The NEXT HEALTH: Sano
Centre for Computational Personalised Medicine
- International Research Foundation
Sano is a project aimed at establishing, developing and sustaining in Kraków the Centre for Computational Personalised Medicine in the form of an International Research Foundation.
The Partnership
About the Project

- **Funds:**
  - H2020-WIDESPREAD-2016-2017 Teaming Phase 2 program (grant 857533)
  - International Research Agendas program of the Foundation for Polish Science (European Regional Development Fund)
  - Polish Ministry of Science and Higher Education

- **Project duration:** 7 years

- **Start:** Aug. 1st 2019

- **Budget:** 15M€ Teaming (CSA) + 15M€ Polish compl. funds
The formative phase (up to 18 months):
- Establishment of the Foundation (administration, key staff positions)
- Recruitment of the Centre’s Director
- The research agenda proposed by the Director and accepted by the ISC
- Research team leaders recruited
<table>
<thead>
<tr>
<th>Challenges</th>
<th>Answers</th>
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</thead>
<tbody>
<tr>
<td>Ageing and co-morbidities</td>
<td>Complexity by composition</td>
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<tr>
<td>Specialists’ capacity</td>
<td>Unlimited capacity</td>
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<tr>
<td>Imprecise diagnosis</td>
<td>Precise diagnosis</td>
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<tr>
<td>Suboptimal treatment</td>
<td>Ranked treatments</td>
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<tr>
<td>Fragmented care</td>
<td>Integrated care</td>
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<tr>
<td>Population-specific issues</td>
<td>Subject-specific approach</td>
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The framework to enable investigation of the human body as a single complex system:

- Personalised healthcare
- Preventative approach to combating disease
- Holistic multi-morbidity medical treatments
- Reduced need for animal experiments
- Industrial partnerships: new products & systems
Subject-specific models as decision-support systems for personalised medicine

Expected Impacts - Digital Patient

- Replace invasive diagnostics
  - Improve efficacy
  - Reduce secondary care costs
- Replace indirect prognostics

- Personalise therapies
- Manage multimorbidity
- Optimise complex pathways

- Reducing impact of ageing
- Externalise management
Expected Impacts - In Silico Clinical Trials

- Revitalise medical industry
- Target rare/neglected disease

Individualised computer simulation for the development or evaluation of new drugs or medical devices

Reduce, refine, and replace animal experimentation

Reduce innovation costs of MedTech

Reduce innovation costs of Pharma

More ethical research
Subject-specific models for the self-management of health

Self-manage chronicity

- Reduce primary care costs,
- Improve quality of life
- Empower participation

Refine rural telemedicine

- Improve access to care
- Low-cost MedTech industry

Personalise prevention

- Consumer ISM market

Expected Impacts - Personal Health Forecasting
Objectives

Development of *computational models* of human organs built in the context of organ(s) related diseases with the view to provide medical (analytical, preventive, diagnostic, and therapeutic) solutions.

Related product categories will be *tools* and *services* designed to effectively deliver, integrate and exploit this *computational models*.

The ultimate Centre product category resulting from merging previous products within integrated (disease related) solutions will be the computational *Clinical Decision Support Systems*.

- Development of new technologies for prevention, diagnosis and therapy
- Integration of existing and novel preventive, diagnostic and therapeutic solutions to increase clinical objectivity and improve outcomes
- Acceleration of regulatory and certification processes for clinical usage of computational technologies.

- Cardiovascular
- Musculoskeletal
- Orthopaedic
- Oncological
- Neurological
- Urinary

*Computational models* of human physiology
- Conceived in response to clinical need
- Built in the context of related diseases
- Intended to provide medical (analytical, preventive, diagnostic, and therapeutic) solutions.
# Value Proposition

<table>
<thead>
<tr>
<th>Sector</th>
<th>Science →</th>
<th>Industry →</th>
<th>Health care →</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value chain</td>
<td>Concept &amp; feasibility</td>
<td>Design &amp; prototyping</td>
<td>Validation &amp; Preclinical</td>
</tr>
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</table>

### Centre competences, products and services

- **Modeling & simulation**
  - In Silico Techniques
  - Algorithmic Decision Science

- **In Silico drug or medical device development**
- **Tools for Clinical Trial Simulation (CTS)**
- **Models for Clinical Decision Support System (CDSS)**

- Expertise and Tools for Automated Clinical Data Analysis

**Data Science / Healthcare Informatics / Computer Science and High Performance Computing**

**Business Concept Development / Regulatory Approval / Market Entry**

Professional training and consulting
<table>
<thead>
<tr>
<th>Product/service category</th>
<th>Output</th>
<th>Format</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Decision Support Systems</td>
<td>Software system</td>
<td>Integrated platform</td>
<td>EurValve DSS for aortic and mitral valve diseases</td>
</tr>
<tr>
<td>In silico tools for clinical research and practice</td>
<td>Software model</td>
<td></td>
<td>Blood flow simulation models, Image segmentation</td>
</tr>
<tr>
<td>Tools supporting development of computational models</td>
<td>Software tools</td>
<td>Platform, consultancy</td>
<td>Model Execution Environment, Atmosphere Cloud Platform</td>
</tr>
<tr>
<td>Curated data and knowledge-base</td>
<td>Data – sets</td>
<td>Platform</td>
<td>euHeartDB heart model database, NMS Physiome neuro-musculo-skeletal models</td>
</tr>
<tr>
<td>Automated clinical data analysis</td>
<td>Software model &amp; tools</td>
<td>Platform, consultancy</td>
<td>VPH-Share Taverna workflow integration, ARQ, TrialConnect</td>
</tr>
<tr>
<td>In silico drug development</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>In silico device development</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Education and professional training</td>
<td>Learning materials</td>
<td>Teaching &amp; training</td>
<td>In silico Academy, Anatomy/physiology for engineers</td>
</tr>
</tbody>
</table>
### Main Stakeholders and Value Proposition

**Value extracted** at each step, from concept to realisation

<table>
<thead>
<tr>
<th>Health science</th>
<th>Health industry SMEs and StartUps</th>
<th>Health industry medtech and pharma</th>
<th>Healthcare services</th>
</tr>
</thead>
</table>
| • Publicly-funded projects  
  • Dissemination in academic contexts  
  • Shared links with industry partners  
  • Shared PhD programs | • Fast product development  
  • Access to curated data  
  • Validation and testing tools and methods  
  • Business up-scaling & access to markets  
  • Biomarker development | • Co-development of medical technologies  
  • Access to HPC capability and expertise  
  • Early access to IP  
  • Industrial PhD programs  
  • Training | • Exploitation of advanced simulation models and CDSS  
  • Workflow integration  
  • Computational optimisation  
  • *inSilico* clinical trials  
  • Education |

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<tr>
<th>Business development &amp; regulatory</th>
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</thead>
</table>
| • Translation management  
  • Business incubation and acceleration  
  • Support in legal and regulatory issues | | | • IP and patents  
  • Individual market studies |
<table>
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</thead>
<tbody>
<tr>
<td>9 Research proposals</td>
<td>13 SMEs: Digital Health in Poland</td>
<td>11 Industrial corporations</td>
<td>3 Hospitals from Poland (inc. University Hospital in Kraków)</td>
</tr>
<tr>
<td>7 Therapeutic areas</td>
<td>6 Health clusters from the EU</td>
<td>1 EU-Industry Partnership EFPIA - IMI</td>
<td>1 STH in UK</td>
</tr>
<tr>
<td>3 Universities</td>
<td></td>
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</table>

**Business development & regulatory**

- 2 Technology Parks
- 1 Venture/Seed Capital
- 1 Public body (Regional Medical Info System)
- 1 Industrial Alliance (Avicenna)
Outstanding job positions qualities: supervision by top European scientists; high relevance of conducted research; exciting “cutting-edge” projects

Extensive international possibilities: short-term visits to advanced Partners, joint PhD program for Centre scientists, collaboration in international projects

Career development: postdoc positions at the advanced Partners or involvement in industry either by spin-offs or moving to industry partners

Skill development: fellowship programs involving short-term researcher exchange with advanced Partners to build up expertise, learn best practices, study the local self-development culture and return home with this experience,

Competitive salaries: to allow researchers to fully devote their time to the Centre activities.
Recruitment of Life Science and IT research and management staff

Foundation Council
5 reps of Teaming partners (UK, DE, PL)
Concludes employment contracts

Management Board
Led by Scientific Affairs Director prof. Marian Bubak

International Scientific Committee
Chaired by Marco Viceconti
15 members (UK, IT, DE, NL, US, PL)
Selects top candidates

Top international candidates for the Directorship, and Laboratory Leaders

Healthcare Informatics
Data Science
Computer Science and HPC
Modelling and Simulation
In silico techniques

Key personnel numbers:
KPI-1 Research groups - 5
KPI-4 R&D personnel - 55
KPI-5 New scientists - 33
KPI-6 Foreign scientists - 15
**University of Sheffield**
- Staff will (co-)supervise PhD students
- Typical duration 3.5 years
- Students will be located mostly at the Centre
- Comprehensive training and research exchange programme

**University of Amsterdam**
- External PhD students at UvA
- Computational Science

**AGH University of Science and Tech.**
- 4-year PhD program in Computer Science, Biomedical Engineering or Biophysics
- Option for “industrial PhD” programme with a collaborating company
- Option for “External” PhD degree

**Collegium Medicum UJ**
- Medicine and other health-related fields

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**Special training and Research Exchange Programme**
- At least 6 months abroad
- USFD advanced training, multi-disciplinary, computational medicine
- 2 trainings, each of at least 30 hours per student

**PhD programme in numbers**
- Polish medical researchers involved in PhD co-supervision: 15 (from Clinical Advisory Committee)
- Total number of PhD students: 30 (18 on salary, 12 stipends)
Opportunities for Clinical R&D Cooperation

Now: Clinical partners engage in the planning, and guide our strategy

18 months+: Workshop programme begins, call for (joint) research projects

- **Flexible opportunity** - three levels of clinical partnership: Informed, Participating or Contributing Partner

- **Engagement at many stages** throughout the clinical trials process
  - Conceptual Development
  - Initial R&D
  - Early Clinical Prototyping
  - Regulatory Processes
  - Clinical trials planning and implementation

**Clinical collaboration, driven by...**
- practical application of scientific and clinical concepts
- funds awarded to the Centre to support R&D projects
- co-supervision of PhD students to address research interests
Opportunities for industrial cooperation

- **Flexible opportunity**, three levels of industrial partnership as Contributing, Supporting or Preferred Partner.
- **Engagement at many stages** throughout the R&D cycle
  - Conceptual Development
  - Initial R&D
  - Early Clinical Proving
  - Commercial Development
  - Regulatory Processes
  - Market Exploitation

Now: Industrial partners engage in the planning, and guide our strategy

18 months+: Joint research projects begin, to bring concrete results

Industrial collaboration, driven by...
- Intellectual Property creation, across multiple domains
- Commercial development and integration around international healthcare standards
- A disciplined academic environment delivering a trained workforce
Towards Cooperation with the Centre

Research agenda and scientific collaboration

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Talent development and career

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Managing Partner

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Communication Commercialisation & Business development

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