BigData@Heart
Big Data for Better Hearts

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Professor of Clinical Epidemiology
Rationale

Progress Drug development in CVD is frustrated by:
  • Poor definition of disease ignoring underlying (molecular) mechanisms and co-/multi-morbidities
  • Lack of approved relevant patient-centered outcomes
  • Data access limited to selected small patient populations

This results in:
  • Mismatch trial and real-world patients
  • Large inter-individual variation in prognosis
  • Heterogeneous treatment response
Big-Data: The next revolution in science?
Join forces to improve patient outcome

• Launched in March 2017, BigData@Heart brings together a consortium of 19 stakeholders under an Innovative Medicines Initiative-2 (IMI-2) funded project.

• The aim of the project is to apply big data approaches to improve patients outcomes in the most common cardiovascular diseases in Europe today: acute coronary syndrome, atrial fibrillation and heart failure.
Unprecedented consortium

- The European Society of Cardiology (ESC), numerous European academic research groups, and European Federation of Pharmaceutical Industries and Associations (EFPIA)-based pharmaceutical industry have joined forces to develop a big data-driven translational research platform.

- This platform will deliver clinically relevant disease phenotypes, scalable insights from real-world evidence driving drug development and personalized medicine through advanced analytics.
Unprecedented scale: Data on over 25 million subjects across Europe

The BigData@Heart consortium encompasses all relevant stakeholders and an unparalleled array of data
Opportunities unleashed in a European research infrastructure and collaboration

Big data from electronic health records for early and late translational cardiovascular research: challenges and potential

Harry Hemingway\textsuperscript{1,2,8}, Folkert W. Asselbergs\textsuperscript{1,2,3}, John Danesh\textsuperscript{4}, Richard Dobson\textsuperscript{1,2,5}, Nikolaos Maniadakis\textsuperscript{5}, Aldo Maggioni\textsuperscript{6}, Ghislaine J.M. van Thiel\textsuperscript{3}, Maureen Cronin\textsuperscript{7}, Gunnar Brobert\textsuperscript{8}, Panos Vardas\textsuperscript{6}, Stefan D. Anker\textsuperscript{9,10}, Diederick E. Grobbee\textsuperscript{11}, and Spiros Denaxas\textsuperscript{1,2}; On behalf of the Innovative Medicines Initiative 2nd programme, Big Data for Better Outcomes, BigData@Heart Consortium of 20 academic and industry partners including ESC\textsuperscript{†}
Work packages in BigData@Heart

- WP1 – Project management
- WP2 – Outcome definitions
- WP3 – Data harmonisation
- WP4 – Data enrichment
- WP5 – Data analysis
- WP6 – Communications of results and guidance documents
- WP7 – Ethics, legal and data privacy
Ambition

• New definitions of diseases and outcomes in ways that are universal and computable, and relevant for patients, clinicians, industry and regulators.

• Informatics platform that allow to link, visualize and harmonise data sources of varying types, completeness and structure.

• Data science techniques to develop new definitions of disease, identify new phenotypes, and construct personalised predictive models.

• Guidelines that allow for cross-border usage of big data sources acknowledging ethical and legal constraints and data security.
More info

• www.bigdata-heart.eu

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BigData@Heart
Big Data for Better Hearts

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Consultant Cardiologist,
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Scientific Coordinator BD@H
Casestudies BigData@Heart

WP1 – Project management
WP2 – Outcome definitions
WP3 – Data harmonisation
WP4 – Data enrichment
WP5 – Data analysis
WP6 – Communications of results and guidance documents
WP7 – Ethics, legal and data privacy
#1 Comparison of real world heart failure patients to trial patients to guide future trials

DOI 10.1186/s13063-015-1023-4

A literature review on the representativeness of randomized controlled trial samples and implications for the external validity of trial results
#2 Deliver clinical relevant definition of HF subphenotypes and outcomes using -OMICS and EHR data resources
To compare clinical outcomes derived from public registries with formally adjudicated endpoints
#4 Compare HF epidemiology across EU countries
#5 Identify novel druggable targets using proteomics and genomics in iron depletion
Dense multi-omic phenotyping

90 cell parameters in all 50,000 samples at 2 timepoints

>3500 proteins in 3300 samples

350 proteins in 5000 samples

450 lipid species being assayed in all 50,000 samples

230 lipoproteins, lipids and low molecular weight metabolites in all 50,000 samples

1000 untargeted metabolites (700 named) in 9000 samples

50,000 GWAS
4,500 WES 50x
25,000 WGS 15x

+RNAseq pilot, mass spec protein pilot, autoantibody assays, virome sequencing, nasal microbiome coming soon
#6 Investigate how data from wearables/Apps can be used as premarket and postmarket evidence

www.radar-cns.org/
More info regarding casestudies

• www.bigdata-heart.eu

• F.W.Asselbergs@umcutrecht.nl
BigData@Heart
Big Data for Better Hearts
Webinar – IMI Public Private Partnership

Overview

September 13, 2017
Panos Vardas, Chief Strategy Officer, European Heart Agency
Gunnar Brobert, Director of Epidemiology, Bayer AG
Innovative Medicines Initiative IMI

- Establishing critical mass consortia to make drug R&D processes in Europe more innovative and efficient
  - Industry defines strategic research agenda & projects
  - Agenda addresses WHO healthcare priorities
  - Projects in discovery, through development to healthcare delivery and access models

> €5 bn

Partnership 2008 - 2024

€2.5 bn
IMI2 – From Science to Patients

Drive change in real life medical practice

- Faster clinical development in a world of precision medicine
- Understanding of diseases on a molecular level
- Target & Biomarker Identification (safety & efficacy)
- Innovative clinical trial paradigms
- Patient tailored adherence programmes
- Understanding and improving the „real-life“ situation
- Development of novel medicines in areas without sufficient incentives for industry
- Innovative Medicines

For more information please look at the IMI2 Strategic Research Agenda
http://www.imi.europa.eu/content/imi-2
IMI – From idea to project start

INDUSTRY CONSORTIUM

Industry Consortium (several companies)

Definition of scope

PUBLIC CONSORTIA

Proposal for joint implementation

PUBLIC PRIVATE CONSORTIUM

Joint development of detailed project plan

NEGOTIATIONS AND START

Consortium Agreement and Grant Agreement

Call launch

Selected team merges with industry

Definition of contractual terms

Project start!
Big Data for Better Outcomes Programme
Investing in key enablers

Goal
- Support the evolution towards outcomes-focused and sustainable healthcare systems
- Exploit medical innovation and opportunities offered by large data sets from variable sources

Themes/Enablers

1. Design sets of standard outcomes and demonstrate value
   - Sets of target outcomes
   - Clinical endpoints
   - Alignment of HC stakeholders on the value of those outcomes

2. Increase access to high quality outcomes data
   - Mapping of sources, methods and tools for collection and harmonization
   - Governance and technical standards

3. Use data to improve value of HC delivery
   - Drivers of outcomes variation
   - Best clinical practices
   - Methodologies to predict outcomes

4. Increase patient engagement through digital solutions
   - Patient Reported Outcomes opportunities
   - Profiling patients behaviors
   - Tools to increase patient engagement
Big Data for Better Outcomes (BD4BO) Programme at a glance

"Big data for better outcomes"
Goal: Support the evolution towards outcomes-focused and sustainable healthcare systems, exploiting the opportunities offered by large data sets from variable sources

<table>
<thead>
<tr>
<th>COORDINATION AND SUPPORT ACTION (CSA) – PROJECT PUBLISHED</th>
<th>EUROPEAN DISTRIBUTED DATA NETWORK</th>
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<tbody>
<tr>
<td>1 Design sets of standard outcomes and demonstrate value</td>
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ROADS: ALZHEIMER’S DISEASE – PROJECT PUBLISHED
HEMATOLOGIC MALIGNANCIES – PROJECT PUBLISHED
CARDIOVASCULAR – PROJECT PUBLISHED
PROSTATE CANCER – PROJECT PUBLISHED
Oncology ‘Big 5’ Project

Future topic proposals, e.g. respiratory, multi-morbid patients and ophthalmology

PLANNED PROJECTS

Themes / Enablers
Coordination and operational topics
Disease-specific topics
DO→IT Structure at a glance

• BD4BO Programme strategy and coordination
• Integration of knowledge incl. knowledge repository (incl. sustainability)
• Communication and Collaboration with Healthcare Systems Stakeholders
• Minimum Data Privacy Standards for ICFs and Supporting Materials
Big Data Analysis to Improve Outcomes in 7 fields of Hemato-Oncology:

- Non-Hodgkin lymphoma (NHL)
- Chronic lymphocytic leukemia (CLL)
- Myelodysplastic syndromes (MDS)
- Acute lymphocytic leukemia (ALL)
- Acute myeloid leukemia (AML)
- Multiple myeloma (MM)
- Pediatric

Others
- GMV, Barcelona (IT-Infrastructure)
- Patient Organizations
- EMA / IfARM /NICE
- EORTC, EHA

Pharma Industry
- Novartis (Coord.)
- Celgene (Coord.)
- Bayer
- Janssen
- Amgen
- Menarini
- Takeda

University Hospitals
- Clinic Barcelona
- Ulm
- Bologna
- Wien
- Erasmus, Rotterdam
- Navarra
- Torino
- Amsterdam
- Cambridge
- Rome ‘Tor Vergata’
- Frankfurt
- Masaryk Univ. / Brünn

- LMU München
- Duesseldorf
- Newcastle upon Tyne
- Helsinki
- York
- Ospedale Pediatrico Bambino Gesù, Roma
- Assistance Publique – Hôpitaux de Paris
- La Fe, Valencia
- IBSAL, Salamanca

no exhaustive list of partners; 51 partners total
More info

- https://www.bigdata-heart.eu/