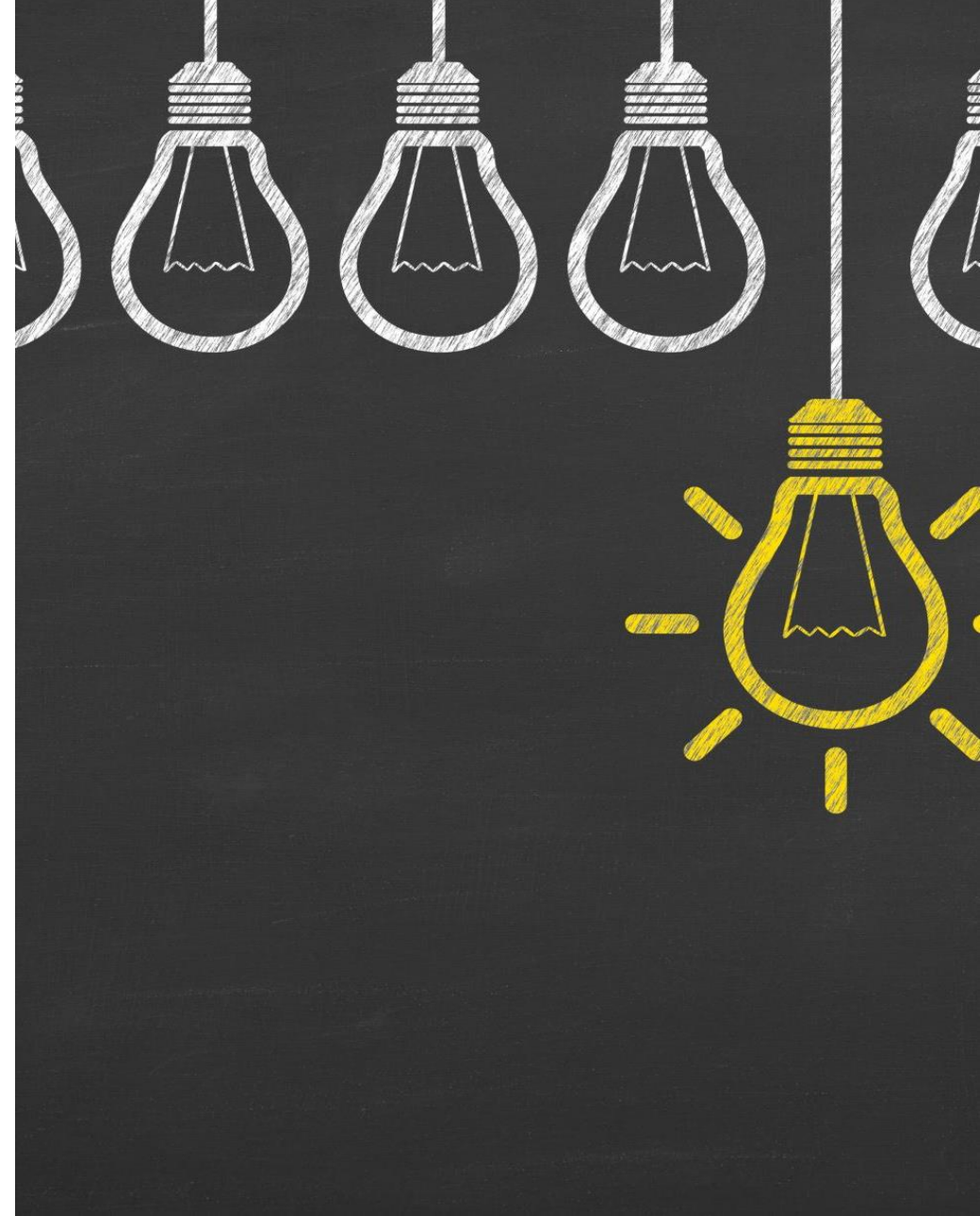
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Currently Visiting Fellow,

Kellogg College

University of Oxford, UK



Key research achievements and progress update

Infection prevention and control (IPC): Operational readiness and response research and innovation for public health emergencies

The COVID-19 pandemic highlighted ongoing **gaps** in the understanding of how **transmission modes influence prevention measures** and what are the most effective practical **tools for protection and control** in the context of emergencies due to novel high-threat pathogens (HTPs) of epidemiologic concern.

Objectives

In collaboration with experts from many countries, the WHO Infection Prevention and Control (IPC) teams focused on the following research areas:

- Understanding risk factors in exposures to SARS-CoV-2 and other pathogens in the health care work environment and cost-effectiveness of measures to prevent health and care workers (HCWs) SARS-CoV-2 infection
- Rethinking existing IPC medical devices and equipment based on key enabling technologies.
- Defining pragmatic protocols for guiding local implementers in executing safe and effective IPC practices.
- Working with laboratory experts to bridge knowledge gaps on how to detect and deactivate novel pathogens, to inform cleaning, disinfection and reprocessing practices.
- Establishing research and innovation (RI) priorities which should be brought to the attention of the international community.

Peer-Reviewed Publications

WHO teams coordinated research resulting in **25** peer-reviewed publications since the last GRIF meeting

PPE (n=13)

Health Worker
Infections
(n=2)

IPC
Programmes &
HAI
Surveillance
(n=7)

Environment
(n=3)

Relevant Publications (n=25)*

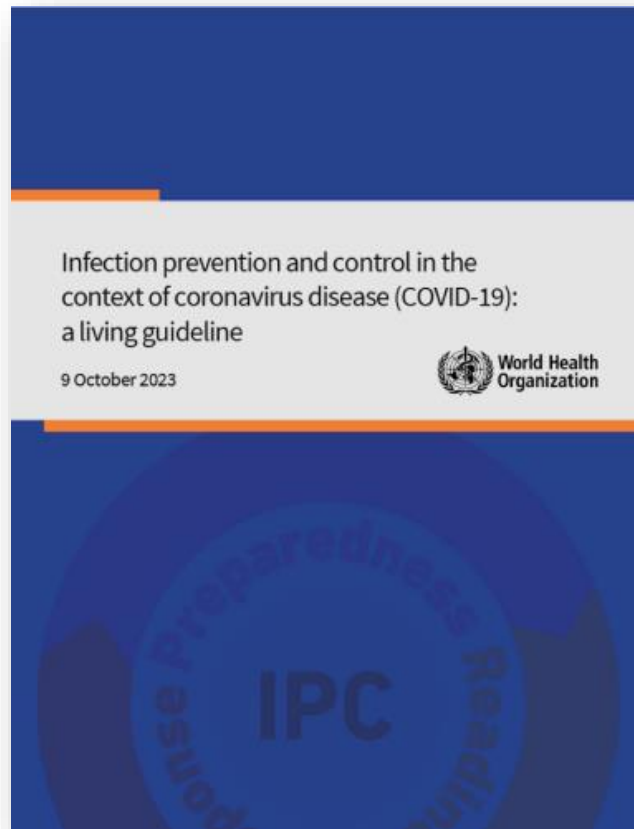
1. Considering context: Adaptive elements of a simulation program to improve primary care safety during the COVID-19 pandemic in Alberta, Canada
2. Detection of SARS-CoV-2 in exhaled air using non-invasive embedded strips in masks
3. Inactivation strategies for SARS-CoV-2 on surgical masks using light-activated chemical dyes
4. Methylene blue applied to N95 respirators and medical masks for SARS-CoV-2 decontamination: What is the likelihood of inhaling methylene blue?
5. Of masks and methylene blue-The use of methylene blue photochemical treatment to decontaminate surgical masks contaminated with a tenacious small nonenveloped norovirus
6. Methylene blue in combination with sunlight as a low cost and effective disinfection method for coronavirus-contaminated PPE
7. Introduction of mandatory masking in health care and community: experience from Jena, Germany
8. Perceived Workload Using Separate (Filtering Facepiece Respirator and Face Shield) and Powered Air-Purifying Respirator and Integrated Lightweight Protective Air-Purifying Respirator: Protocol for an International Multisite Human Factors Randomized Crossover Feasibility Study
9. Non-patient-related SARS-CoV-2 exposure from colleagues and household members poses the highest infection risk for hospital employees in a German university hospital: follow-up of the prospective Co-HCW seroprevalence study
10. Sars-Cov-2 exposures of healthcare workers and acquisition of COVID-19
11. Perceptions of organizational culture among infection preventionists in Israel, the United States, and Thailand: Results from national infection prevention surveys
12. Robust epidemiological investigations in hospital-based COVID-19 outbreaks cannot be overlooked-even in the era of whole-genome sequencing
13. Surveillance for SARS-CoV-2 and its variants in wastewater of tertiary care hospitals correlates with increasing case burden and outbreaks
14. Viable mpox virus in the environment of a patient room
15. Viral cultures for assessing fomite transmission of SARS-CoV-2: a systematic review and meta-analysis

... and more!

*Funded entirely or in part by WHO



IPC Guidelines



World Health Organization. (2023). Infection prevention and control in the context of coronavirus disease (COVID-19): a living guideline, 9 October 2023. World Health Organization. <https://iris.who.int/handle/10665/373269>



World Health Organization. (2023). . World Health Organization. Infection prevention and control guideline for Ebola and Margurb disease, August 2023. <https://www.who.int/publications/i/item/WHO-WPE-CRS-HCR-2023.1>

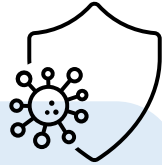
Future research priorities

- [WHO Priority Pathogens](#)
- Global research prioritization exercise to define the research priorities for IPC in context of Public Health Emergencies (PHE)

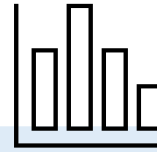
IPC Research Priorities



**Environment
Sampling
methods and
deactivation**



**IPC measures
Transmission-
based
precautions
PPE**



**Early data
management,
collection,
and
interpretation**



**Exploring
non-toxic
measures**



**Pre-planned
protocols for
RCTs ready
for outbreaks**



**Standardization
of wastewater-
based
surveillance**



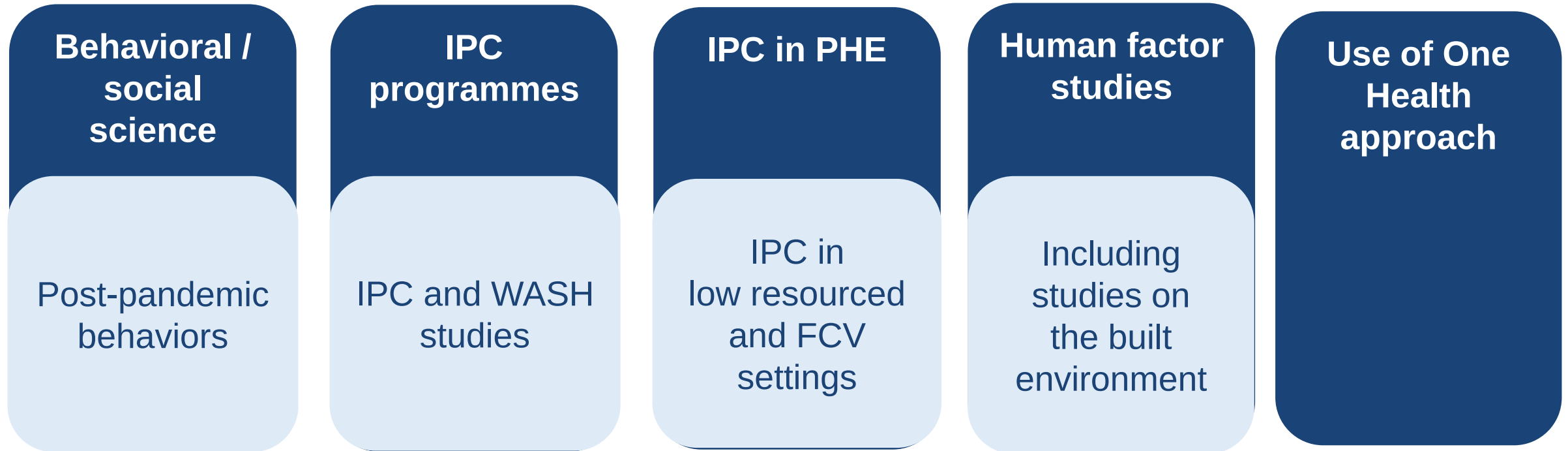
**Application of
artificial
intelligence**



**Exploring
low-cost
methods**



Implementation Research



Research Prioritization Exercise

Ebola Disease / Marburg Disease (EBOD/MARD)

- **Participants:** IPC Public Health Working Group + GDG EBOD/MARD members
- Modified Delphi technique: 1 preliminary meeting + two rounds of survey

Results:

Research priorities (≥ 75 percentile of sum score) included the following thematic areas:

- Glove disinfection
- Healthcare workers' EBOD/MARD occupational risk
- Defining most appropriate research design for EBOD/MARD studies
- PPE indication for use, reuse, and donning/doffing.

Early Identification and Response Research

Incorporating Innovative Big Ideas

Funding for Research

**Low-cost
innovations
in resource-
constraint
settings**

Revamp Knowledge Gap

**Data management
and data science**

**Methods
standardization**

**Implementation
science**

IPC + WASH

**Merge IPC
practitioner with
WASH
practitioner**

**Behavioral
sciences**

**Lessons
learned from
previous
epidemics**

Big Research Idea

Early detection of epidemic-prone infectious diseases and infection prevention and control operational readiness and response

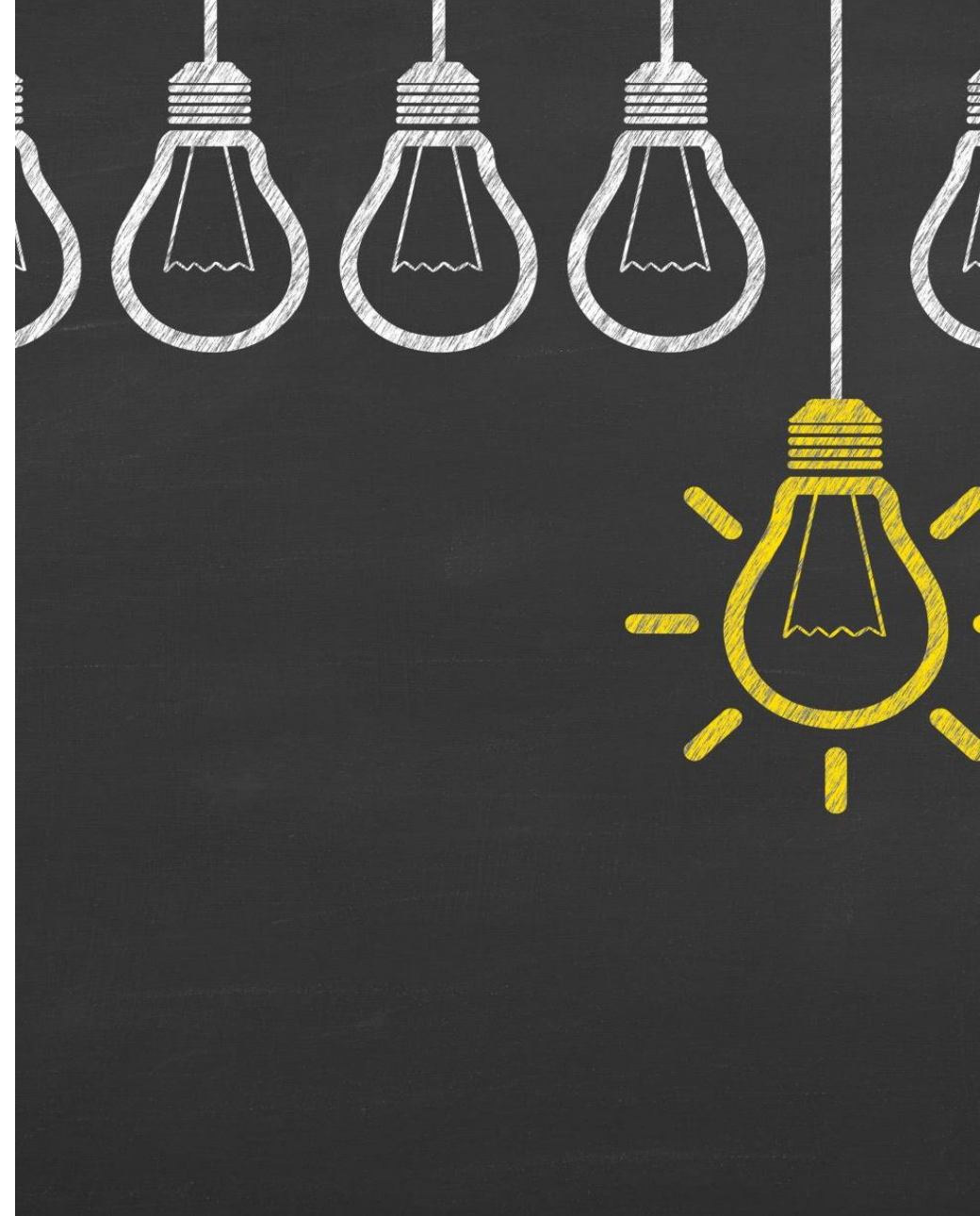
Innovative approaches

Jesus Rodriguez-Manzano MSc PhD

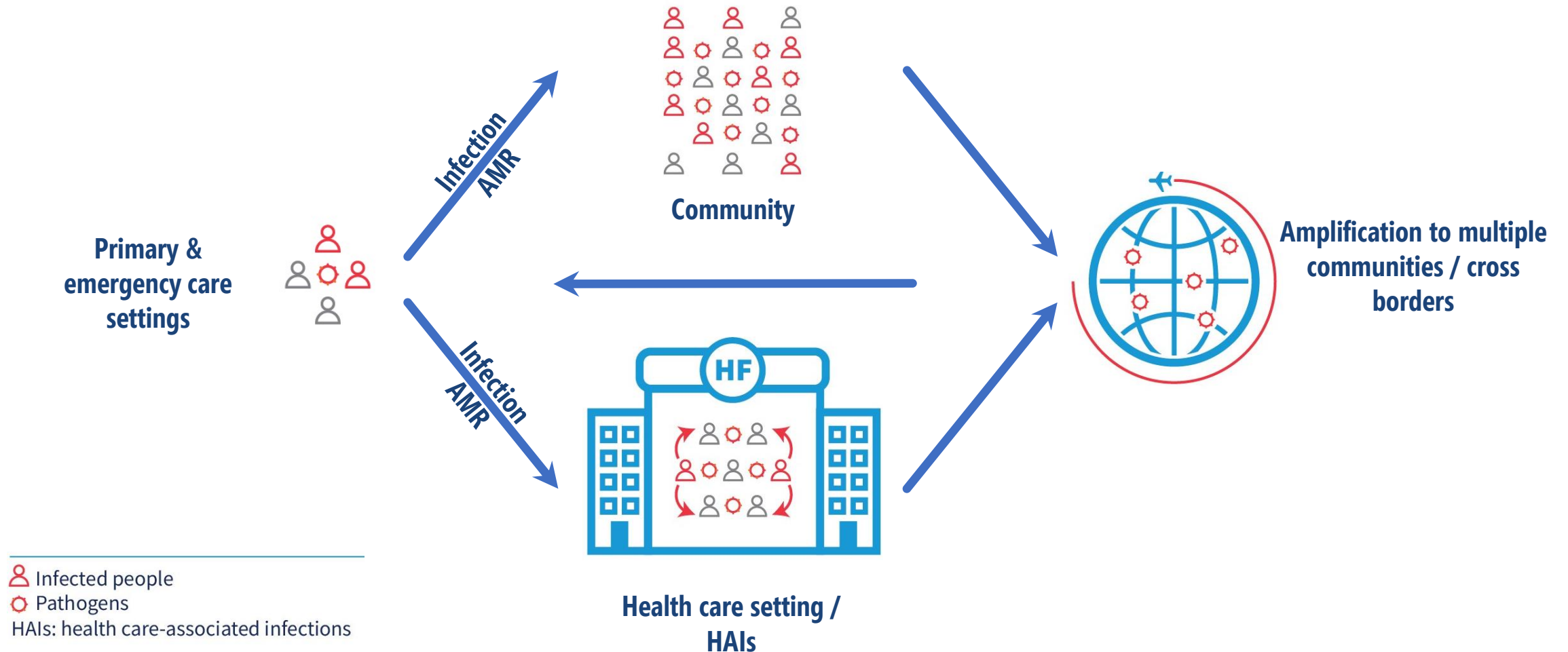
Senior Lecturer in Diagnostics for Infectious Diseases at Imperial College London

Deputy Director of the Centre for Antimicrobial Optimisation (CAMO)

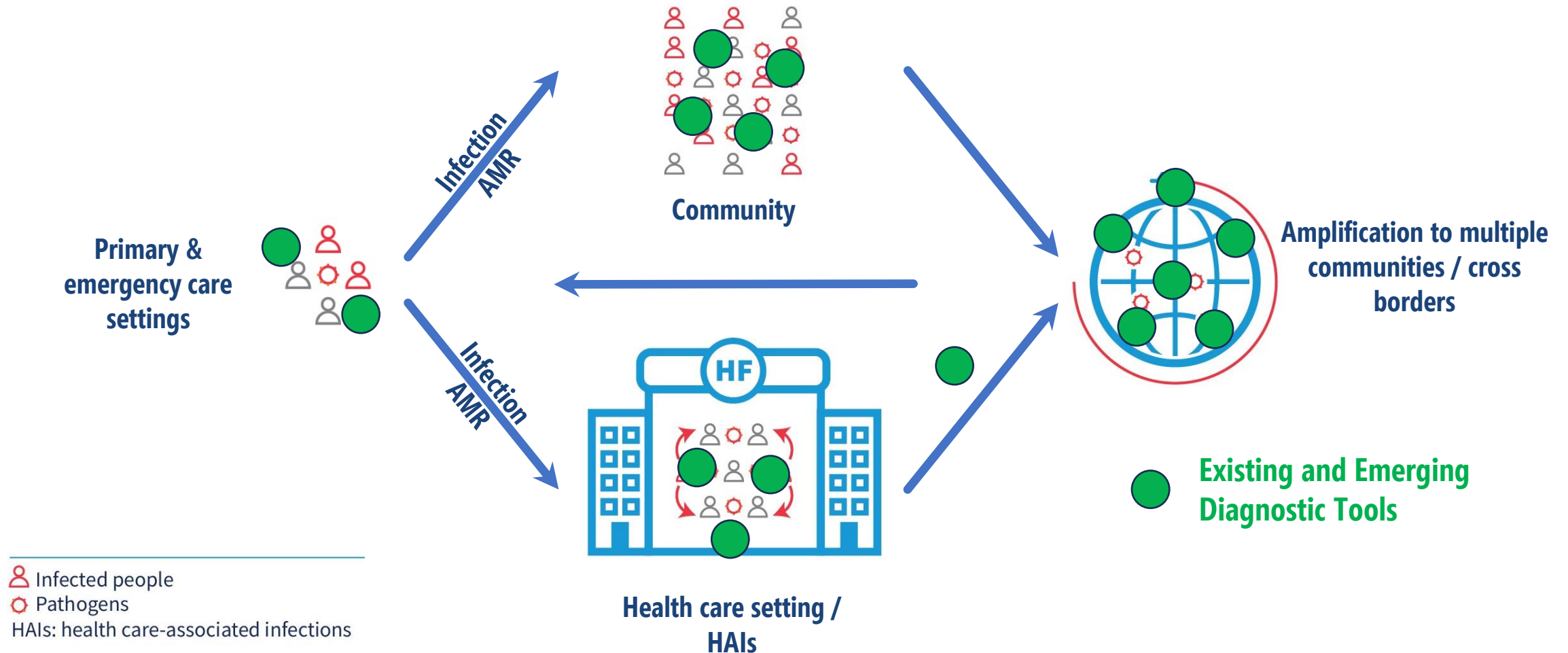
Co-Founder and Chief Scientific Officer at ProtonDx Ltd



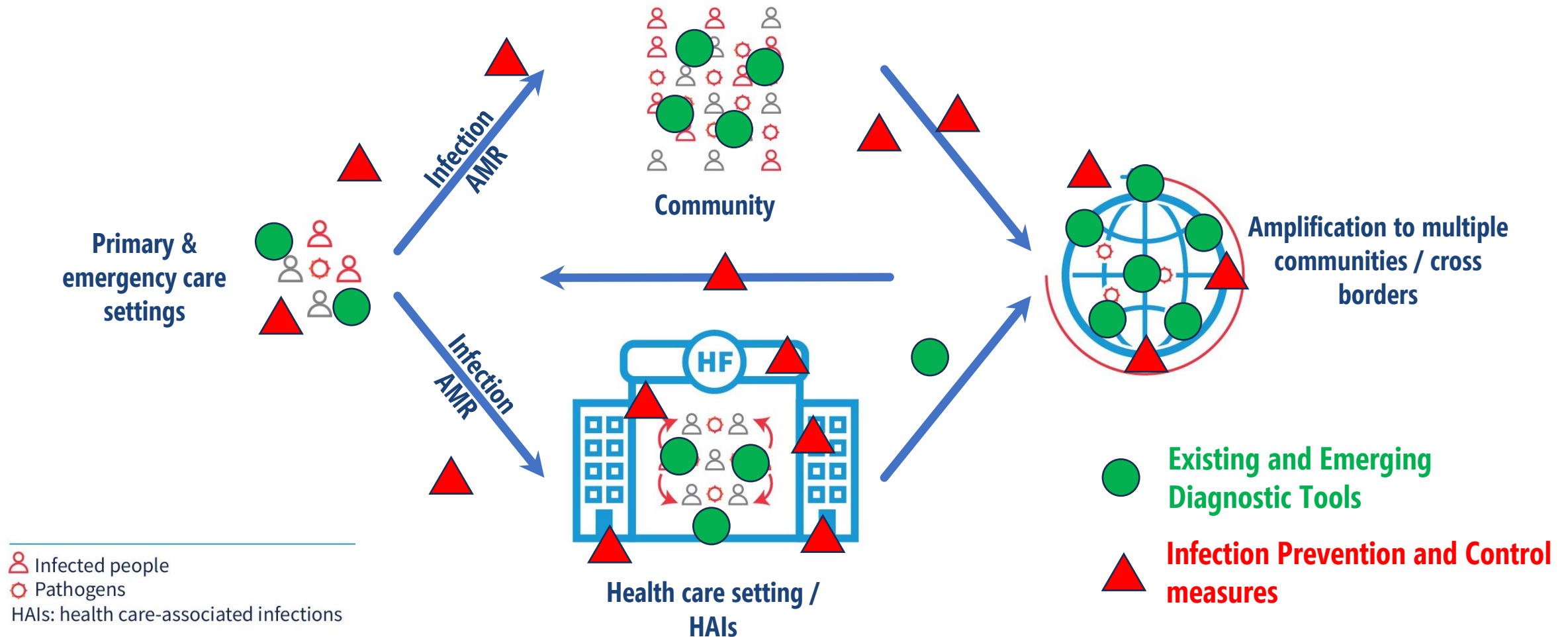
Problem: Amplification of Outbreaks Associated with Healthcare Infections Along the Patient Pathway



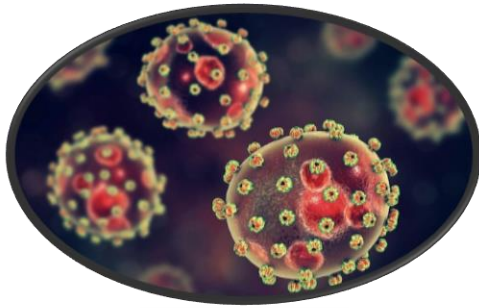
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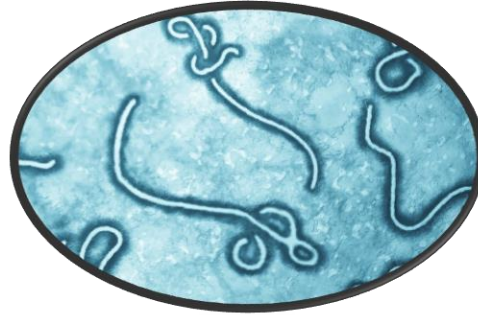
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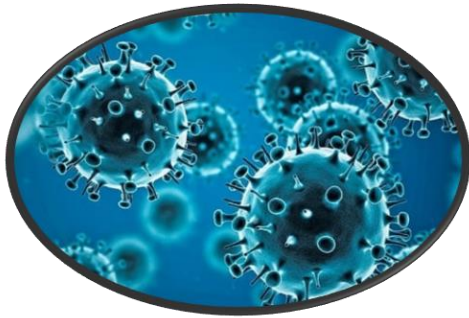
Well-Documented Outbreaks in Primary Care and Outpatient Settings



Lassa virus



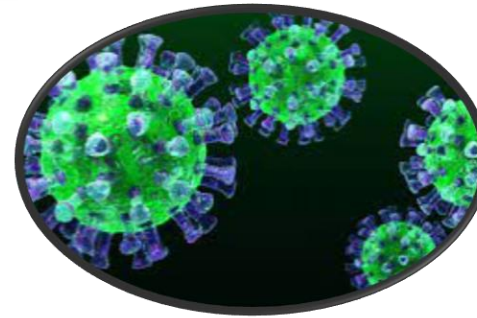
Ebola/Marburg



SARS-CoV-2



mpox



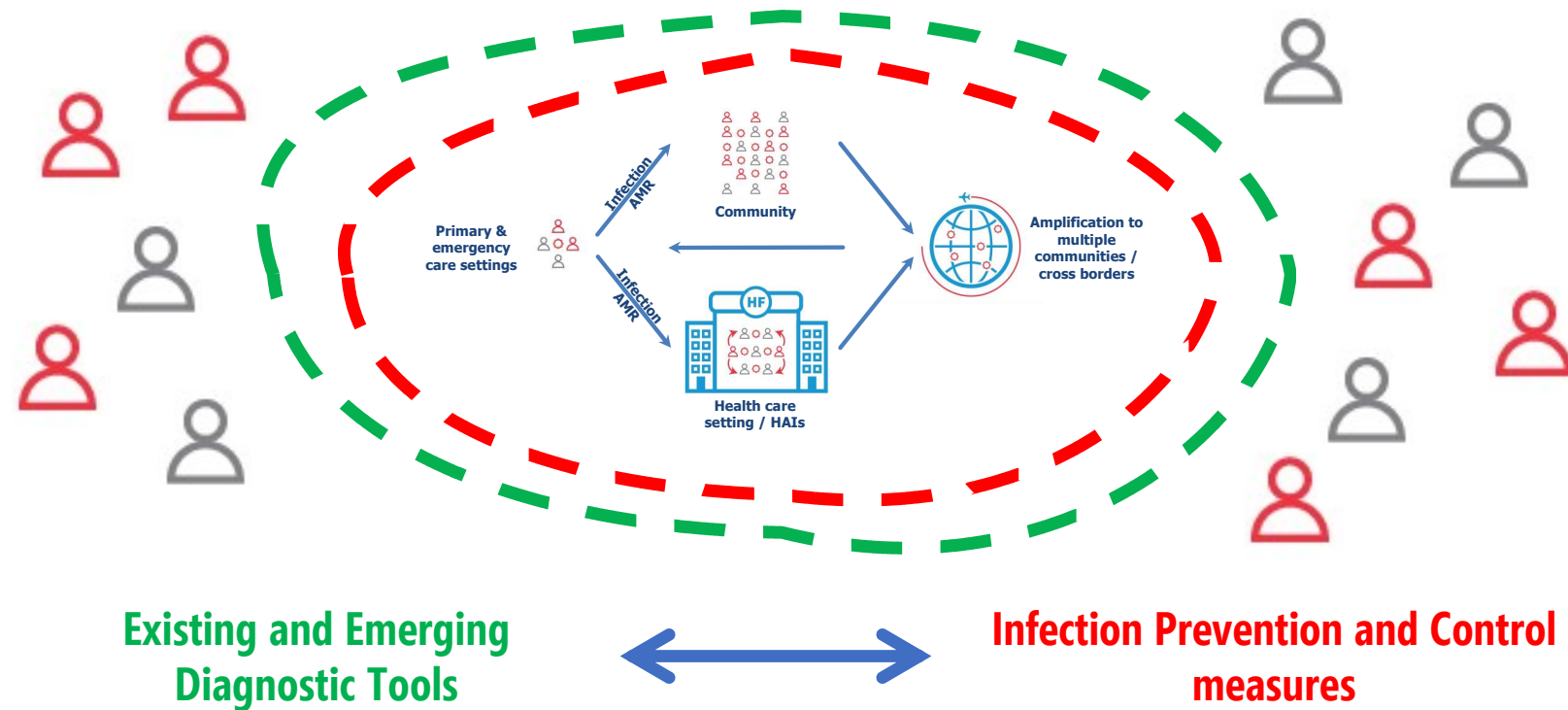
MERS-CoV

Effective infection control can prevent HAIs from escalating into pandemics

[WHO List of Priority Pathogens](#)

Solution: "Big Research Idea – Creating a 'Ring of Protection' by Decentralizing Testing and Implementation of IPC Measures"

Deploy rapid point-of-care testing and targeted IPC responses along and beyond the patient pathway



Integrating Diagnostics in IPC Practices

Near-patient diagnostic tools to inform infection control practices

- Early screening and risk assessment of high-risk patient
- Rapid identification and detection of pathogens
- Timely implementation of relevant IPC measures (e.g., patient placement, selection and use of PPE, duration of precautions)
- Outbreak management
- Guiding antibiotic usage

The big idea: using point-of-care diagnostic tests to improve the implementation and effectiveness of IPC measures along and beyond the patient pathway.

Implementing The Big Idea

Paradigm Shift in the Use of Diagnostics in Healthcare

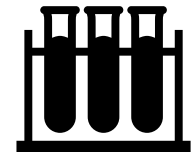
We need to shift away from the **conventional definition of diagnostic tests** (e.g. presence/absence).



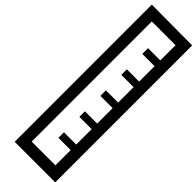
Considerations for **community** in addition to individual patients only.



Diagnostics tools need to be used to guide surveillance, inform IPC measures, and prevent the amplification of outbreaks associated with healthcare settings.



Move **beyond the one-size-fits-all** approach.

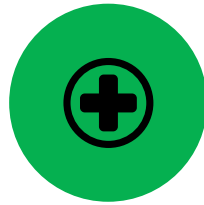


Near-Patient Diagnostic Applications

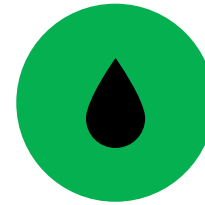
In combination with syndromic based assessments



Rapid diagnostic testing (self-testing and point-of-care) for patients and health workers

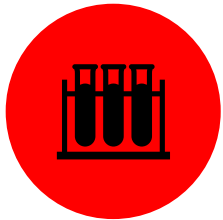


Contact tracing technologies within health care facilities

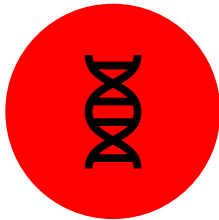


Wastewater surveillance at health care facility level

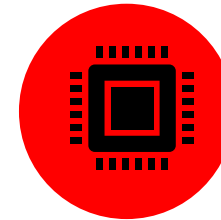
Improved IPC Approaches and Innovative Tools



Identification of worldwide common barriers and facilitators (behavioural sciences)

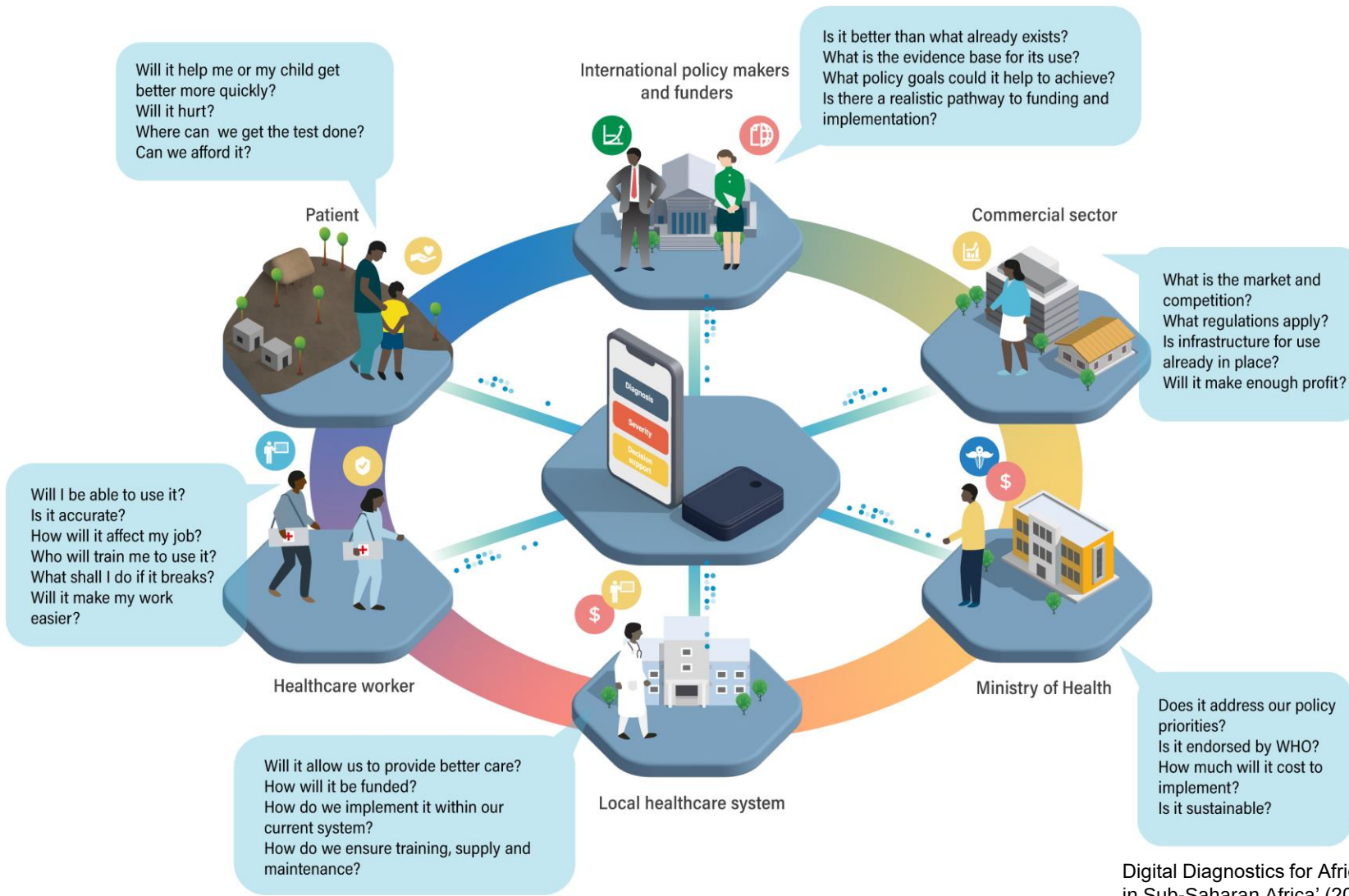


Innovative dissemination strategies on IPC measures in the context of outbreaks



AI technologies

Enhancing Transparency Throughout the Implementation Pathway



Fostering a Unified Approach Among Stakeholders for the Integration of Diagnostics

Particular attention to regulatory bodies & establishment of emergency pathways

Digital Diagnostics for Africa Network. 'The potential of digital molecular diagnostics for infectious diseases in Sub-Saharan Africa' (2022) *PLOS Digital Health*, 1(6). <https://pubmed.ncbi.nlm.nih.gov/36812544/>

Research Questions

What strategies can be implemented to **establish early warning systems** for the detection of emerging infections **outside and within** health care facilities?

How can we optimize the **implementation of responsive point-of-care testing protocols** to improve healthcare outcomes and patient safety?

What methods and technologies can be employed to better **monitor and track the health and well-being of healthcare workers** in real-time?

How can we **enhance the precision and efficiency of targeted IPC interventions beyond** healthcare systems to maximize positive health outcomes?

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