Are we ready for precision medicine?

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Two paradigm shifts in molecular biology

Small data sets ➔ very large data sets and their cross-linking and integration with other knowledge

Pathways ➔ networks

The complexity of genetic information per sample is increasing rapidly

Signaling pathways are not linear sequences, but rather organized as networks

[Image of pathway with networks and molecular interactions]

[Reference: Kahvejian et al., Nature Biotechnology 2008]

[Reference: Kholodenko et al., Science Signaling, 2012]
Are we ready for precision medicine?

Yes.

• Molecular tumour boards are forming, consisting of e.g. geneticists, pathologists, and physicians for the involved disciplines like gynaecology, or haematology

• Panel diagnostic data is increasingly available (~10 - 50 genes)

• Data science methods are available on various scales
Are we ready for precision medicine?

No.

- Data quality often poor and unstructured
- Data semantics different across locations
- Politics
- Legal issues

Medical Informatics Funding Scheme

Networking data – improving health care
Aims of the project

• Motivation for collaboration
• Development of non-structured sources ➔ text mining
• Integrate data between several sites
• Use the generated data repositories to support clinical care and research
  • Decision support
  • Study recruitment
  • Research on rare diseases
  • Personalized medicine
Medical Informatics Funding Scheme

Total funding for 3 - 4 consortia: ~100 M€

- Support activities
- Supplementary funding modules
- Conceptual phase: 2016 - 2017
- Development and networking phase: 2017 - 2021
- Consolidation and further development phase: 2021 - 2025

Audit: 2016 - 2017, 2021 - 2025

measurable benefit for the patient!
Data Integration Centers

Local Data Integration Center (DIC) at each site provide data to the central meta data integration center (mDIC)
Current challenges in precision medicine

• Political challenges
• Data protection
  • At the hospital
  • Statutory provisions in every federate state
  • General Data Protection Regulation (GDPR)
• Standards for communication and data exchange
• High competition ↔ coordinated/concerted concepts
• Data extraction from non-structured patient records
• Data quality issues
Thank you

http://sysbio.uni-ulm.de
Integration of `omics-data

- Support of molecular tumor boards
- Provide a basis for research → molecular register
  - Combine `omics-data with data from patient records and longitudinal follow up data
  - Create basis for personalized medicine