

Digital healthcare solutions – From big data to clinical impact

Hans Hofstraat
Philips Research
October 24, 2019

innovation  you

MEDTECH & PHARMA
PLATFORM

PHILIPS

Today, Philips is a leading health technology company focused on improving people's health



Personal Health 	Precision Diagnosis 	Image-Guided Therapy 	Connected Care
Operations, delivery & services 			

Innovation & Strategy

- Design
- Chief Technology Office organization
- Strategy, Mergers & Acquisitions, Partnerships
- Sustainability
- Intellectual Property & Standards
- Product Engineering Organization
- Idea to Market Excellence
- Technical Expert Group
- Innovation Services

External medical & high-tech companies



Global healthcare challenges



Growing and aging population



Rising chronic diseases



Spiraling costs



Too little access



Too little capacity

Innovation for personalized health, better outcomes, higher efficiency

Trends connected to health technologies



Consumers increasingly engaged in their health



Transition to value-based healthcare



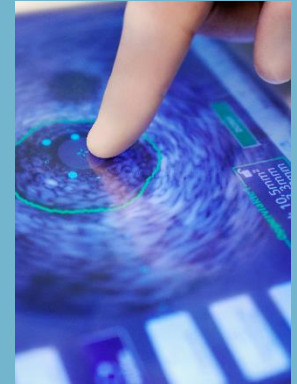
Care shifting to lower-cost settings



Provider and payer landscape consolidating



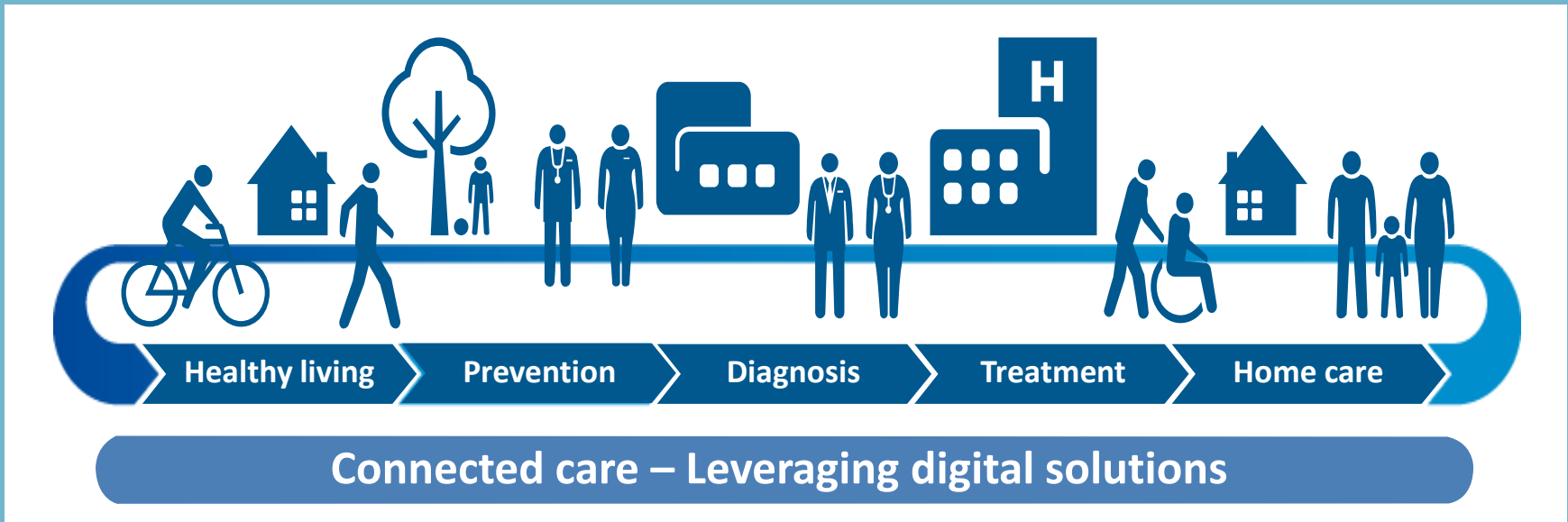
Precision diagnostics & personalized therapies



Integrated technology; Data-driven care



The Health Continuum is guiding our strategy





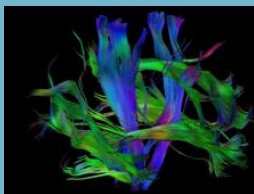
Digital solutions for integrated, continuous care

Delivering clinically rich healthcare informatics across the enterprise

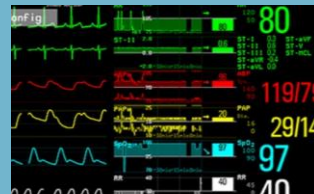
Cloud **Internet of Things** **Artificial Intelligence** **Sensors**
Conversational interfaces Micro-systems Robotics Autonomous systems



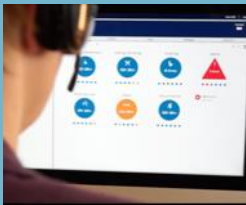
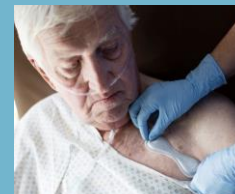
Continuous health tracking



Advanced visualization



Context-aware patient monitoring



Home monitoring



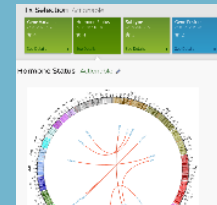
Image-guided therapy



Computational pathology



Quantification



Genomics



Adaptive interfaces

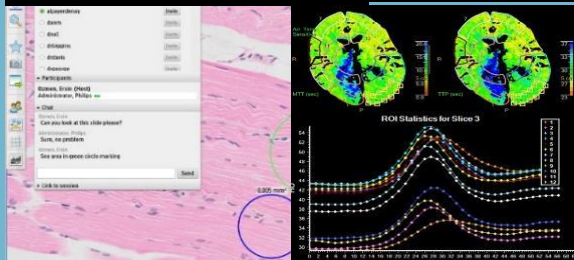
Opportunity to gain deeper, denser and more longitudinal insights than ever before

The Data Explosion in Healthcare



Dense data

Pattern recognition in aggregated data sets – across a population



Deep data

From anatomy to cells and molecules



Wide (longitudinal) data

Continuous monitoring over time



Artificial Intelligence can augment healthcare providers to deliver high-quality care and increase operational efficiency

- **Finding patterns in large amounts of data that are too complex for a human to detect**
- **Enabling experts to create hypotheses by adding clinical and domain knowledge**
- **Allowing for timely interventions using predictive analytics, after critical validation**

Challenges in implementation:

- **Availability of complete & trustworthy data sets**
- **Concerns about privacy – legal & ethical challenges**
- **Confidence in outcomes – AI literacy, education**
- **Technology challenges – ‘black box’, transparency**

AI & Data Science will be a key enabler for Care Everywhere



Precision medicine and personalized treatment
enabled by smart algorithms



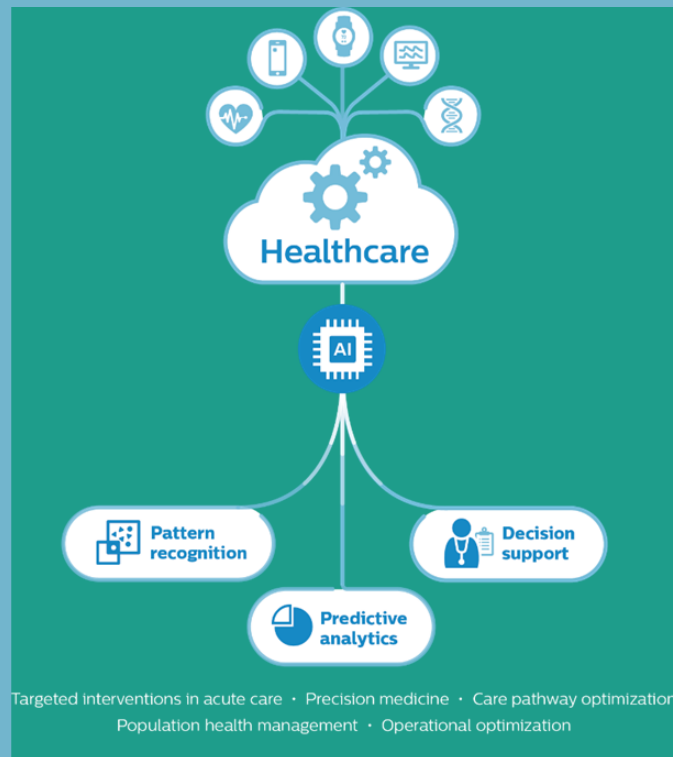
Transition to value-based care through analytics and pathway optimization



Digital Platforms for data-driven solutions
across the care continuum



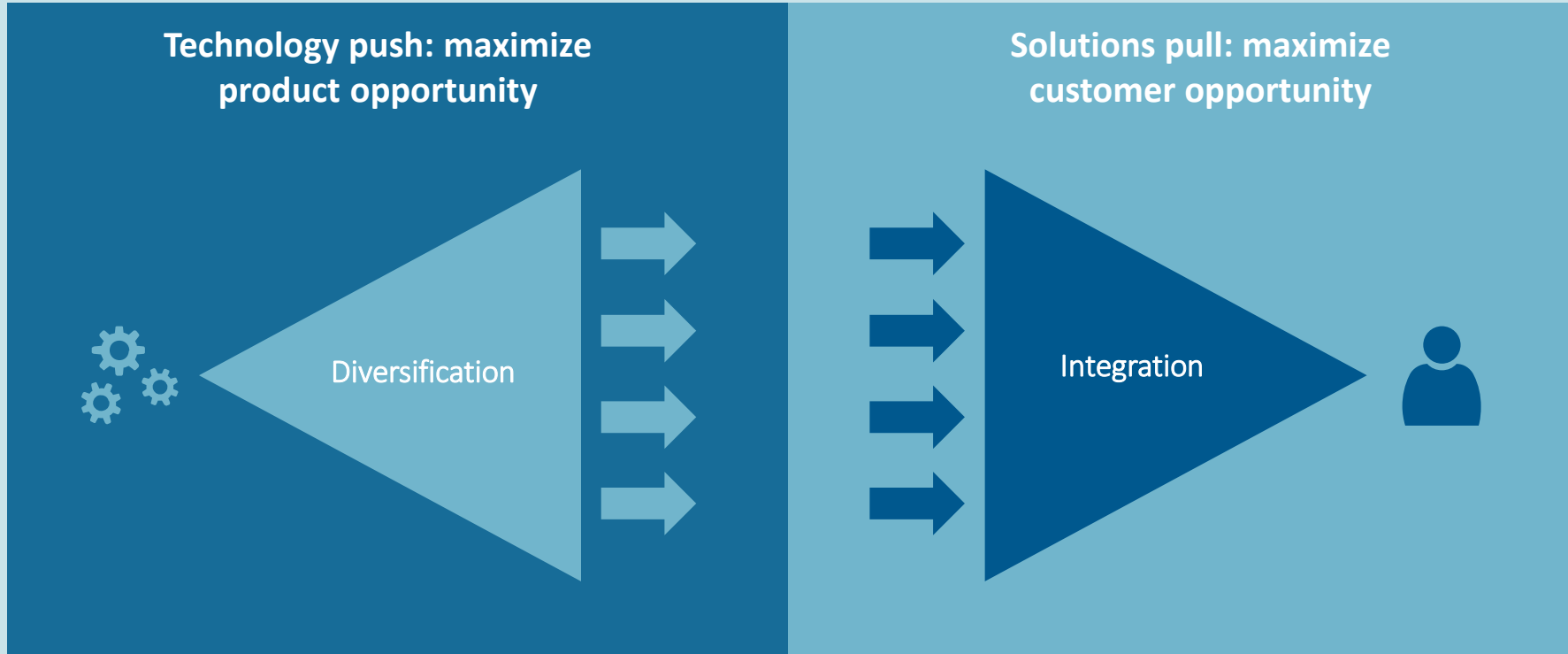
Networked care
patient engagement & coaching via portals & apps



AI is already in Philips Commercial Products/Solutions



Moving from products to solutions is transformative



It is only a solution if it addresses the customer KPI's: *becoming an outcomes company*

Addressing the Quadruple aim

Towards new outcome-oriented models of care delivery



Improved
health
outcomes



Improved
patient
experience



Improved
staff
satisfaction



Lower
cost
of care



Innovative value-added, integrated solutions

Developed to better meet customer needs and capture greater value

Packaged suite of systems, smart devices, software and service

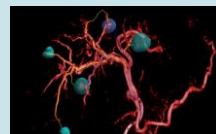
Image-guided therapy solutions



Image-guide therapy systems



Smart catheters



Disease-specific navigation software



Cath lab management, services, consulting

Early warning of patient deterioration¹



Monitoring



Cableless measurements, biosensors



IntelliVue Guardian software



Integration, services, consulting

Respiratory Drug Management



I-neb Adaptive Aerosol Delivery



Drug-specific Aerosol Delivery



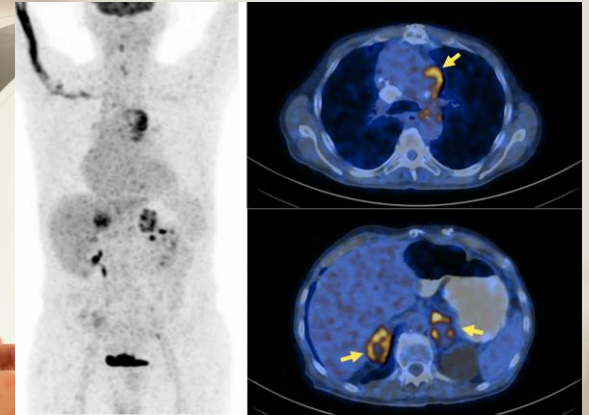
i-Neb Insight



Drug Adherence Management System

Precision Diagnosis Right-fit treatment selection

AI and advanced analytics applied on images, pathology and genomics supports precision diagnosis and personalized treatment



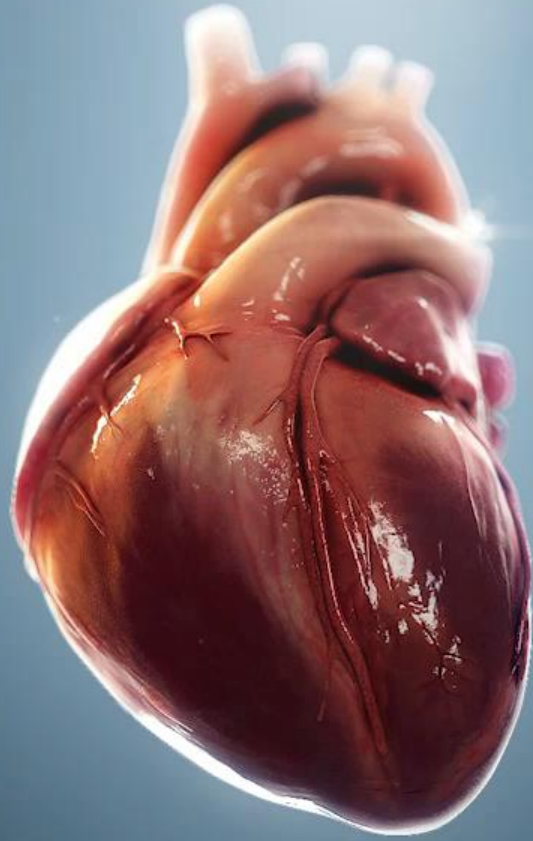




Image Guided Therapy

Real-time imaging, nanotechnology, smart catheters, robotics and augmented reality support the surgeon

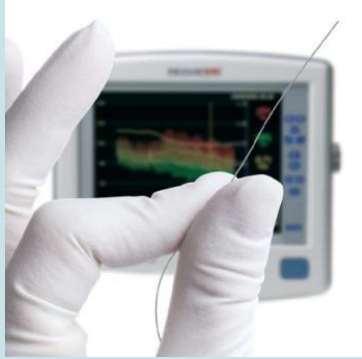
Smart Catheters



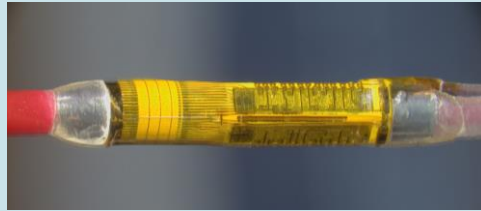
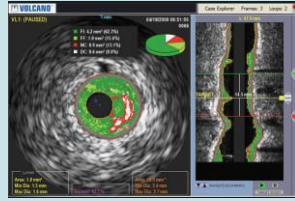
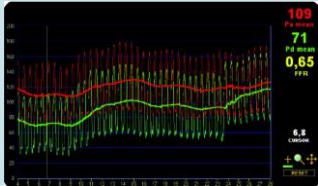
Coronary diseases

Arrhythmia

Structural heart diseases



Fractional Flow Reserve (FFR)
Ø 0.36 mm

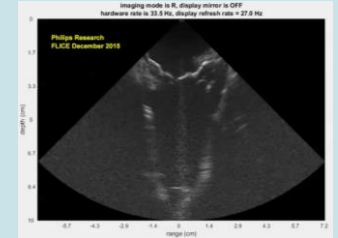


Intravascular ultrasound (IVUS)
Ø 1.0 mm



Ablation
Ø 2.0 mm

Electrophysiology
Ø 1.2 mm



Intracardiac ultrasound (ICE)
Ø 3 mm



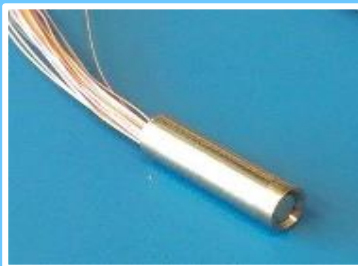
Today's smart catheters



Obsolete technologies

Analog instruments

Point solutions

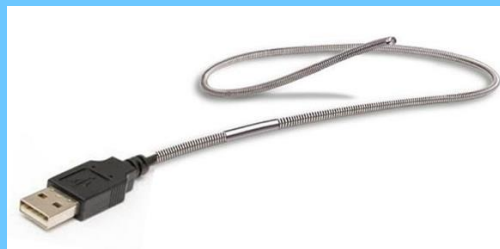


Next generation smart catheters

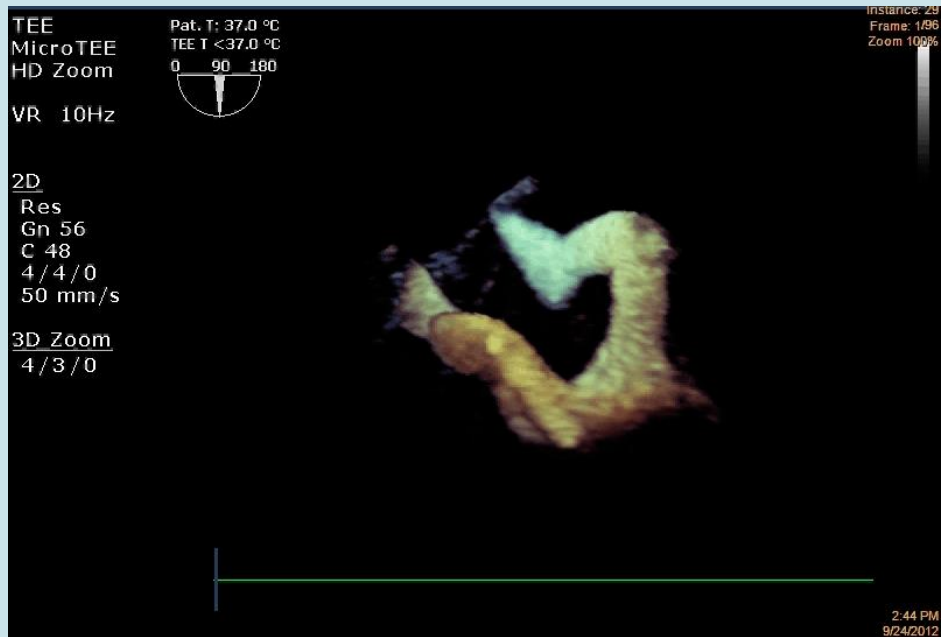
State-of-the-art technologies

Digitization at the tip

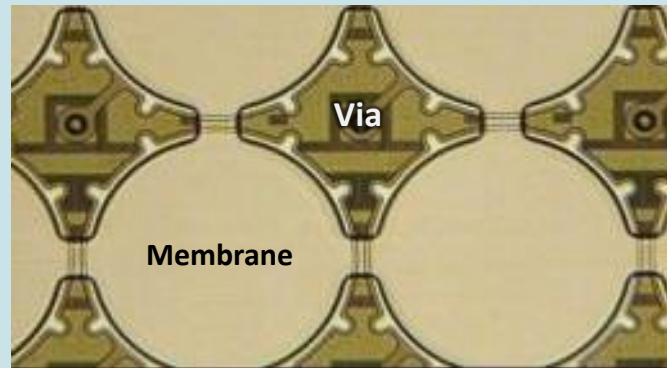
Open technology platforms



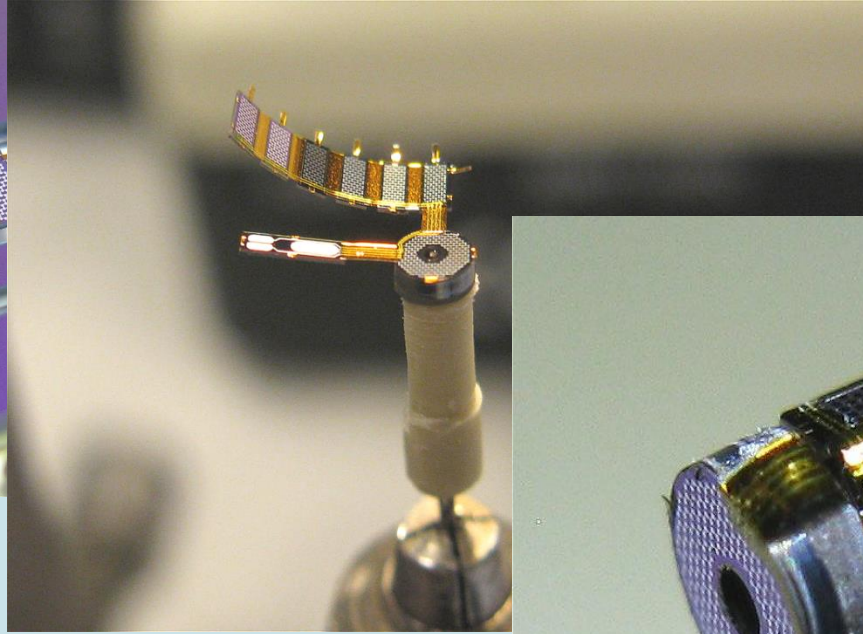
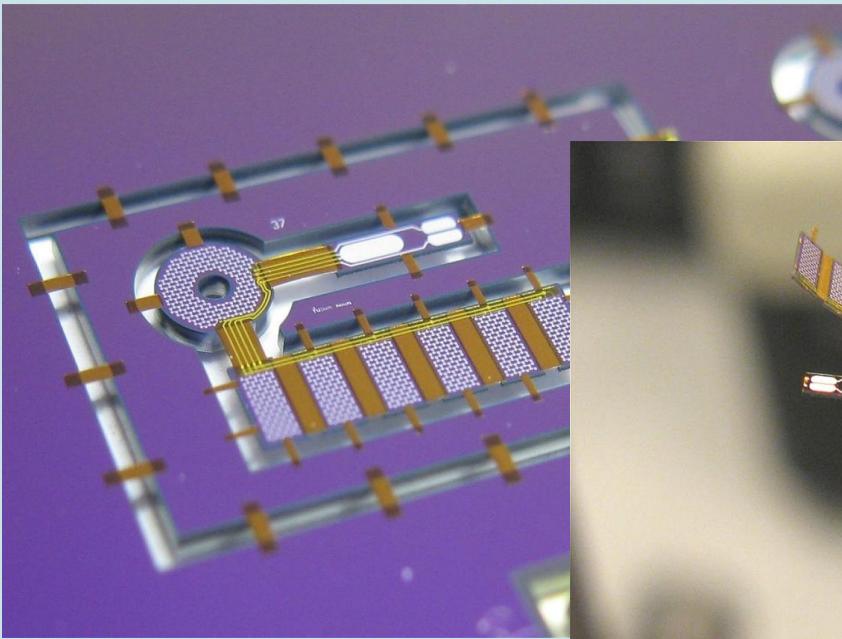
Live 3D ultrasound image with CMUT



- Monolithic integrated CMUT-on-ASIC
- Test array 6×6 mm with 2000 individual elements
- Each element \Leftrightarrow one membrane and has its own transmit and receive circuit



Flex-to-Rigid (F2R) Platform

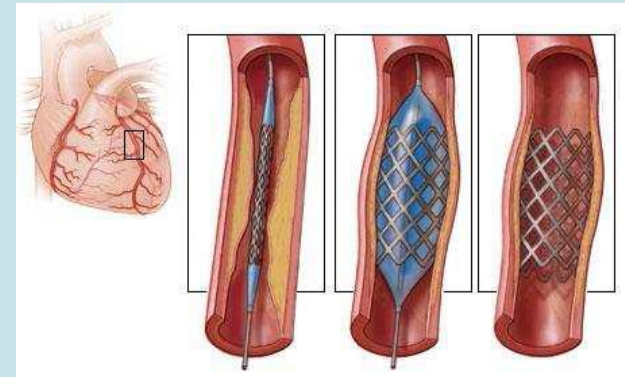
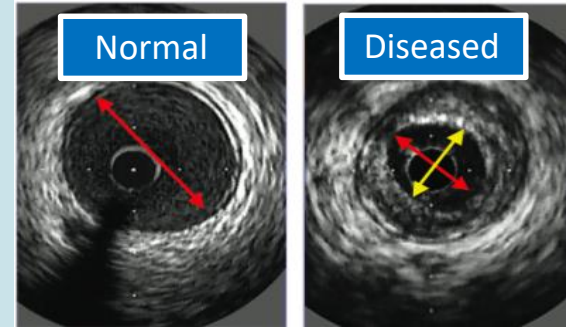


- Arbitrary shapes
- Extremely flexible
- Miniaturization platform
- Supported by a roadmap

IVUS: Intra_vascular_u_ltraso_u_n_d

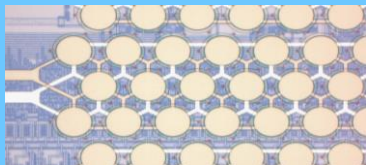


IVUS for stent sizing & deployment verification



Open Platform Roadmap

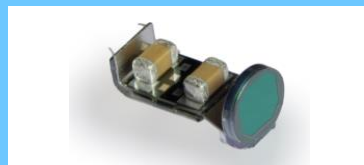
MEMS ultra-sound



Open Infrastructure



Smart Catheters



Emerging Domains



Moore4Medical



POSITION II



ULIMPIA



ASTONISH

Advancing Smart Optical Imaging and Sensing for Health



InForMed



INCITE



2014

2015

2016

2017

2018

2019

2020

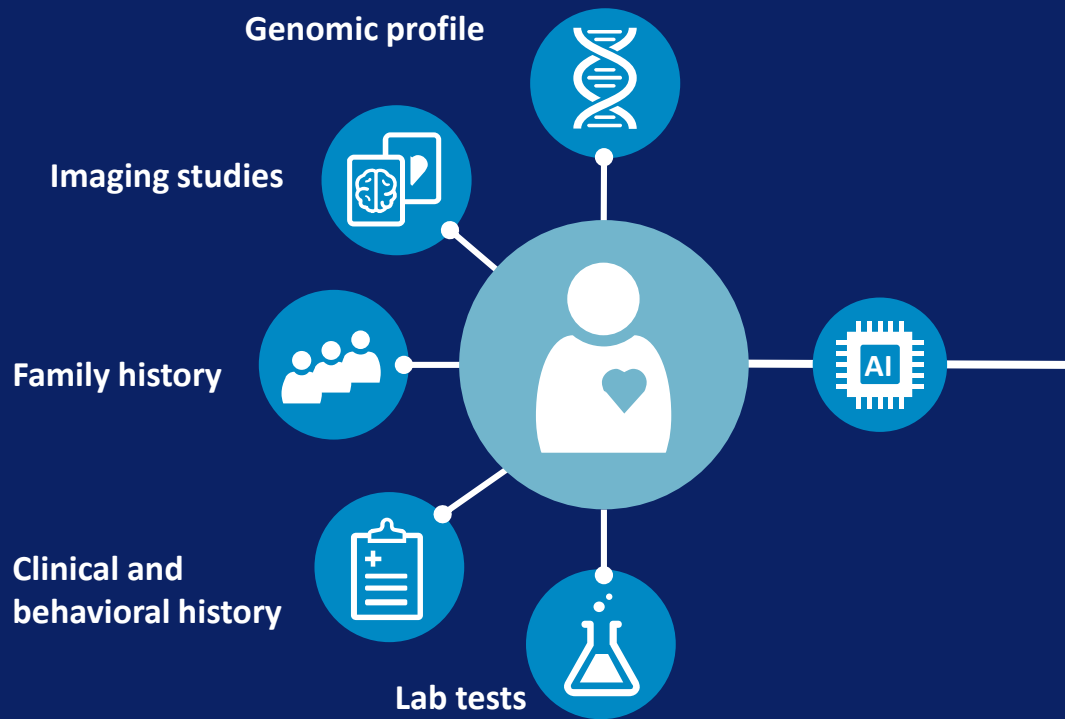
2021

2022

2023



Full patient context: longitudinal data and models



Digital twin



Summary – Innovations enabled by digital technologies



Transition to **value-based care** through analytics and pathway optimization

Precision medicine and personalized treatment enabled by smart algorithms



Digital Platforms for **data-driven solutions** across the care continuum

Networked care with active patient engagement & coaching with integrated portals & apps



Acknowledgements



Grant no.: Ecsel-783132-Position-II-2017-IA

Ronald Dekker



ULIMPIA is a labelled a PENTA project endorsed by
EUREKA under PENTA cluster number E!9911



