Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
Università di Pisa

The Role of Biomedical Engineer in public Health

Leandro Pecchia

Kenyatta University

Personal Journey…

2005 & 2009

2009-2011

2011-2013

2013-2022

2020-2023

2022 - …

Intelligent Health Technology: Sustainable design, management and assessment

Ph.D. Candidates


Martina Sassi


Nahimiya Husen


Alberto M. Di Giacinto


Claudia Ferraro


Maria E. Pagnano

Ph.D. Students


Jiras Ligan


David Della Morte


Cristiana Ragozzino


Edoardo Caporin


Filippo Crispino


Tamara Boscarino


Jacopo Vitale


Marianna Zarro


Ruben Piperno


Agnese Bonfigli


Simone Crispino


Pietro Furlani


Luigi Manzo


Mattia Muraro


Carla Cambiano

3 PIs


Leandro Pecchia
Director


Mario Merone
Lab Co-Director


Joseph Lovecchio
Lab Co-Director

4 Assistant Professors


Margherita Matarrese
Signal Processing EEG/MEG


Karina Ovejero
Nanotechnology for Tissue Engineering


Luca Bacco
AI & NLP


Pierpaolo Fucile
Bioprinting for Tissue Engineering

2 Project Managers


Sara Cinelli
PM


Marta M. Romano
PM & AI

IHT
INTELLIGENT
HEALTH TECHNOLOGIES

ùCurrent (Main) Projects

Tot grant we wrote since 2022: ~80mil, ~7.3mil for our lab since Sep 2022

ODIN [Horizon Europe]
Hospital of the Future

GRACE [Horizon Europe - IHI]
AI, telemedicine and Congestive Health Failure

AI4RIRD [PNC]
AI for rare diseases (eye and heart)

Afya Moja [PNRR]
One Health in Africa

EPoCA [Horizon Europe]
Ebola Point of Care for Africa

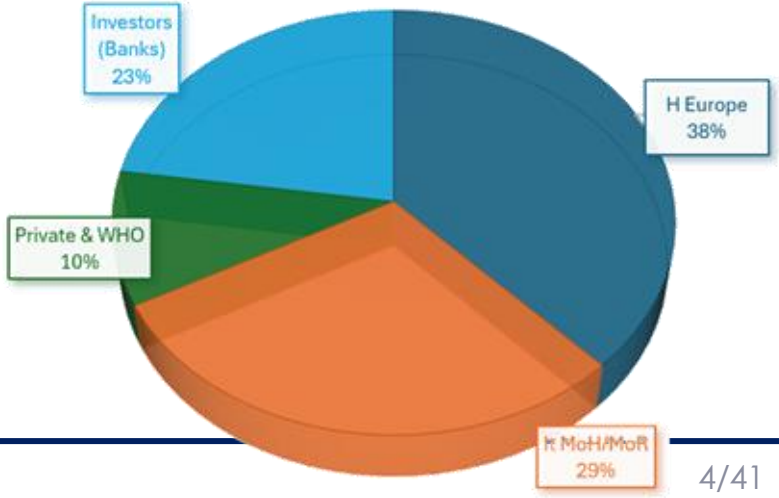
WHO Medical Device Policy [WHO]
Rewriting WHO device national policies

ENKORE [Horizon Europe - IHI]
Greening, medical device and pharma

WHO Medical Device Donation [WHO]
Rewriting WHO device donation guidelines

IMPACT-MED
AOIMD4 Cardio Metabolic D.

SISTINE [MUR FIS, *PI J. Lovecchio*]
AI for Tissue Engineering



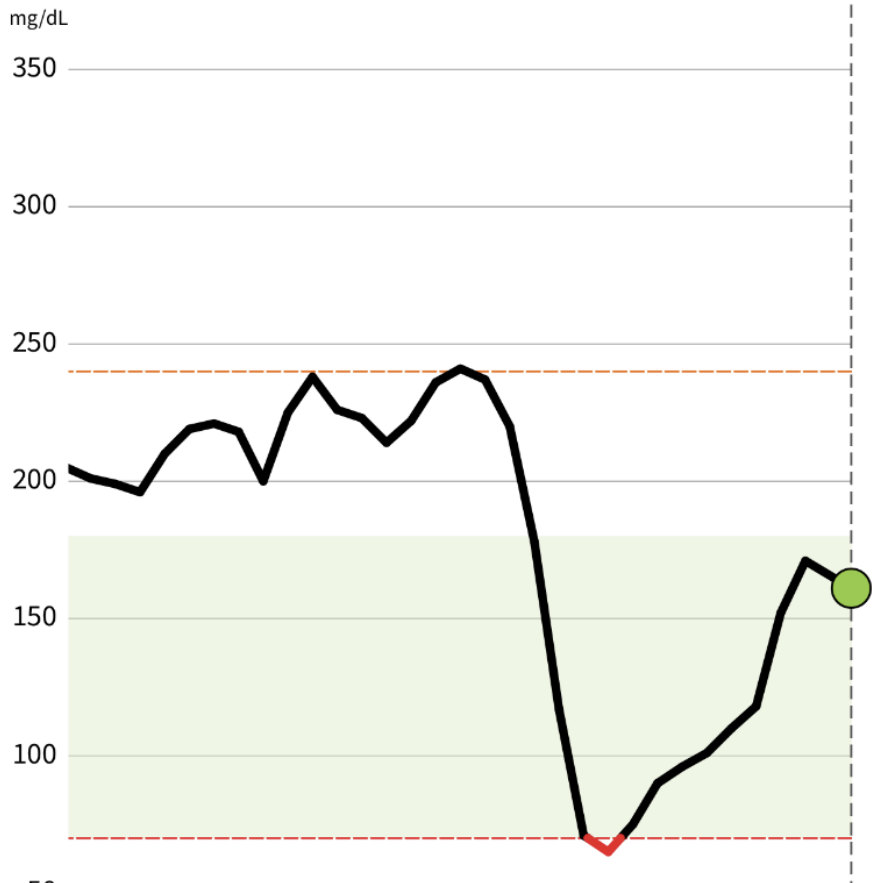

pollutant
awkward
painful

13:11

FreeStyle LibreLink

GLUCOSIO NELL'INTERVALLO

161 mg/dL



Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
Università di Pisa

The Role of Biomedical Engineer in public Health

Leandro Pecchia

Kenyatta University

BIOMEDICAL ENGINEERING GLOBAL HEALTH

from engineering biology and medicine to Global Health

Leandro Pecchia, PhD

Professor of Biomedical Engineering

Pro-Rector for Research

Univ. of Warwick

Univ. Campus Bio-Medico of Rome

Innovation Manager WHO Emergency Program IPC for COVID

Secretary General, IFMBE (2022-2025), https://ifmbe.org/

VP EAMBES for Public Affairs (2025-27), https://eambes.org/

Secretary General, IUPESM (2018-2022), https://iupesm.org/

Nairobi, 9 February 2026

Università Campus Bio-Medico di Roma - Via Álvaro del Portillo, 21 - 00128 Roma – Italia

www.unicampus.it

BME and the Global Health ecosystem

UN
Agencies

IAEA
(International Atomic Energy Agency)

WB
(World Bank)

UNESCO
(United Nations Educational, Scientific and Cultural Organization)

IMF
(International Monetary Fund)

WHO
(World Health Organization)

Innovation Manager (2020-23)

ISC
(International Science Council)

NGOs in Official Relations with the WHO

IUPESM
(International Union for Physical and Engineering Sciences in Medicine)

Secretary General (20218/22)

IOMP
(International Organization for Medical Physics)

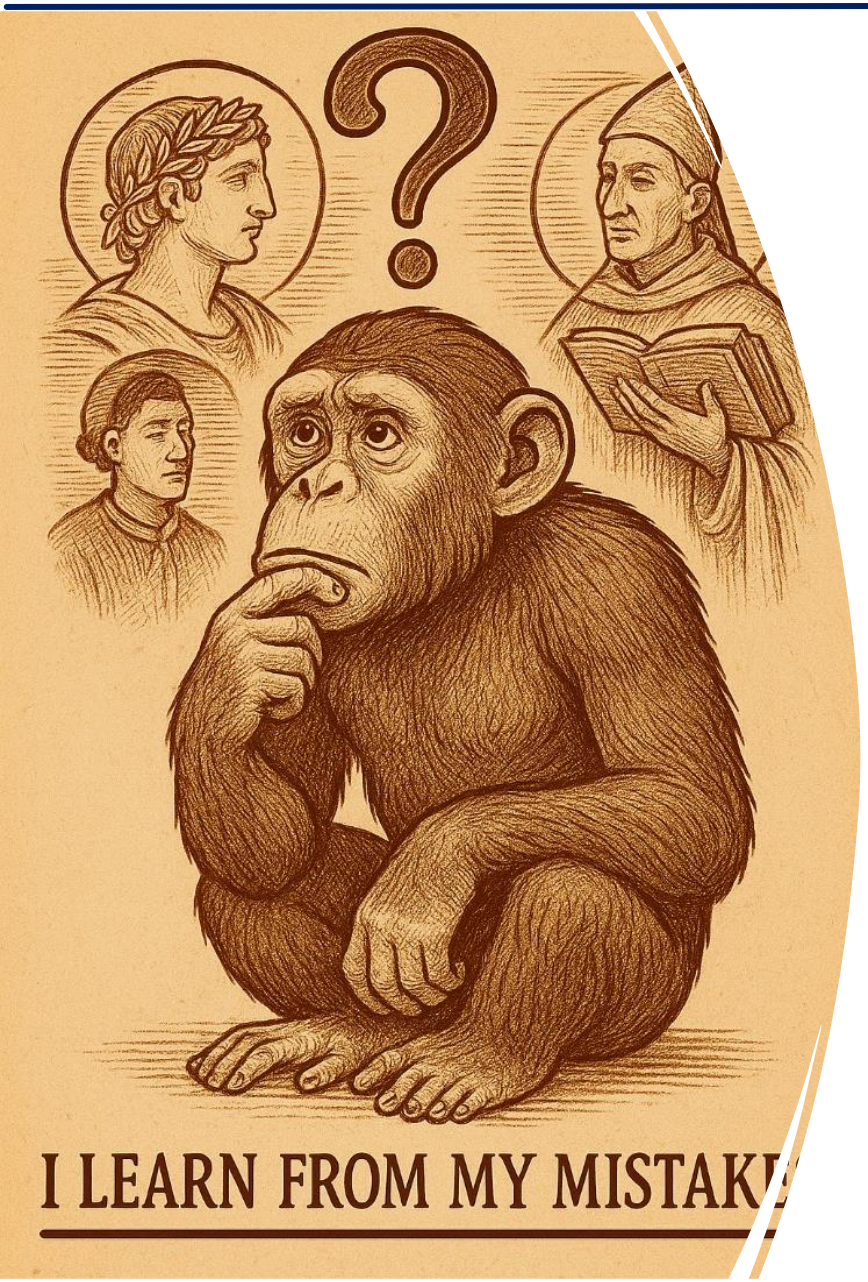
IFMBE
(International Federation of Medical and Biological Engineering)

Secretary General (2022/28)

Africa: Benin, Etiopia, Ghana, Kenya, Nigeria, RD Congo, Rwanda, South Africa, Uganda

European Alliance for EAMBES Medical and Biological Engineering & Science

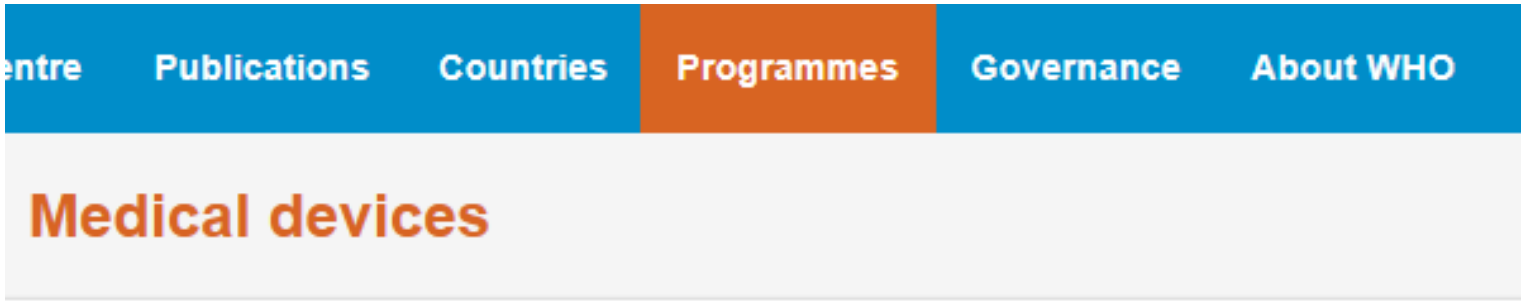
VP Public Affairs (2025/27)



What does define BME?

…I have my own answer:
I am what I do, I do what I am.

What does define BME?



World Health Organization

Biomedical engineering global resources

Trained and qualified biomedical engineering professionals are required to design, evaluate, regulate, maintain and manage medical devices, and train on their safe use in health systems around the world.

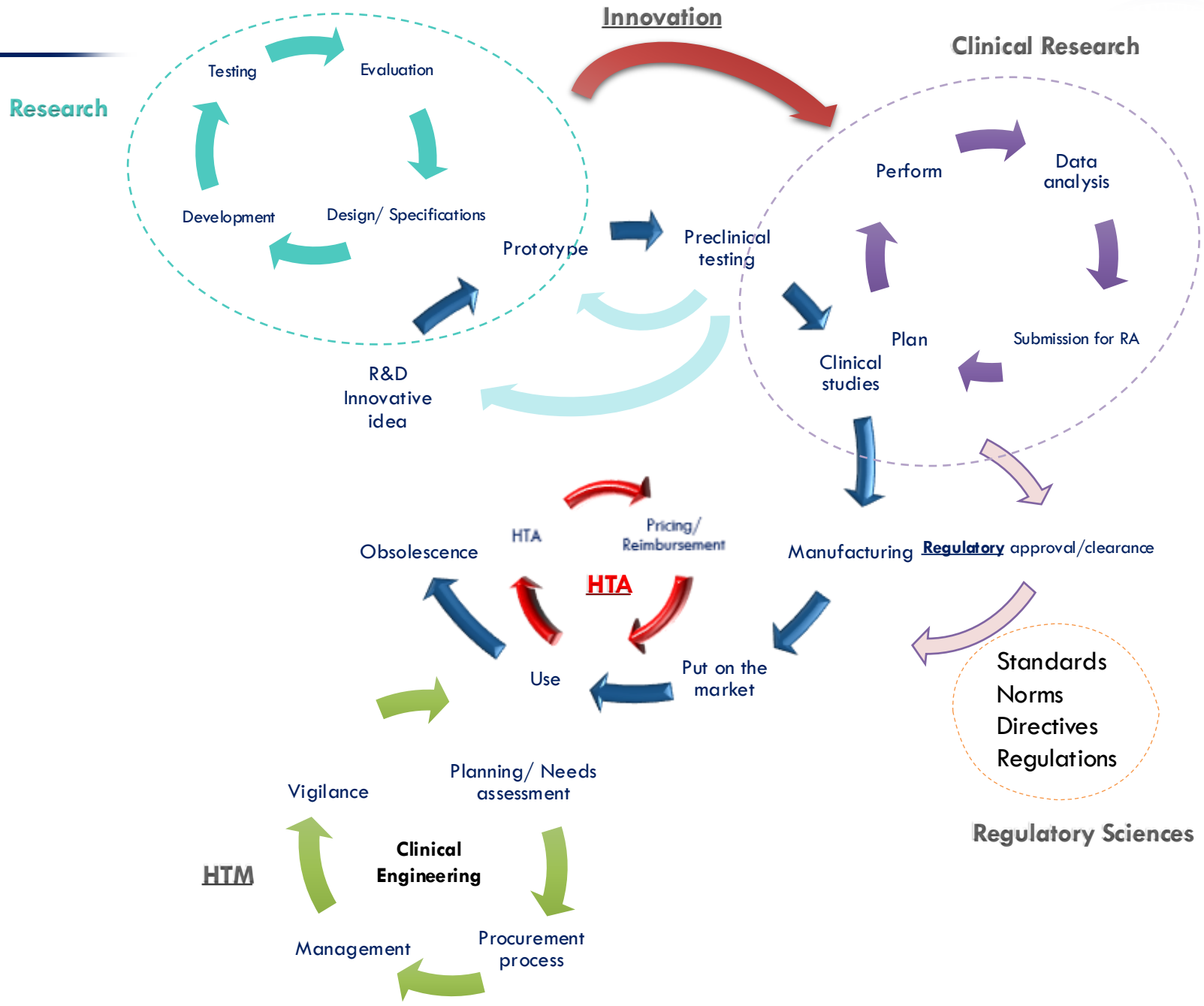
4.9.2015 EN Official Journal of the European Union C 291/45

Opinion of the European Economic and Social Committee on Promoting the European single market combining biomedical engineering with the medical and care services industry

EU EESC

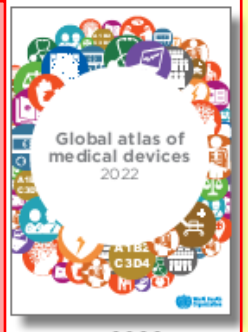
"Modern medicine predominantly secures important advances through the use of the products of biomedical engineering [i.e., Medical Devices]" (2015/C 291/07)

Medical Devices …lifecycle



MedTech: a global prospective…

2025



2022

2017

2025

Management


2011


2011


2024


2019


2011


2025

Technical specifications

2019-2021

Regulation

Assessment

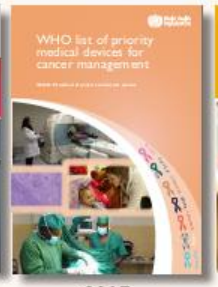
2025

Priority/Essential list

2019- 2023

2021

2020



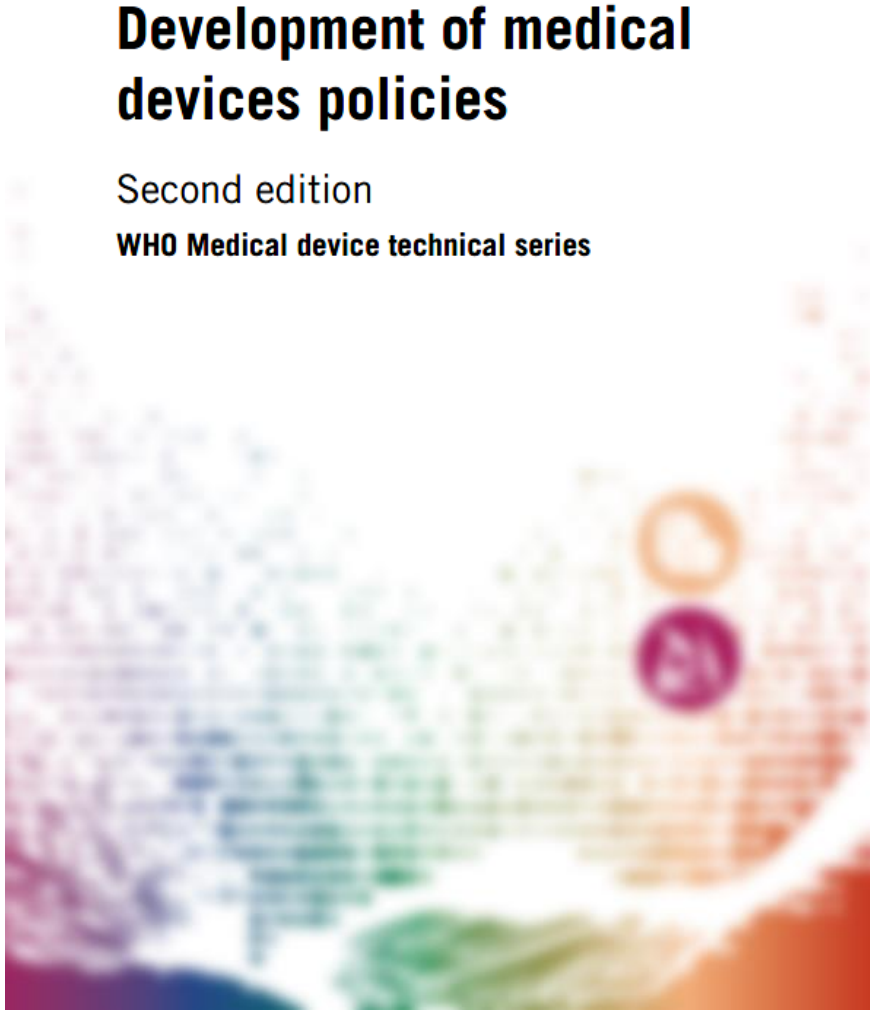
2017

2015

Compendiums


2011-2024

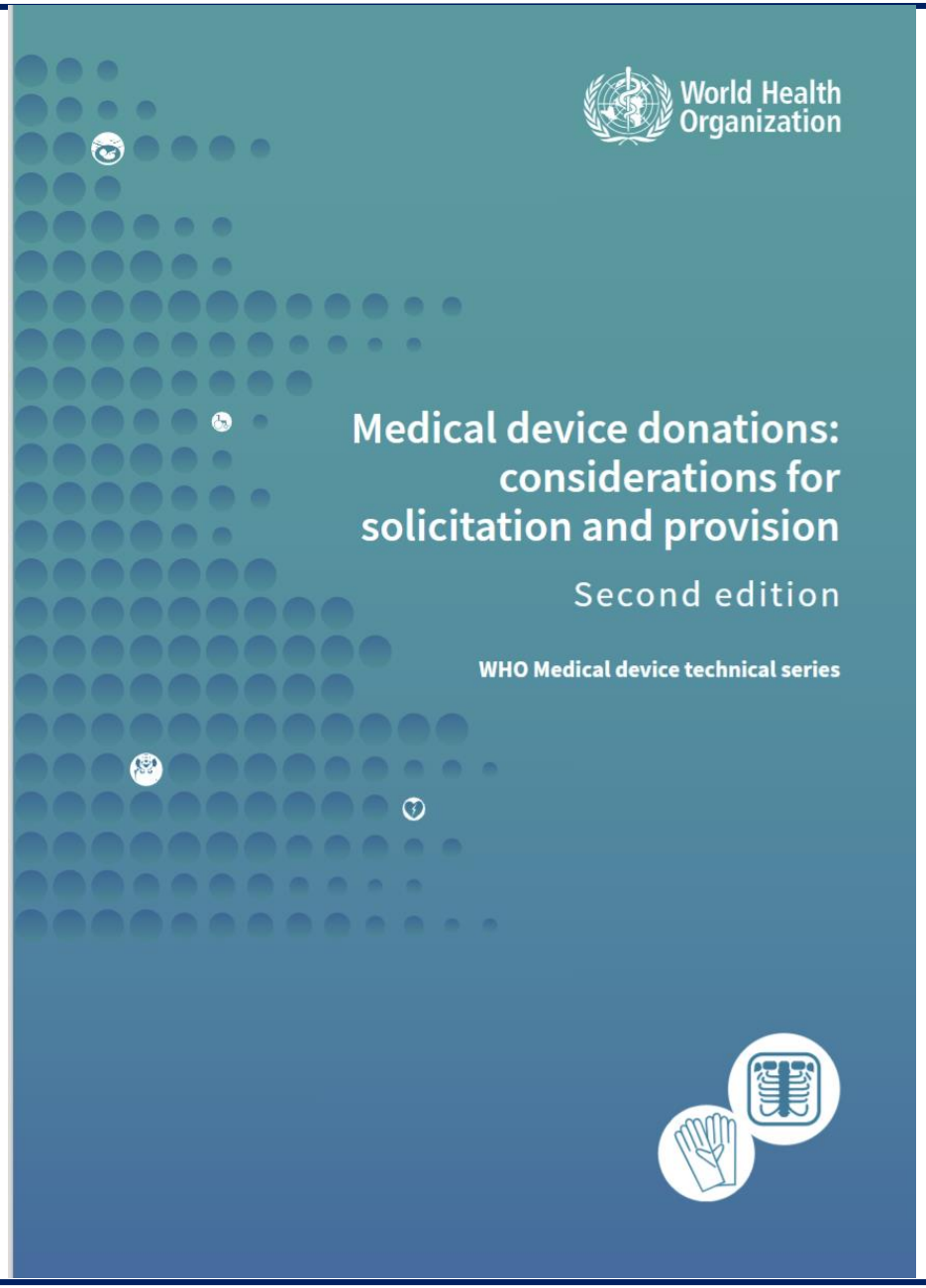
How to write National Policies on Medical Devices?



Desing Policies, strategies, and action plans for health technologies, specifically for medical devices, as part of any national health plan.
Policies must:

- ensure access to **safe, effective, and high-quality** medical devices that prevent, diagnose, and treat disease and injury, and assist patients in their rehabilitation.
- raise the awareness of the importance of developing and **implementing health technology policies** – comprised of **regulatory**, health technology **management**, and health technology **assessment** components – within the context of a national health plan.
- **Integrate MD policies into NHS planning, budgeting, monitoring**
- Address **new Challenges: AI**

WHO considerations on medical device donations



Three main sections

- major problems that may arise during the donation process.
- best practices for donors and recipients.
- Guidance on handling situations requiring special attention.

Three annexes for further reading

- Criteria for the acceptability of a donation.
- Literature review on donations of medical devices (2010–2023).
- An informational flyer ready to be shared.

Purpose of the document

- Improve the quality of medical device donations: medical equipment, digital health, single-use medical devices, in-vitro diagnostics.
- Ensure maximum benefit for all stakeholders.

Target audience

- Organizations, experts, and practitioners involved in donation, procurement, and management of medical devices.
- Health workers, biomedical engineers, health managers.
- Policymakers, donors, nongovernmental organizations, and academic institutions.

Criteria for sustainable innovation

Target settings

Icons for the target settings under 'Health technology and engineering management'.

Primary level

Home settings

Urban

Secondary level

Ambulance

Outdoors

Tertiary level

Rural

Indoors

Regulatory assessment	Proceed	Proceed with caution	Not acceptable	Not Applicable
Technology evidence assessment - risk/benefit ratio	High	Medium	Low	Not Applicable
Technology evidence assessment - Impact	High	Medium	Low	Not Applicable
Summary:				
Innovation		Innovation aspect in the domain		
Technology readiness level (TRL)	8-9	5-7	1-4	
Technology evidence assessment	Recommended	Recommend with caution	Not recommended	Not Applicable
Health technology and engineering management	High appropri-ateness for low-resource settings	Moderate appropri-ateness for low-resource settings	Low appro-priateness for low-resource setting	Not Applicable
Technology transferability	Fully transferable	Partly transferable	Not transferable	Not Applicable
Openly access intellectual property	Fully open access	Limited open access	No open access	Not Applicable
Local production	High appropri-ateness for low-resource settings	Moderate appropri-ateness for low-resource settings	Low appro-priateness for low-resource setting	Not Applicable

TECH 4 GLOBAL HEALTH

OBSERVATORY ON GLOBAL HEALTH

UNIVERSITÀ CAMPUS BIO-MEDICO DI ROMA

INTESA SANPAOLO

WHAT ARE THE LEGAL FOUNDATIONS FOR THE DEVELOPMENT AND USE OF INNOVATIVE TECHNOLOGIES IN GLOBAL HEALTH?

To address this issue, we have analyzed United Nations resolutions, particularly those of the World Health Organization (WHO), which establish the legal foundations for the use of such innovations for global well-being and health. We systematically examined the documents of the World Health Assembly* (WHA) over the past 25 years.

RESOLUTIONS	
WHA77.6	2024 - Promotes investments in new antibiotics and diagnostic tools for AMR
A/78/L.49	2024 - Calls for regulations for safe AI, public-private collaborations, inclusion
WHA76.5	2023 - Strengthens diagnostics and integration of digital technologies in health systems
WHA76.6	2023 - Promotes access to essential medications for NCDs in low-income settings
WHA76.2	2023 - Emphasizes the integration of surgical care in primary health systems
WHA76.5	2023 - Recognizes the potential of AI in health diagnostics
WHA77.3	2023 - Integrates psychosocial support and mental health into emergency plans
WHA75	2022 - Access to technologies for non-communicable diseases (NCDs)
WHA74.8	2021 - Emphasizes the need for access to health technologies, role of digital health during the COVID-19 pandemic
WHA74.13	2021 - Adopts the Global Patient Safety Action Plan (2021-2030)
WHA73.1	2020 - Defines global response to COVID-19, focusing on testing and vaccinations
WHA72.6	2019 - Establishes World Patient Safety Day
WHA72.16	2019 - Calls for resilient health systems for emergencies and natural disasters
WHA71.7 e .8	2018 - Integrates digital technologies in health systems, including telemedicine and mobile health
WHA70.12	2017 - Highlights the need for technologies for cancer prevention and treatment
WHA69.11	2016 - Links technological innovation to Sustainable Development Goals
WHA68.15	2015 - Improves access to essential surgical care within UHC
WHA67.25	2014 - Calls for surveillance systems to combat antimicrobial resistance (AMR)
WHA67.23	2014 - Encourages capacity building in HTA for evidence-based decision making
WHA60.29	2007 - Promotes data collection and national strategies for health technology management

The decision-making body of the WHO is the World Health Assembly, composed of representatives from the 194 member countries and over 200 Non-Governmental Organizations in official relations with the WHO, who meet annually to agree on the priorities and policies of the WHO. The WHA makes decisions through resolutions adopted if voted by at least 2/3 of those entitled to vote.

World Health Organization

UNIVERSITÀ CAMPUS BIO-MEDICO DI ROMA

INTESA SANPAOLO

GLOBAL HEALTH CHALLENGES ARE INCREASINGLY INTERCONNECTED AND URGENT, REQUIRING AN UNAVOIDABLE SHIFT IN FOCUS FOR THOSE ENGAGED IN RESEARCH AND INNOVATION IN HEALTHCARE TECHNOLOGIES AND BIOMEDICAL ENGINEERING.

CLIMATE CHANGE

Global Warming:

Increased Frequency of Heatwaves, Droughts, Torrential Rains, and Unusual Flooding.

Impact on Human Health:

- Cardiovascular mortality and respiratory diseases due to heatwaves.
- Malnutrition caused by crop failures.
- Increased transmission of infectious diseases.
- Spread of infectious diseases such as dengue, malaria, and West Nile virus in non-tropical areas.

In 2023:

- 167% increase in mortality among individuals over 65 due to high temperatures compared to the 1990s.
- 6% reduction in sleep hours compared to the 1986-2005 average.
- The basic reproduction potential (R0) of dengue increased by 31% in 2020 compared to the 1950-1954 period in Italy.

PUBLIC HEALTH EMERGENCIES

Healthcare Emergency Management:

- A global priority to address unexpected events.
- COVID-19 highlighted the need for more resilient healthcare systems.

Emerging and Re-emerging Diseases:

- Dengue and malaria worsened by climate change and ecosystem disruptions.
- Vector proliferation (mosquitoes, ticks) favored by these changes.

Disaster-Related Emergencies

- Increase in earthquakes, floods, hurricanes, and extreme weather events.
- Greater Impact on Vulnerable Populations:
  - Higher risk of infectious diseases
  - Scarcity of healthcare resources.
  - Challenges in emergency response.

DEMOGRAPHIC CHANGES

Global Aging:

Rapid Increase in the Elderly Population
UN estimate: People aged 60+ will reach 2 billion by 2050.

Health Impacts:

- Increased disability.
- Higher prevalence of chronic diseases.
- Reduced quality of life and well-being.

Key Challenges:

- Adequate healthcare services.
- Management of chronic diseases.
- Prevention and treatment of malnutrition.

INFECTIOUS DISEASES

Threat of Infectious Diseases:

- Zoonoses and vector-borne diseases (e.g., malaria) require new prevention strategies in non-endemic areas.
- Persistent diseases: Tuberculosis, HIV/AIDS, viral hepatitis, avian influenza, Ebola.

COVID-19 pandemic:

Exposed vulnerabilities in healthcare systems; highlighted the need to improve global preparedness and response

Antimicrobial Resistance (AMR):

- Drug-resistant pathogens increase mortality and treatment challenges.
- Projections: Up to 10 million deaths per year by 2050 without intervention.
- Risk of making currently treatable infections fatal.

NON COMMUNICABLE DISEASES (NCDS)

Diseases on the Rise:

among the many increasing diseases, the main ones are diabetes, cardiovascular diseases, and cancer.

These conditions may be linked to other widespread medical issues such as obesity and hypertension.

Main Causes:

- Individual factors (age, sex, genetic predisposition).
- Unhealthy lifestyles: unbalanced diet, physical inactivity.
- Environmental, socioeconomic, and cultural factors.

NON COMMUNICABLE DISEASES (NCDS)

Grace®

TELEMEDICINE & AI FOR CONTINUITY OF CARE FOR CVD

Medtronic

UNIVERSITÀ CAMPUS BIO-MEDICO DI ROMA

This project is supported by the Innovative Health Initiative Joint Undertaking (IHI JU) under grant agreement No 101194778. The JU receives support from the European Union's Horizon Europe research and innovation programme and COCIR, EFPIA, Europa Bío, MedTech Europe, and Vaccines Europe.

Funded by the European Union, the private members, and those contributing partners of the IHI JU. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the aforementioned parties. Neither of the aforementioned parties can be held responsible for them.

innovative health initiative

COCIR

efpia

EuropaBio

MedTech Europe from diagnosis to cure

Vaccines Europe

Co-funded by the European Union

COORDINATOR AND BENEFICIARIES

NON COMMUNICABLE DISEASES (NCDS)

Grace®

Coordinator of the project

Medtronic

AstraZeneca

FIBAO
FUNDACIÓN PÚBLICA ANDALUZA PARA LA INVESTIGACIÓN BIOSANITARIA DE ANDALUCÍA ORIENTAL ALEJANDRO OTERO

universitäts klinikum bonn

activage association

bridg

SaludMadrid

UMC Utrecht

PHILIPS

Predi[t *By

Institut Català de la Salut

WAVY

SAMSUNG

OUTCOMES10

UDG Alliance

Happy Mondays communication

CHU Rennes

FONDAZIONE POLICLINICO UNIVERSITARIO CAMPUS BIO-MEDICO

Dedalus HEALTHCARE SYSTEMS GROUP

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

cnïc

Gemelli

Fondazione Policlinico Universitario Agostino Gemelli IRCCS
Università Cattolica del Sacro Cuore

COORDINATOR AND BENEFICIARIES

HEALTHCARE PROVIDERS

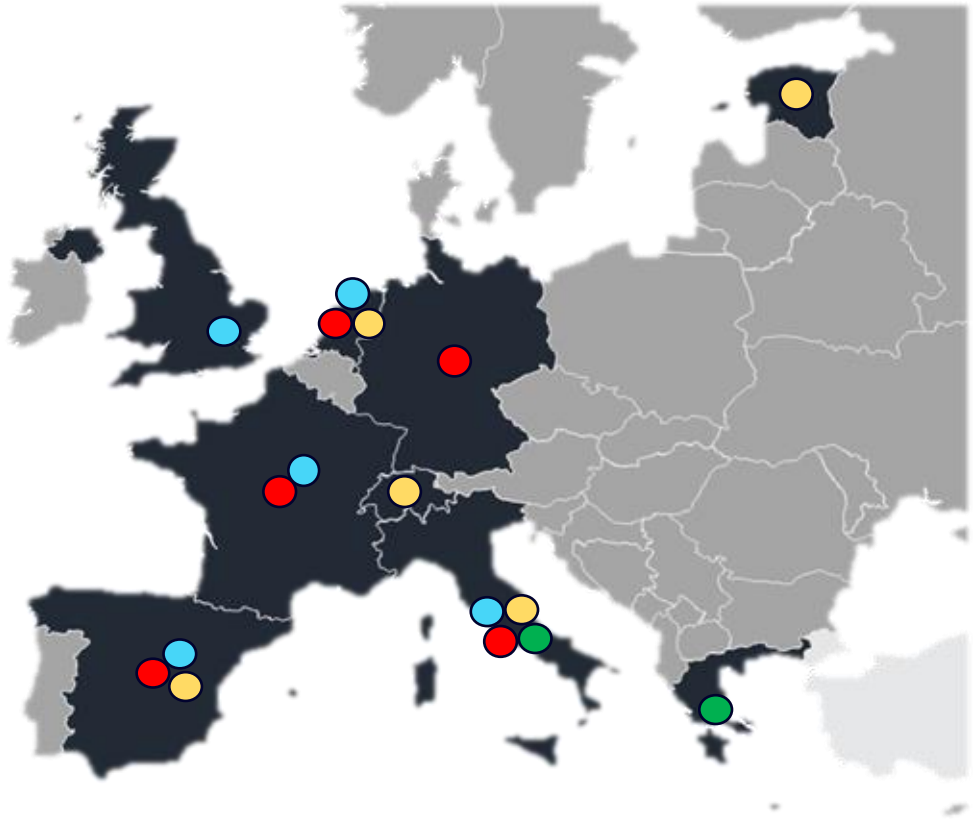
1. CHU RENNES (CHUR)
2. CENTRO NACIONAL DE INVESTIGACIONES CARDIOVASCULARES (CNIC)
3. UNIVERSITATSKLINIKUM BONN (UKB)
4. UNIVERSITAIR MEDISCH CENTRUM UTRECHT (UMCU)
5. FONDAZIONE POLICLINICO UNIVERSITARIO CAMPUS BIO-MEDICO (FPUCMB)
6. FONDAZIONE POLICLINICO UNIVERSITARIO AGOSTINO GEMELLI IRCCS (FPG)
7. FUNDACIÓN PARA LA INVESTIGACION BIOSANITARIA DE ANDALUCIA ORIENTAL-ALEJANDRO OTERO (FIBAO)
8. SERVICIO MADRILENO DE SALUD (SERMAS)

LARGE ENTERPRISE PARTNERS

1. MEDTRONIC IBERICA (MDT-IB)
2. MEDTRONIC FRANCE (MDT-FR)
3. PHILIPS MEDICAL SYSTEMS NEDERLAND BV (PMSN)
4. SAMSUNG ELECTRONICS (UK) LIMITED (SAM)
5. DEDALUS ITALIA S.P.A. (DEDA)
6. ASTRAZENECA (AZ)

SME PARTNERS

1. BRIDG OÜ (BRD)
2. PREDICTBY RESEARCH AND CONSULTING S.L. (PBY)
3. HAPPY MONDAYS COMMUNICATIONS S.L. (HMC)
4. UDG ALLIANCE (UDGA)
5. OUTCOMES' 10 S.L. (O'10)
6. WAVY ASSISTANT (WAVY)
7. HUMAN FACTOR & INNOVATION S.R.L. START-UP (HFI)
8. ACTIVE AGEING ASSOCIATION (AOA)



RESEARCH INSTITUTIONS

- UNIVERSITÀ CAMPUS BIO-MEDICO DI ROMA (UCBM)
- ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS (CERTH)

PROJECT OBJECTIVES

NON COMMUNICABLE DISEASES (NCDS)

Grace®

- The GRACE project is formed by 4 interdisciplinary activities:
- **Six Reference use cases**: the projects will run 6 pilots covering 4 specific target cardiovascular diseases (arrhythmias, SHD, CAD, HF) targeting the general population, elderly and patients with comorbidities.
- **Six advanced functionalities for CVD management**:
  - advanced patient **monitoring and management** (remotely and in-hospital) function;
  - **early detection and diagnosis** of red flags and health trajectory deviations;
  - optimization of the **clinical workflow**;
  - **co-pilot** for personalized treatment definition;
  - **knowledge discovery** function via patient **digital twins**;
  - functions for increasing and monitor **engagement and satisfaction of** users (patient, carers and HCWs).
- **Continuum of care models, approaches and tools**
- **Assessment framework**: 3 main aspects:
  - 1) the **clinical workflow** and the early interventions,
  - 2) the **allocated resources** and health care coordination teams and
  - 3) the **patient empowerment** and self-management strategies.

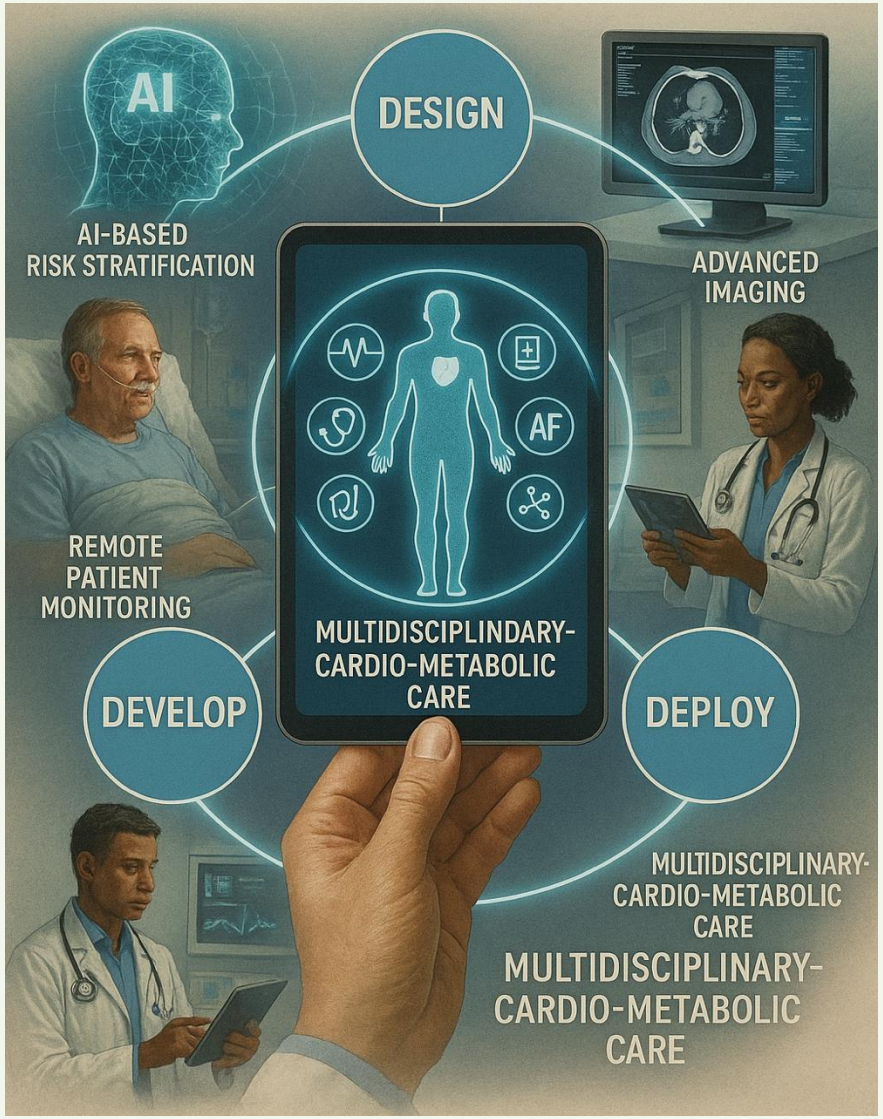
IMPACT : MED

Improving patients' outcomes & fragmented specialized care through a connected & advanced Multidisciplinary-Cardio-Metabolic-Care (MCMC)

NON COMMUNICABLE DISEASES (NCDS)

UNIVERSITÀ CAMPUS BIO-MEDICO DI ROMA

No.	Organisation name	Short	Country
1*	UNIVERSITA CAMPUS BIO MEDICO DI ROMA	UCBM	IT
2	MEDTRONIC IBERICA SA	MDT IB	ES
3	MEDTRONIC FRANCE	MDR FR	FR
4	MEDTRONIC INTERNATIONAL TRADING SARL	MDT BEN	CH
5	NOVO NORDISK A/S	NOVO	DK
6	SIEMENS HEALTHINEERS AG	SHS	GE
7	SIEMENS HEALTHCARE PRIVATE LIMITED	SHIN	IN
8	PERSPECTUM LTD	PERS	UK
9	Hict NV	HICT	BE
10	A.C.T.I.O.N ALLIES IN CARDIOVASCULAR TRIALS INITIATIVES AND ORGANIZED NETWORKS ASSOCIATION-Coeur	ACTION	FR
11	DigiBete CIC	DigiBete	UK
12	Line Systems ApS	LineSys	DK
13	Forward Faster AI B.V.	FWD	NL
14	BRIDG OU	BRD	EE
15	PREDICTBY RESEARCH AND CONSULTING S.L.	PBY	ES
16	HAPPY MONDAYS COMMUNICATION SL	HMC	ES
17	ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS	CERTH	EL
18	Cardioalianza	Cardioalianza	ES
19	THE EUROPEAN COALITION FOR PEOPLE LIVING WITH OBESITY	ECPO	IE
20	THE EUROPEAN ASSOCIATION FOR THE STUDY OF OBESITY	EASO	IE
21	SERVICIO MADRILENO DE SALUD	SERMAS	ES
22	ASSISTANCE PUBLIQUE HOPITAUX DE PARIS	APHP	FR
23	LEEDS TEACHING HOSPITALS NATIONAL HEALTH SERVICE TRUST	LEEDS	UK
24	REGION NORDJYLLAND (NORTH DENMARK REGION)	NDR	DK
25	SAMENWERKENDE TOPKLINISCHE OPLEIDINGSZIEKENHUIZEN	STZ	NL
26	AALBORG UNIVERSITET	AAU	DK
27	SAMSUNG ELECTRONICS (UK) LIMITED	SAM	UK



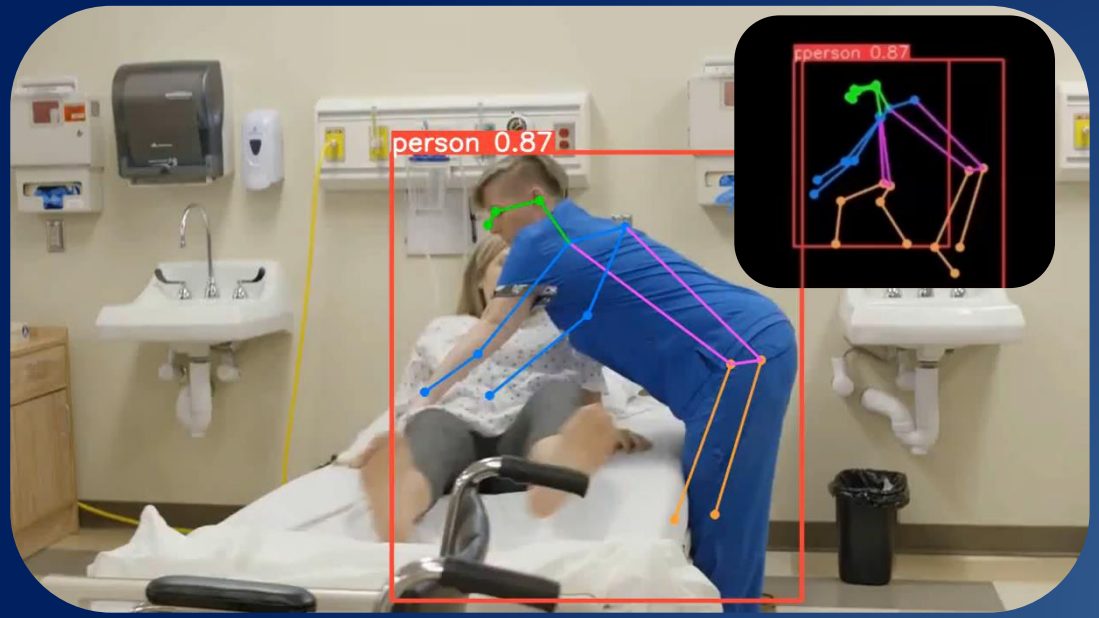
‘70s 2024

I have a dream…

+ time with patients

- time with papers

Facing the shortage of HCWs designing the Hospital of the Future



Toronto Public Health confirms

toronto.ca/news/toronto-public...

TORONTO

I want to...

Search

City of Toronto / Media Room / News Releases & Other Resources / Toronto Public Health confirms first mosquitos to test positive for West Nile virus in 2023

Share Translate

Toronto Public Health confirms first mosquitos to test positive for West Nile virus in 2023

News Release July 18, 2023

As the planet warms, scientists worry that cases of infectious diseases could spike

by ZOYA TEIRSTEIN, Grist

FINANCIAL TIMES

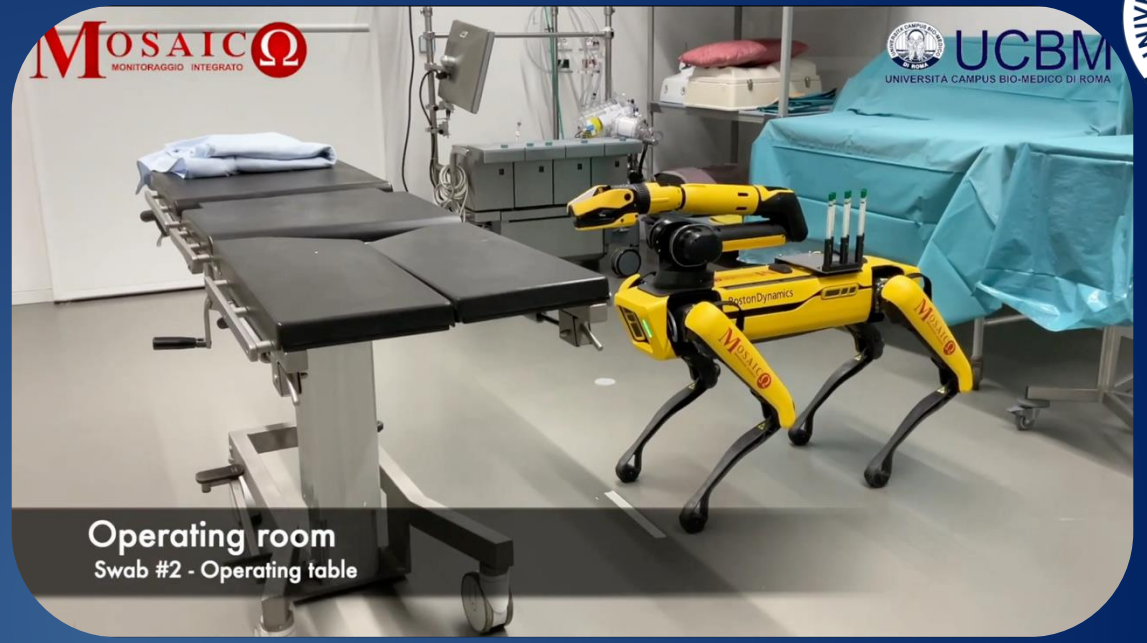
COMPANIES TECH MARKETS CLIMATE OPINION LEX WORK & CAREERS LIFE & ARTS HTSI

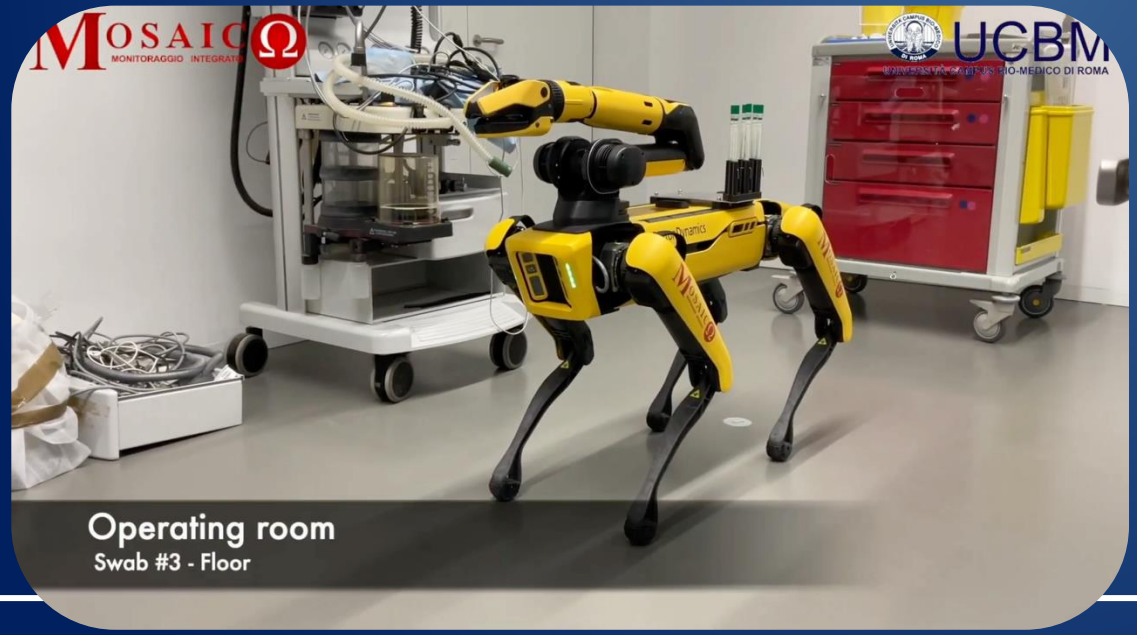
Opinion **Antibiotic resistance**

Antimicrobial resistance is dangerous in more ways than one

The reduced effectiveness of antibiotics risks severe disruption to the global economy

Helping SME deploying intelligent robots for Infection and Prevention Control





PLANTS' INSPECTION

EXTRANEOUS OBJECTS' REMOVAL


80

World Health Organization

SEVENTY-SEVENTH WORLD HEALTH ASSEMBLY
Provisional agenda item 17

A77/16
3 May 2024

Draft fourteenth general programme of work, 2025–2028

Report by the Director-General

World Health Organization

Respond to **climate change**, an escalating health threat in the 21st century.

1.1. More **climate-resilient health systems** are addressing health risks and impacts.

1.2. **Lower-carbon health systems and societies** are contributing to health and well-being.

…t GPW 14ª

…d of health and well-being.			
…l people, everywhere.			
…e **primary** …e **approach** …ial **health** …acities for …ealth	Improve **health service coverage and financial protection** to address inequity and gender inequalities.	**Prevent, mitigate and prepare** for risks to health from all hazards.	Rapidly **detect and sustain an effective response** to all health emergencies.
…imary …e approach …d …d to …niversal …rage. …and care …, **health** …nd **access** …assured …ducts …y …n systems …d, and …ation …d.	4.1. Equity in access to quality services improved for **noncommunicable diseases, mental health conditions,** and **communicable diseases,** while addressing **antimicrobial resistance**. 4.2. Equity in access to **sexual, reproductive, maternal, newborn, child, adolescent and older person health and nutrition services and immunization coverage** improved. 4.3. **Financial protection** improved by reducing financial barriers and out-of-pocket health expenditures, especially for the most vulnerable.	5.1. **Risks of health emergencies** from all hazards reduced and impact mitigated. 5.2. **Preparedness, readiness and resilience** for health emergencies enhanced.	6.1. **Detection of and response** to acute public health threats is rapid and effective. 6.2. **Access to essential health services during emergencies** is sustained and equitable.

What it is **healthcare systems' impact on the environment**?

CO2 emission:

- 4% of national emissions in EU countries (transport accounting for 15%-ish)

Waste production:

- 4.2% of a nation's waste generation (20% from surgery) (50% is general waste)

Resources consumption:

- Power
- Water
- Soil
- …

Sustainability KPIs in Europe

In the **Nordic countries**, sustainability KPIs are an integral part of public tenders

In Norway, **30% of requirements** in public tenders must relate to **sustainability**

Working table between **Norway, the Netherlands and the UK** to **reduce the environmental impact** of healthcare

In **Sweden**, a project to establish **environmental requirements** for **purchases of medical equipment**

The **UK** wants to make the National public Health System (NHS) sustainable

Make the national public health system **net zero** by 2034

Social and environmental sustainability requirements weigh 10% in public tenders and are mandatory

Strong integration between NHS, health sub-network **companies** and trade **associations**

Europe

The European directive **CSRD - Corporate Sustainability Reporting Directive** requires companies and hospitals to **present sustainability KPIs by the end of 2025**

MedTech Companies in US/EU?

KPI	Philips (EU)	Medtronic (US)	Alcon (US)
Carbon Neutrality	Achieved **100% carbon neutrality** in operations	Target: **Carbon neutrality by FY30**, reducing Scope 1 and 2 emissions	Target: **Carbon neutrality by FY30**, including Scope 1 and Scope 2 emissions
Renewable Energy	**100% renewable energy** used in production sites	Increase **energy efficiency** and switch to renewable energy sources	Completed projects totaling **87,000 GJ** energy savings, avoiding **~8,778 tons of CO2eq**
Waste Management	- **91% operational waste recycled**	Logistics improvements to reduce Scope 3 emissions through **packaging**, shipping, fuels, and vehicles	**64% of operational waste recycled**, targeting **100% non-hazardous waste** reduction by FY30
Zero Waste	**100% zero waste**: No industrial waste sent to landfills		
Circular Economy	**18% of sales** derived from circular economy solutions		
Sustainable Supply Chain	**41% of purchases** from suppliers meeting SBT climate targets	Collaborate with suppliers on Scope 3 emissions through evidence-based targets and **purchasing criteria**	
Health Impact Goals		Promote cultural change and collaboration with healthcare stakeholders for improved care outcomes	Improve vision for **5 million people** with untreated cataracts; **150,000 children's vision tests**
Ecodesign Principles	Applied to products (energy, packaging, materials, circularity)		
Social Impact Goals		Collaboration with authorities to define sustainable roadmaps	**102 tons of equipment recycled/reused/donated**

…very well, fragmented contributions…

"Propelling the shift toward the future of circular, safe, and sustainable packaging and single-use device solutions ecoDesigned through healthcare environments".

Topic: *HORIZON-JU-IHI-2023-04-05/Safe & Sustainable by Design (SSbD) packaging and single-use device solutions for healthcare*

ENKORE
eco healthcare

"Propelling the shift toward the future of circular, safe, and sustainable packaging and single-use device solutions ecoDesigned through healthcare environments".

Topic: HORIZON-JU-IHI-2023-04-05/Safe & Sustainable by Design (SSbD) packaging and single-use device solutions for healthcare

ENKORE eco healthcare

MAIN GOAL

ACCELERATING INNOVATION THROUGH ECODESIGN

- **Vision**:
  - establishing an ecoDesign framework sustainable by design (SSbD).
  - supports the development of environmentally responsible solutions while reducing environmental impact and carbon footprint.

- **Product Lifecycle Approach**:
  - From materials selection & product design to end-of-life
  - enabling the creation of circular packaging and single-use medical devices while ensuring patient safety and regulatory compliance.

- **Methods & Tools for Decision-Making**:
  - Environmental & Social Life Cycle Assessment (ELCA/SLCA)
    Circularity Calculator (CC)
    Digital Product Passport (DPP)
  - Fostering closed-loop systems and leveraging advanced data, technologies, and best practices, ENKORE ensures safer, greener, and more efficient healthcare solutions for the future.

"Propelling the shift toward the future of circular, safe, and sustainable packaging and single-use device solutions ecoDesigned through healthcare environments".

Topic: *HORIZON-JU-IHI-2023-04-05/Safe & Sustainable by Design (SSbD) packaging and single-use device solutions for healthcare*

ENKORE eco healthcare

Pharmaceutics & MedTech

- Boehringer Ingelheim
- Lilly A MEDICINE COMPANY
- FRESENIUS MEDICAL CARE
- Johnson & Johnson
- Medtronic
- novo nordisk
- Pfizer
- Takeda
- DUPONT
- ISWA International Solid Waste Association
- Baxter

"Propelling the shift toward the future of circular, safe, and sustainable packaging and single-use device solutions ecoDesigned through healthcare environments".

Topic: *HORIZON-JU-IHI-2023-04-05/Safe & Sustainable by Design (SSbD) packaging and single-use device solutions for healthcare*

ENKORE eco healthcare

DRUG INJECTION DEVICES

SINGLE USE PRODUCTS FOR DIALYSIS, INTRAVENOUS, NUTRITION AND IRRIGATION THERAPIES

SUSTAINABLE PLASTIC MATERIAL FOR PACKAGING

SUSTAINABLE CELLULOSE MATERIAL FOR PACKAGING

SCALE-UP THE RECYCLING OF MEDICAL DEVICES





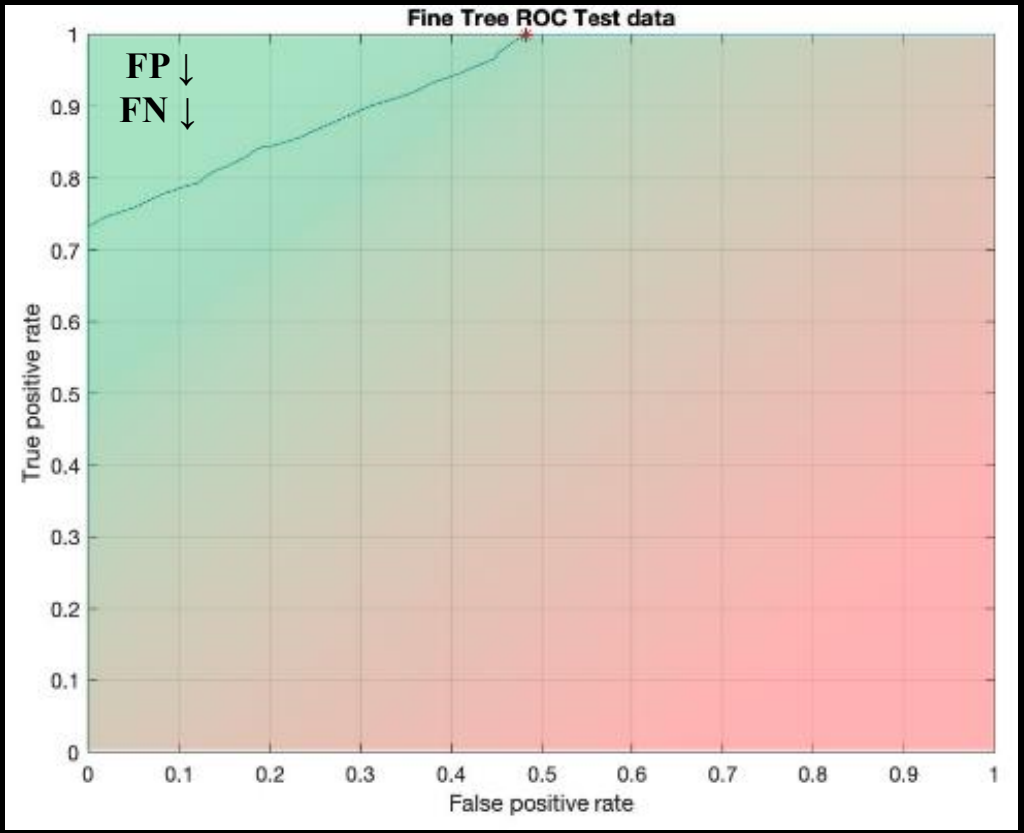










ELSEVIER journal homepage: www.elsevier.com/locate/bbe

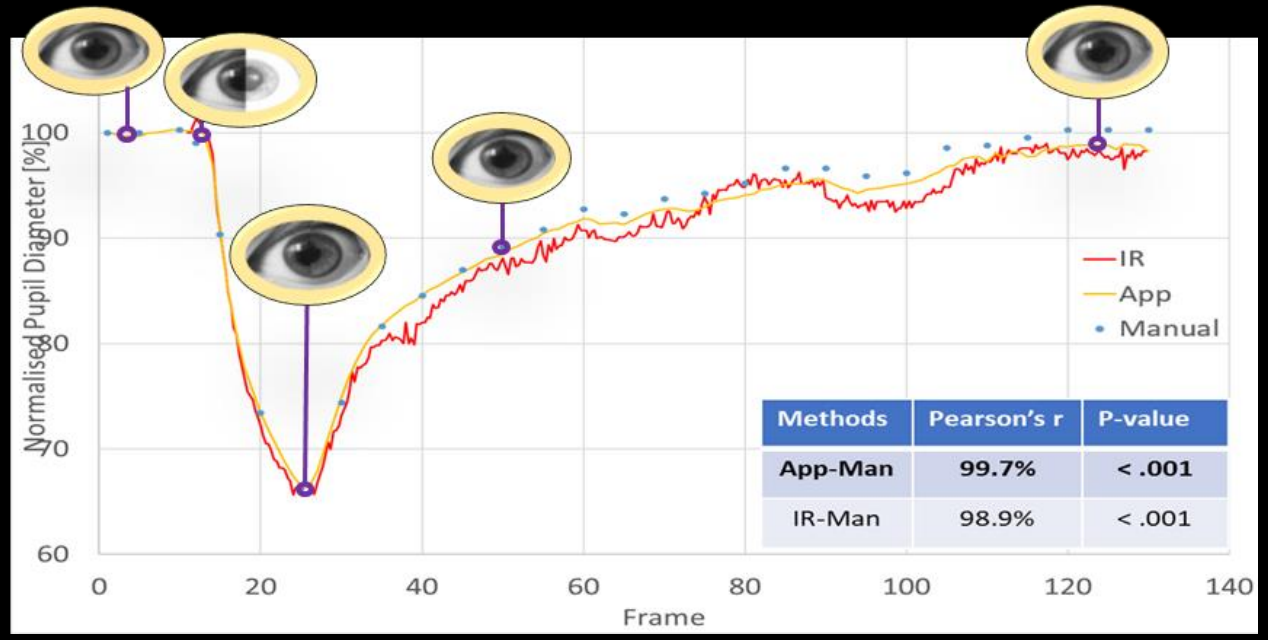
Original Research Article

A machine learning model for supporting symptom-based referral and diagnosis of bronchitis and pneumonia in limited resource settings

Katy Stokes [a], *Rossana Castaldo* [b,*], *Monica Franzese* [b], *Marco Salvatore* [b], *Giuseppe Fico* [c], *Lejla Gurbeta Pokvic* [d], *Almir Badnjevic* [e], *Leandro Pecchia* [a]

[a] University of Warwick, Coventry, UK
[b] IRCCS SDN, Via E. Gianturco, Naples, Italy
[c] Life Supporting Technologies, Universidad Politécnica de Madrid, Madrid, Spain
[d] Medical Device Inspection Laboratory Verlab, Sarajevo, Bosnia and Herzegovina
[e] University of Sarajevo Sarajevo, Bosnia and Herzegovina

- **Senza esami di laboratorio**
- **Con sei sintomi (dolore, rumori respiratori, colore dei muchi, espettorazione…)**
- **L'IA riconosce la polmonite con sensitività e specificità superior all'80%**



ELSEVIER journal homepage: www.elsevier.com/locate/bbe

Original Research Article

Pupillometry via smartphone for low-resource settings

Davide Piaggio [a,*], *Georgy Namm* [a], *Paolo Melillo* [b], *Francesca Simonelli* [b], *Ernesto Iadanza* [c], *Leandro Pecchia* [a]

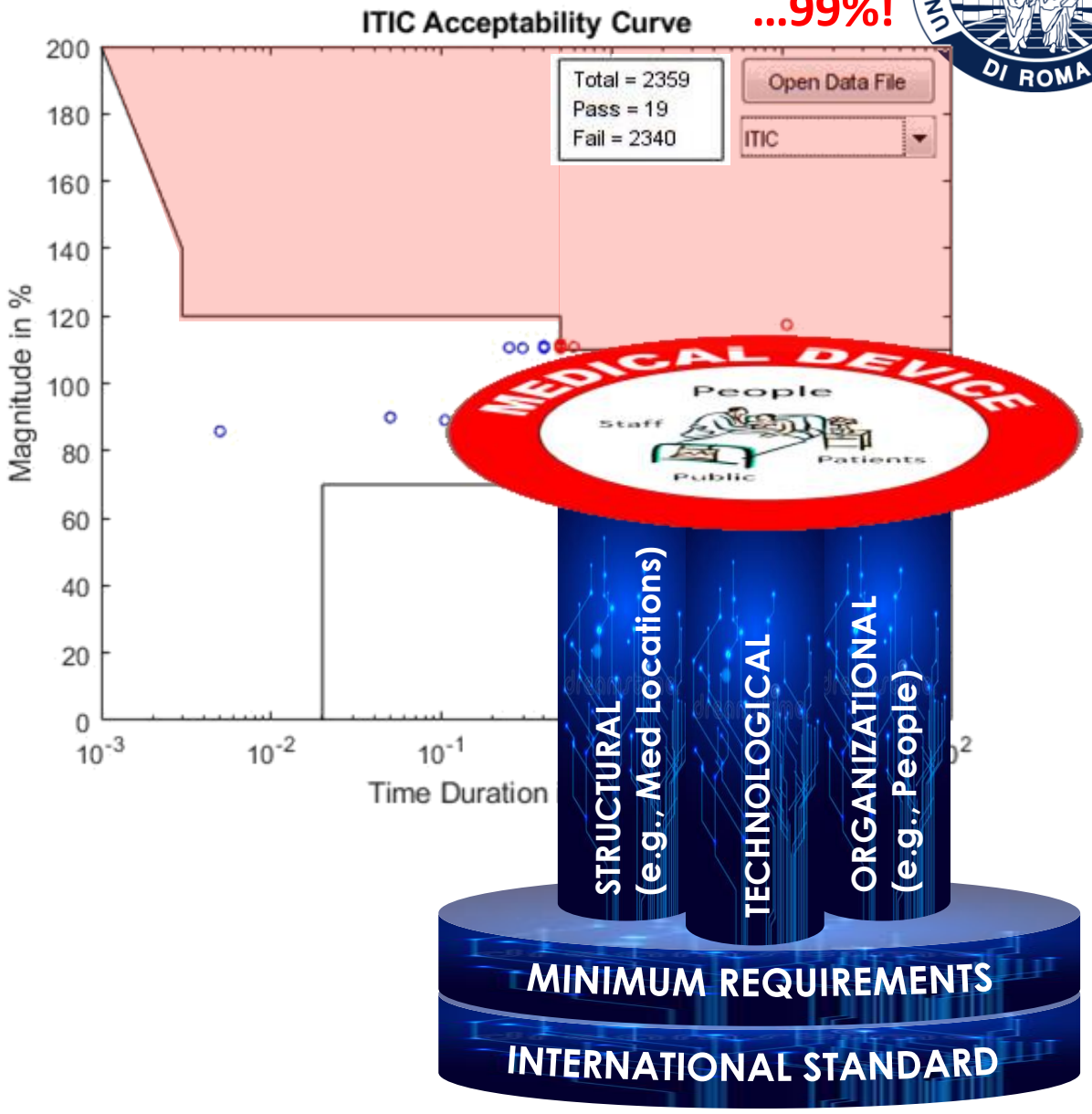
[a] *Applied Biomedical Signal Processing Intelligent eHealth Lab, School of Engineering, University of Warwick, Coventry, United Kingdom*

[b] *Eye Clinic, Multidisciplinary Department of Medical, Surgical and Dental Sciences, Università degli Studi della Campania 'Luigi Vanvitelli', Naples, Italy*

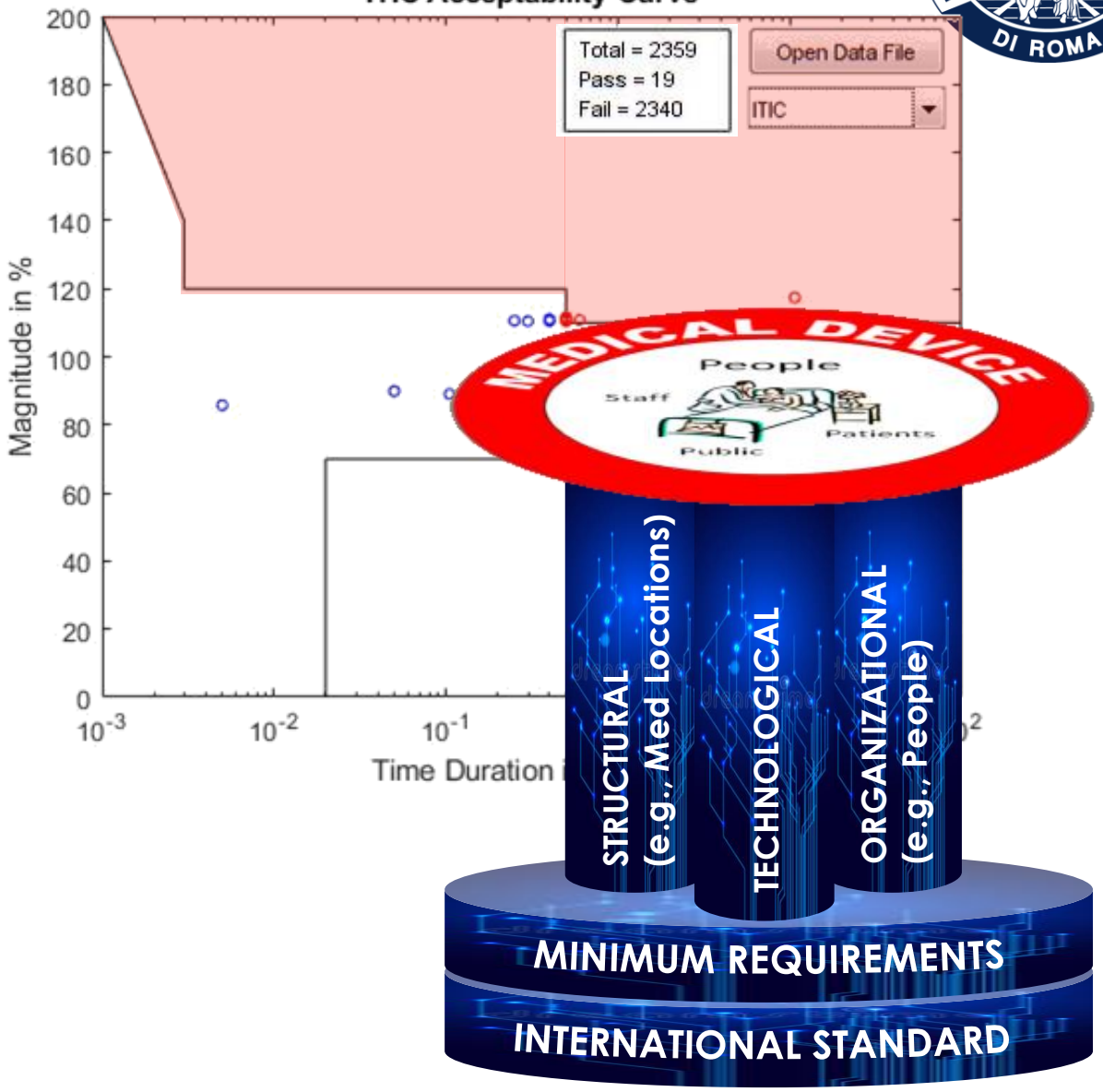
[c] *Department of Information Engineering, University of Florence, Florence, Italy*

Biomedical Engineering for Global Health

...99%!



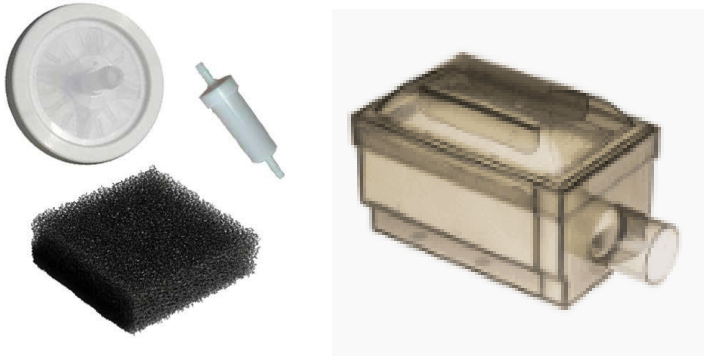
Biomedical Engineering for Global Health



Oxygen Concentrators

A nurse from new-born unit noticed that the device was performing consistently (moving the control from 1 to 2, the output was not doubled as expected)

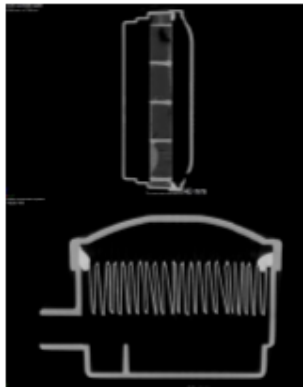
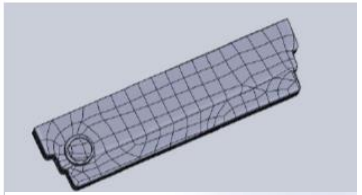
Pecchia, L., et al. "Health Technology Assessment and Biomedical Engineering: Global trends, gaps and opportunities." *Medical engineering & physics* 72 (2019): 19-26.

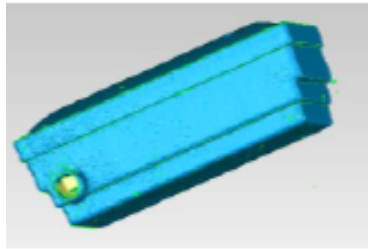
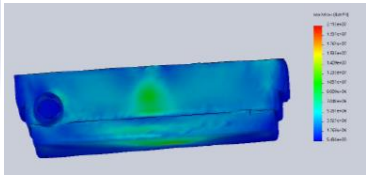


3D-printed activated charcoal inlet filters for oxygen concentrators: A circular economy approach, 2020, https://doi.org/10.1016/j.deveng.2022.100094

Oxygen Concentrators

XR, CAD, 3D printing and DIY active coal, (wood and calcium chlorite)



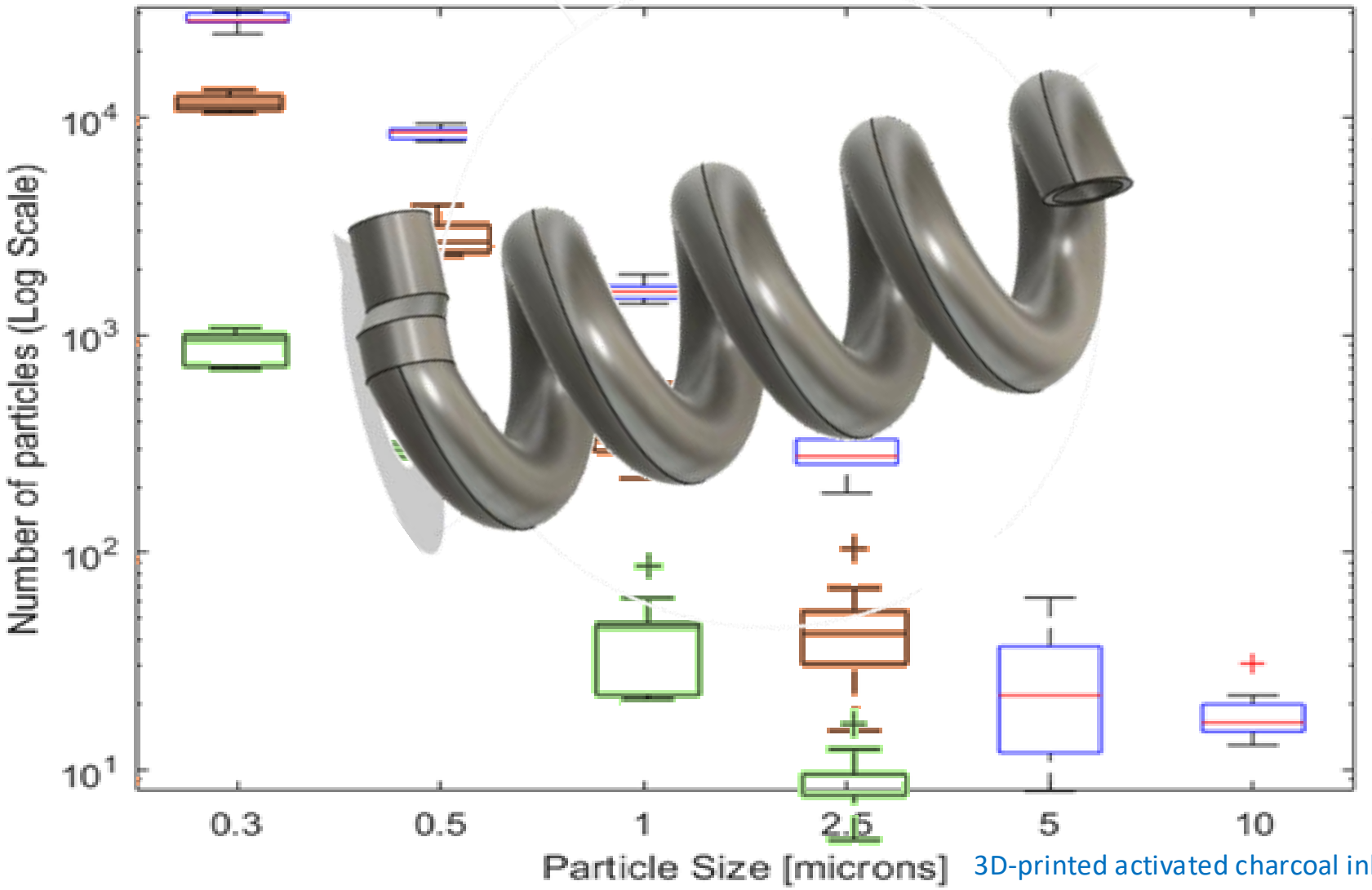







3D-printed activated charcoal inlet filters for oxygen concentrators: A circular economy approach, 2020, https://doi.org/10.1016/j.deveng.2022.100094

Oxygen Concentrators



Room Particles

Av. # particles per liter

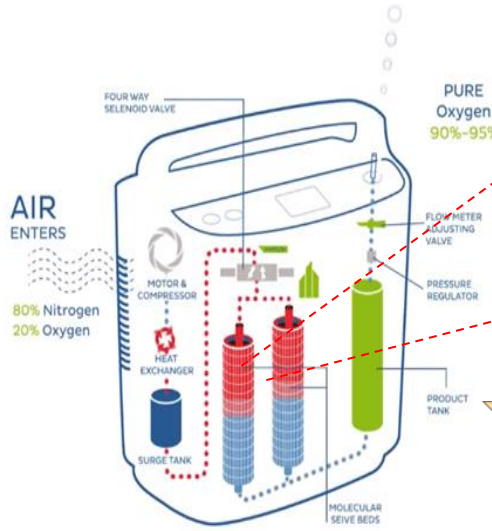
Particle size	Original Filter	OUR Filter
10.0µm	0	0
5.0µm	0	1
2.5µm	3.4	18
1.0µm	16	141

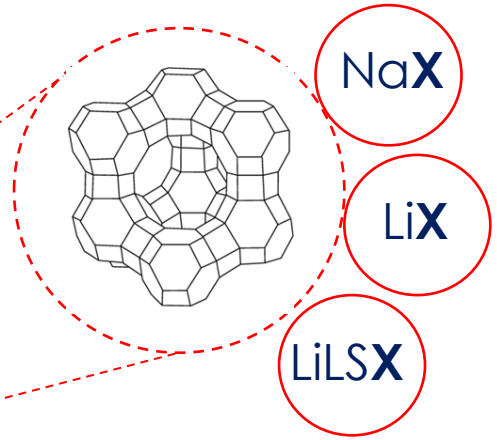
Our filter avg filtering power: **50%**
Our filter avg filtering power (>0.1 micron): **76,6%**

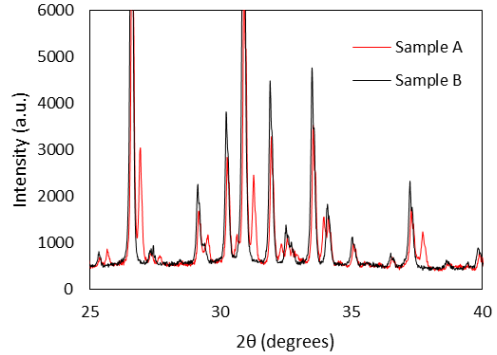
Original Filter

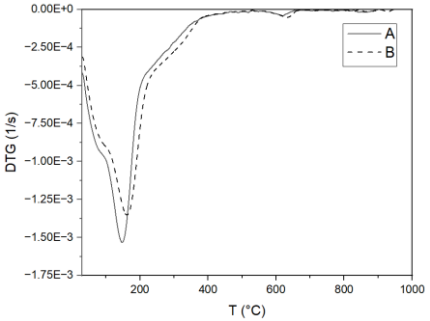
3D-printed activated charcoal inlet filters for oxygen concentrators: A circular economy approach, 2020, https://doi.org/10.1016/j.deveng.2022.100094

Biomedical Engineering for Global Health









Other Elements present in traces

Cl **P** **S**

Zr **Ti** **Mn**

A Exhausted "African" Zeolite characterization

- TGA/FTIR ?
- Correlation with environmental conditions

Experimental Air Separation Runs

- Experimental set-up to reproduce an OC
- Runs with Commercial zeolites
- Comparison with "African" zeolites

Regeneration Runs

- TSA on Exhausted "African" zeolites
- TSA on Exhausted commercial zeolites

B Number of cycles

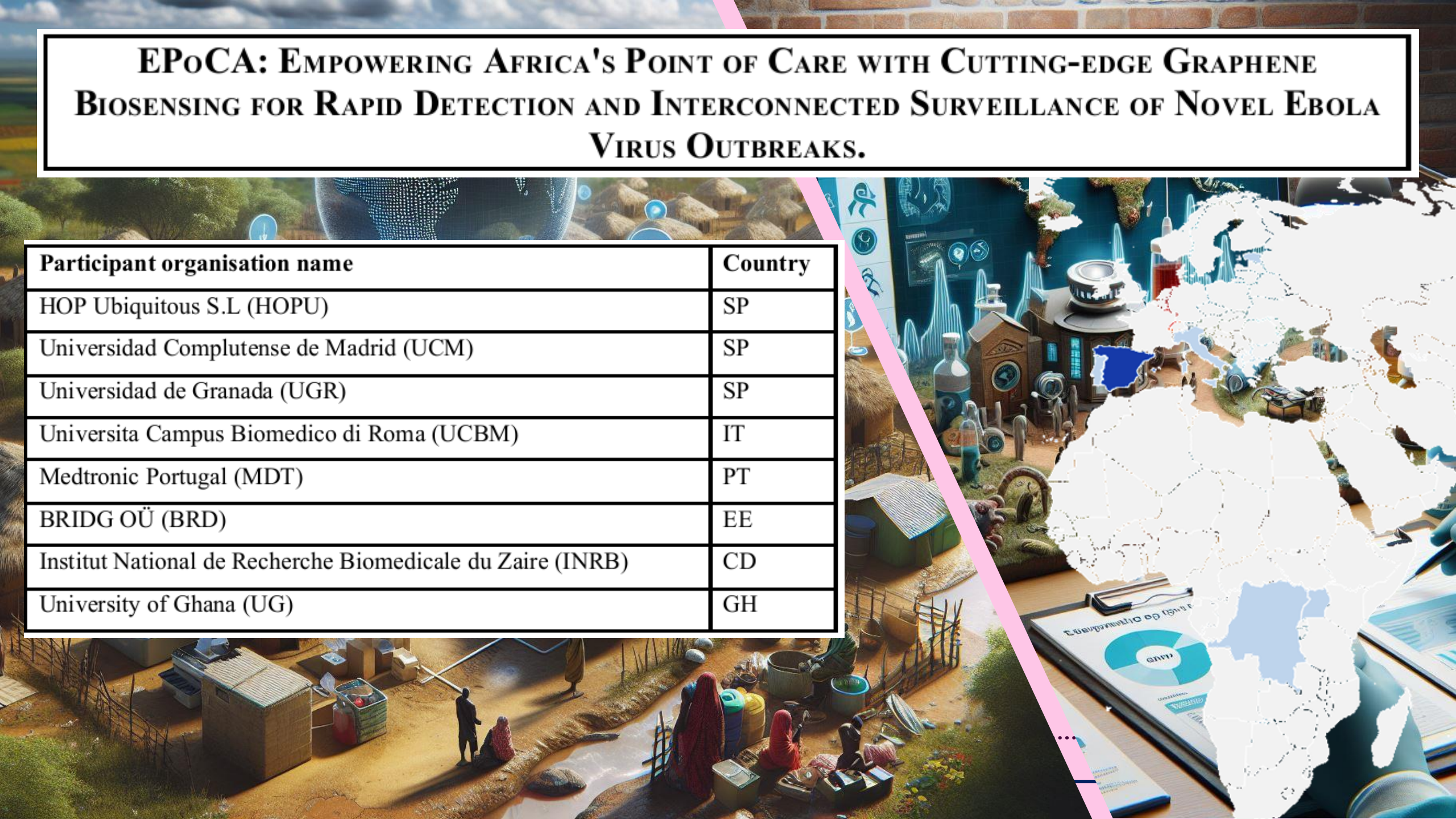
- Experimental cyclic runs on the simulated OC

2

Zeolite Synthesis from Waste Materials for the Medical Field of Oxygen Concentrators: Focus on the African Scenario, 2023: https://doi.org/10.3303/CET23101028

EPoCA: Empowering Africa's Point of Care with Cutting-edge Graphene Biosensing for Rapid Detection and Interconnected Surveillance of Novel Ebola Virus Outbreaks.

Participant organisation name	Country
HOP Ubiquitous S.L (HOPU)	SP
Universidad Complutense de Madrid (UCM)	SP
Universidad de Granada (UGR)	SP
Universita Campus Biomedico di Roma (UCBM)	IT
Medtronic Portugal (MDT)	PT
BRIDG OÜ (BRD)	EE
Institut National de Recherche Biomedicale du Zaire (INRB)	CD
University of Ghana (UG)	GH



Afya Moja (in Swahili “One Health”)
science and tech for OneHealth in Africa

Afya Moja (in Swahili “One Health”) PNRR Project

Ambition: strengthen African university capacities in delivering high quality research-oriented teaching. Increase African capacity to embed into their programs innovative concepts linked to sustainability, social responsibility, and SDG.

Following the “One Health” approach, the project will span across four interrelated *Reference Use Cases*:

- biomedical engineering,
- medicine and surgery,
- veterinary medicine and animal production,
- nutrition and agriculture,

While keeping Ethics and regulatory sciences at the core of all the activities.

Specific project objectives are:

Objective 1: strengthen African universities’ capacity in participating in European projects.
Objective 2: support the creation of novel research-intensive teaching modules and programs in Africa.
Objective 3: short-term training programs.
Objective 4: science diplomacy, supporting the inclusion of African experts in writing of international norms (e.g., guidelines, standards, & policies).

Project budget: €2.744.928,78
Starting date: 1st September 2024
Link: https://iht.unicampus.it/afya-moja/

Scientific Director: Prof Leandro Pecchia
Duration: 18 months

AFYA MOJA PROJECT

AFYA MOJA

Afya Moja (in Swahili «One Health») project will strengthen African capacities in health technologies

- **Training program for strength capacity to join (write) Horizon Europe projects**
- **Research-intensive teaching (RIT)**
- **Short term programs**
- **African experts' involvement in writing of international norms in technologies for Health Tech and One Health.**

Context: This course is part of the **Afya Moja** project and is delivered through:

- online lectures via the **International Federation for Medical and Biological Engineering (IFMBE) e-learning platform**.
- followed by in-person writing sessions focusing on specific calls/opportunities.

Goal: supporting capacity strengthening in **Health Technologies and One Health**, with a strong focus on international research collaboration.

Objective: provide **practical, hands-on knowledge of Horizon Europe**, enabling them to:

- **Understand** funding opportunities and rules of participation
- Foster **Africa-centered international research and innovation projects**
- Strengthen proposal writing, impact planning, and project management skills

Key Topics: introduction to **Horizon Europe** International cooperation & Africa focus

- Health research opportunities
- Proposal writing and evaluation criteria
- Impact, budget planning & project management

BIOMEDICAL ENGINEERING GLOBAL HEALTH

Leandro Pecchia, PhD
Professor of Biomedical Engineering,
Univ. of Warwick
UnivCampus Bio-Medico of Rome

Innovation Manager WHO Emergency Program IPC for COVID
Secretary General, IFMBE (2022-2025), https://ifmbe.org/
VP EAMBES for Public Affairs (2025-27), https://eambes.org/
Secretary General, IUPESM (2018-2022), https://iupesm.org/

University of Warwick, 8 September 2025

Università Campus Bio-Medico di Roma - Via Álvaro del Portillo, 21 - 00128 Roma – Italia
www.unicampus.it