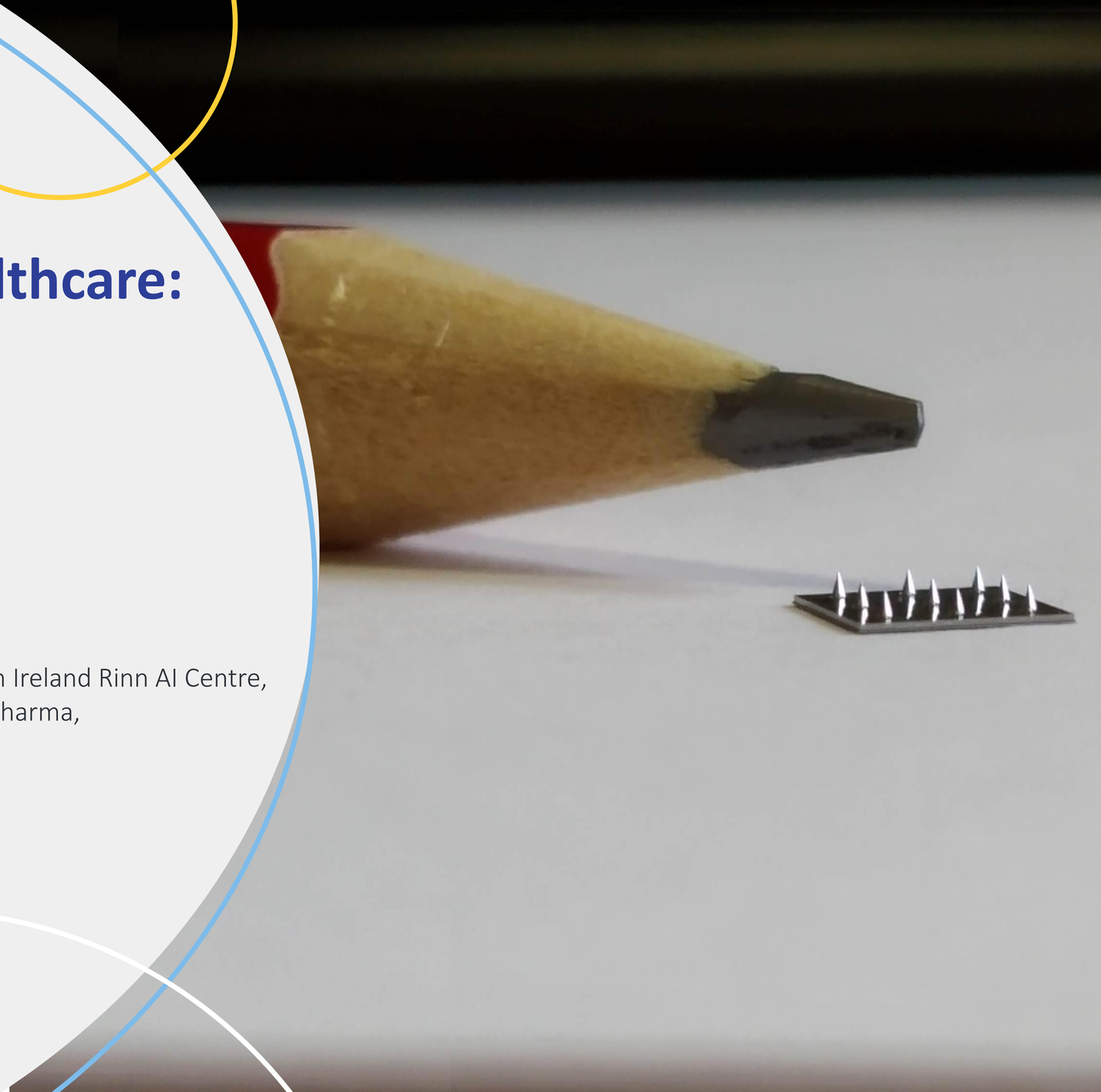
Tyndall

Engineering the Future of Healthcare: Systems Competencies for Life Sciences Innovation in Europe



Dr Paul Galvin

Senior Head of Group Bioelectronics,
Head of ICT for Health Strategic Programmes,
Head of Life Sciences Interface Group,
Director - ENTIRE 2.0 European Digital Innovation Hub,
Co-Investigator and Digital Healthtech Theme Lead for the Research Ireland Rinn AI Centre,
Principle Investigator in the Research Ireland Rinn Pharma and Biopharma,
Tyndall National Institute,
University College Cork,
Ireland.

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Rialtas na hÉireann
Government of Ireland

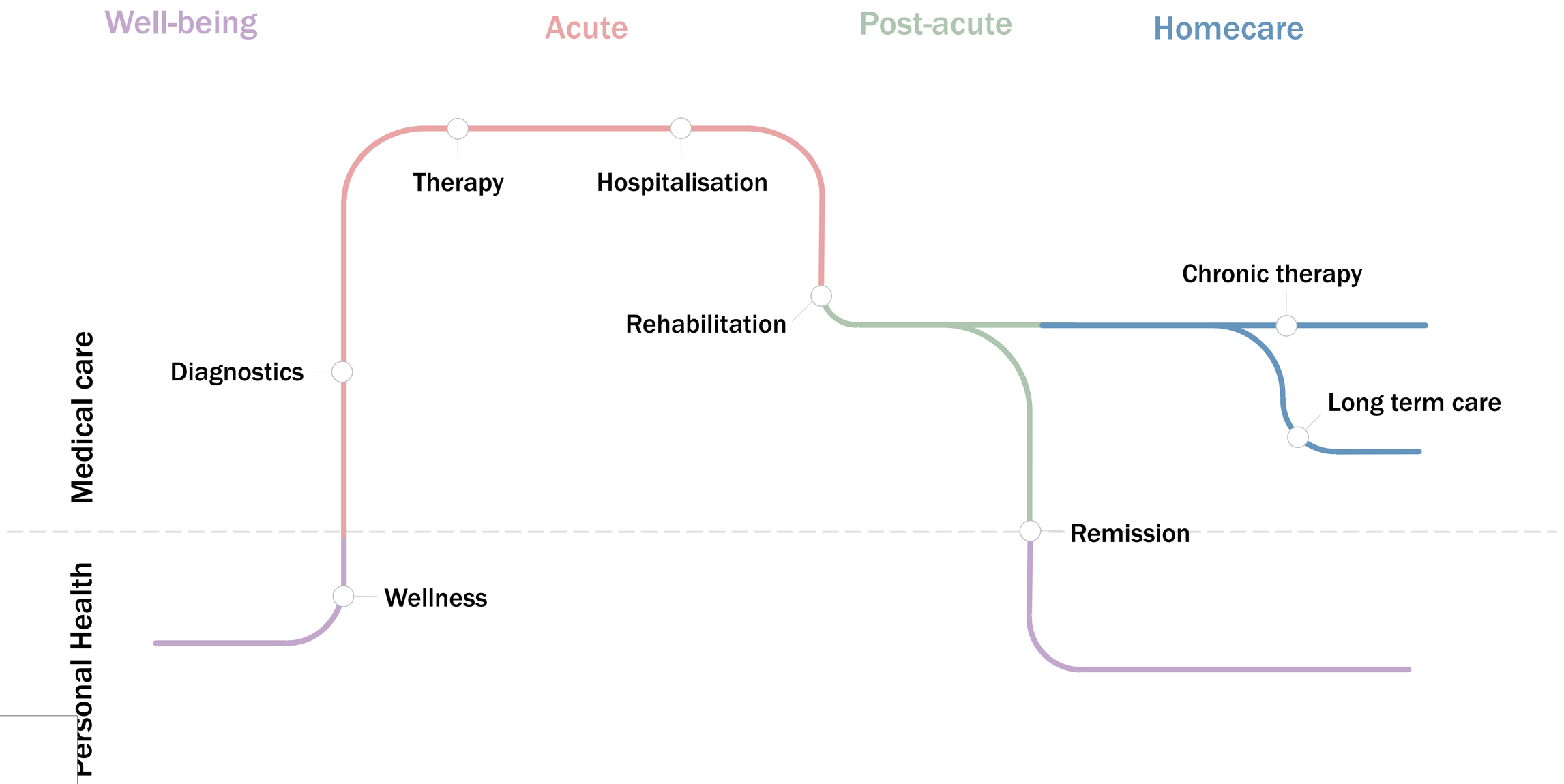
Digital Healthtech

- Digital Healthtech encompasses integrated sensors and systems, including hardware, firmware, and AI tools to enhance healthcare delivery, improve diagnosis, and enable remote patient monitoring.

  - Mobile Health (mHealth)
  - Telehealth & Telemedicine
  - Health Information Technology (IT)
  - Artificial Intelligence (AI) & Machine Learning
  - Personalized Medicine



Healthcare delivery and healthcare systems today



(H2020 project in collaboration with Bioanalytik Muenster)

Digital Healthtech Innovation
ABCD ecosystem

Tyndall

Collaborations involving:

- Global Medtech, Pharma & ICT Companies;
- Innovative SMEs;
- Contract Manufacturers;
- Innovative Clinicians;
- Leading Scientists and Engineers;
- Human Factors Design;
- Government agencies

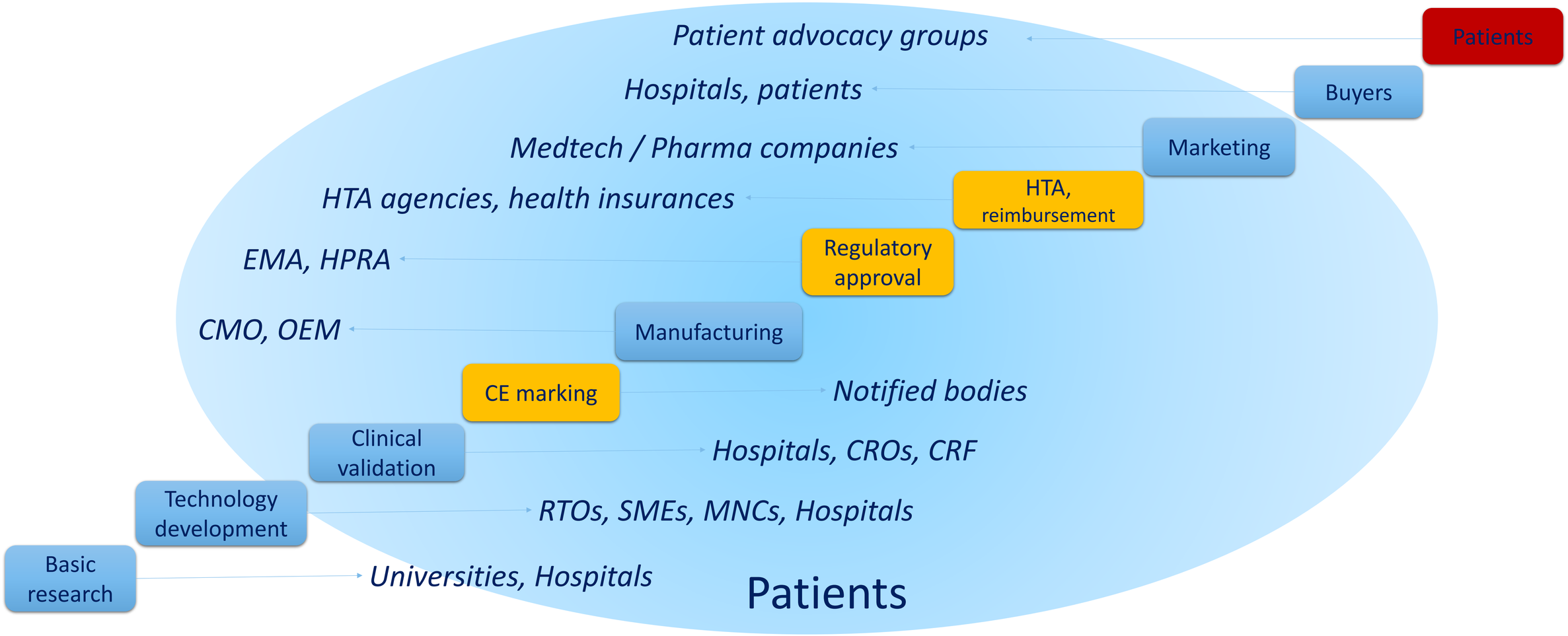
ABCD Ecosystem
Academic,
Business,
Clinical
Design
(Human Factors)



Collaborative Ecosystem with Supports across Digital Healthtech Product Development Cycle

Tyndall

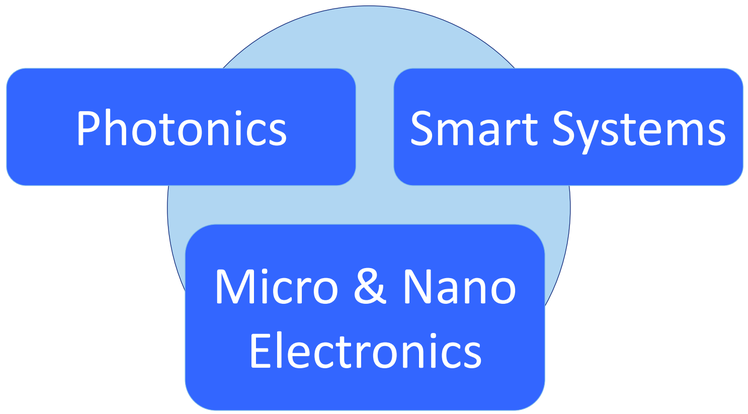
To facilitate a cross-cutting multistakeholder ecosystem to accelerate the development of, and patient access to, health innovation



Semiconductor Enabled Key Technologies Underpinning Digital Healthtech Innovation

Tyndall

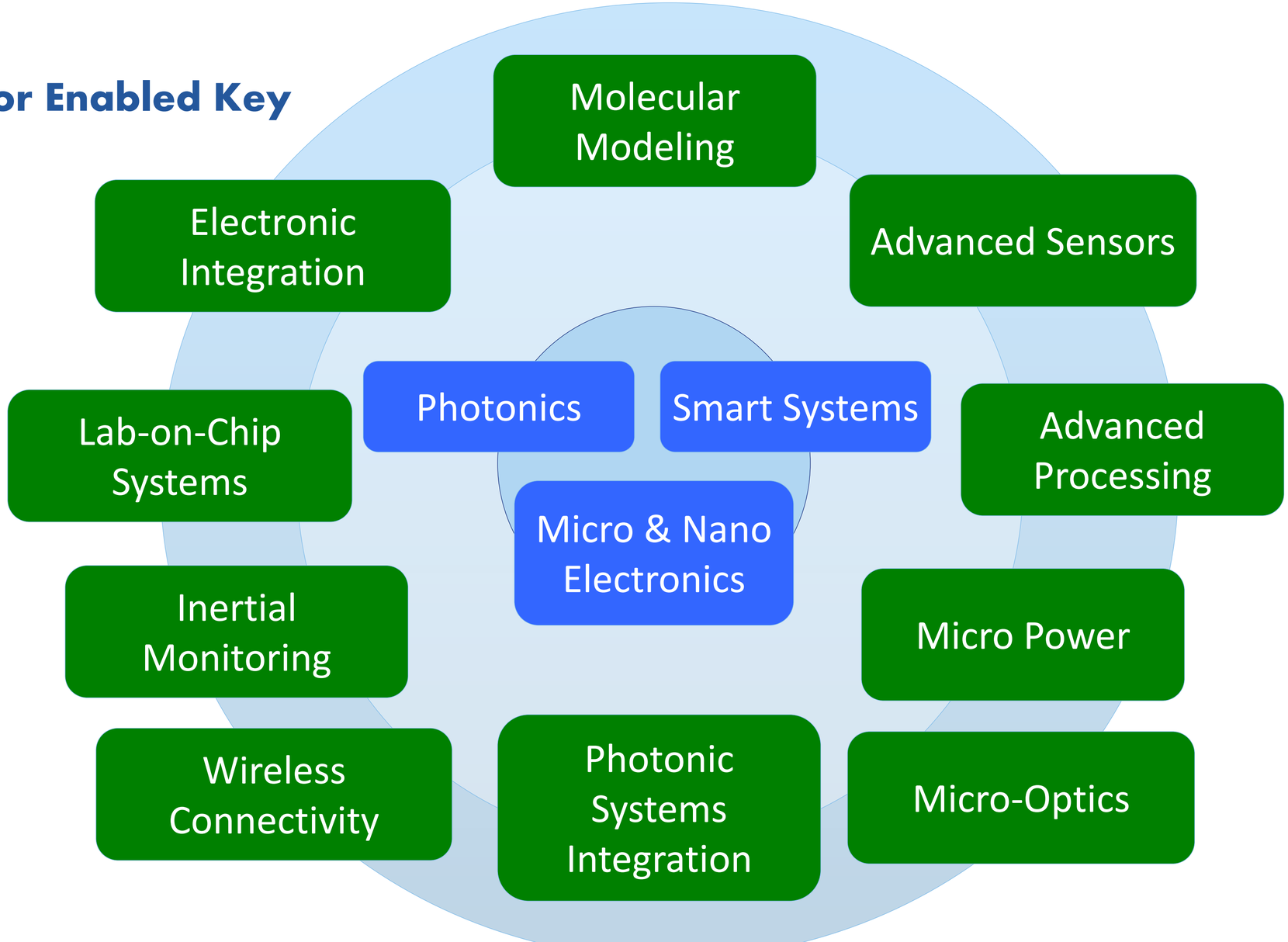
Semiconductor Enabled Key Technologies



Semiconductor Enabled Key Technologies Underpinning Digital Healthtech Innovation

Tyndall

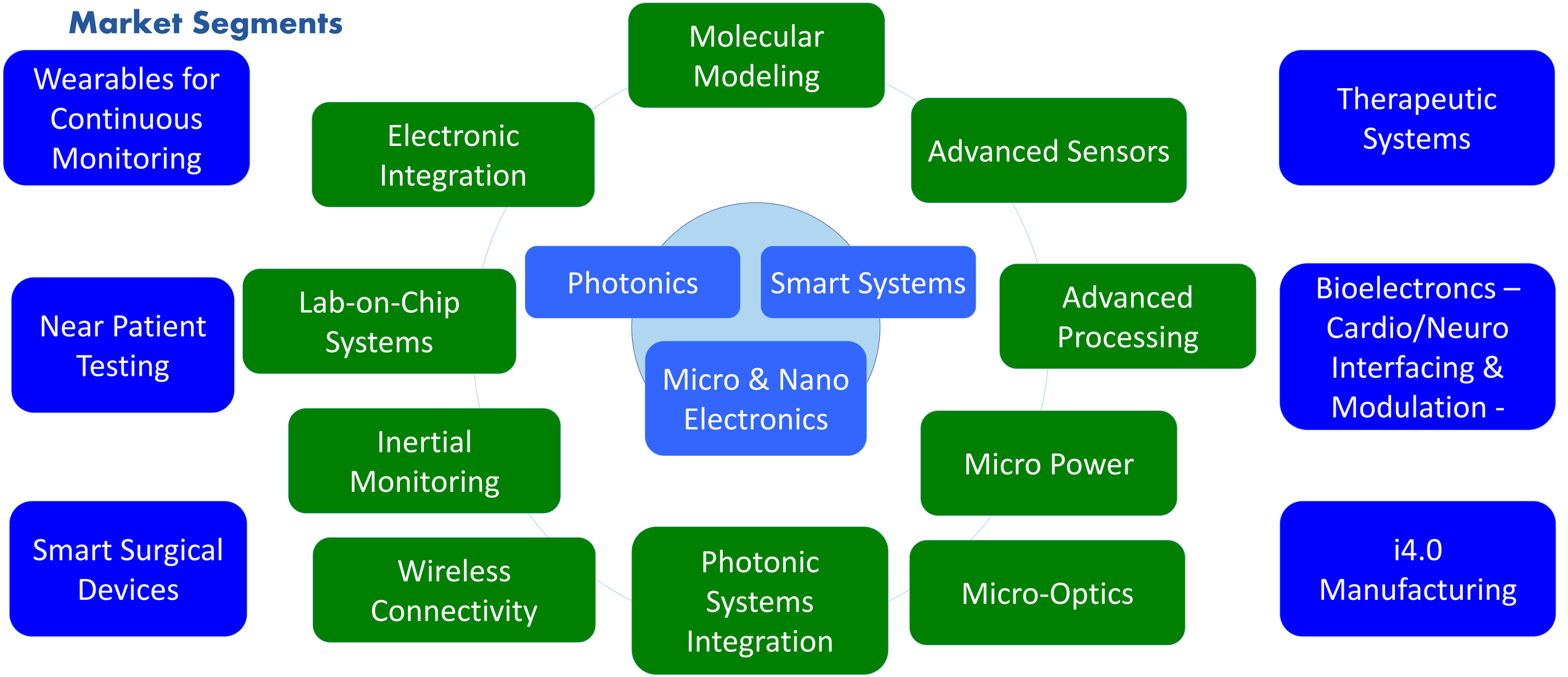
Semiconductor Enabled Key Technologies



Semiconductor Enabled Key Technologies Underpinning Digital Healthtech Innovation

Tyndall

Market Segments



Digital Healthtech Competency Requirements:
Wearable, minimally invasive and implantable systems

- Human Factors Design
  - Determination of optimal physical form factor and out of the box experience
  - Design of GUI compatible with all mobile platforms and regulatory compliant
- Power
  - Selection of optimal power source e.g. Disposible battery / Energy harvesting / Wireless power.
  - Optimisation of power consumption and management e.g. low energy IC design
- Communications modules
  - Development / integration of antennae wireless communications optimised for wearables/ implantables
  - Optimisation of Gateway solution for connectivity e.g. mobile phone / IOT / etc
- Flexible electronics
  - Enable wearable solutions and/or electronics which can be conformal on 3D devices or conformal to the human body.
- AI
  - Design of local EDGE-based AI for optimal system performance.
  - Cloud-based AI/ML to identify and leverage population patterns.
  - Trustable AI for clinical decision supports and closed loop systems



Digital Healthtech Competency Requirements:
Wearable, minimally invasive and implantable systems

- Fluidic actuation devices
  - Selection / design and integration of optimal MEMS pumps / valves
- Diagnostics for combination devices
  - Measurement of biomarkers to trigger initiation of drug delivery or inform threshold therapeutic dose reached.
  - Sensor system for verification of drug delivered to target tissue or related biomarker
  - Continuous monitoring of systemic health to provide early identification of adverse events
- Smart delivery vehicles
  - needles and patches for parenteral delivery
  - pills / inhalers / nebulisers for oral delivery
  - implants
- Security
  - Data encryption for cyber security / GDPR
  - Authentication of drugs and devices
- Encapsulation
  - Biocompatibility, robust packaging – sustainability aspects of product life cycle.



Digital Healthtech - A System of Systems Challenge

Tyndall

Digital Healthtech can enable Preventative, Predictive, Personalised and Participatory Medicine.

Digital Healthtech requires competencies which are:

- highly multidisciplinary, with deep knowledge of the requirements of application sectors including medtech, pharma, biopharma, consumer and agritech;

- a strong appreciation of the need for integrated solutions along the patient care pathway;

- deep tech domain expertise spanning atoms to systems, hardware, firmware and AI tools;

- people skills to manage internal and external stakeholders along the product development cycle.



Thank you for your attention

paul.galvin@tyndall.ie
www.tyndall.ie

Tyndall

Connecting ideas. Delivering impact.

Rialtas na hÉireann
Government of Ireland

UCC
Coláiste na hOllscoile Corcaigh
University College Cork, Ireland