



Discovery and Innovation in Health IT

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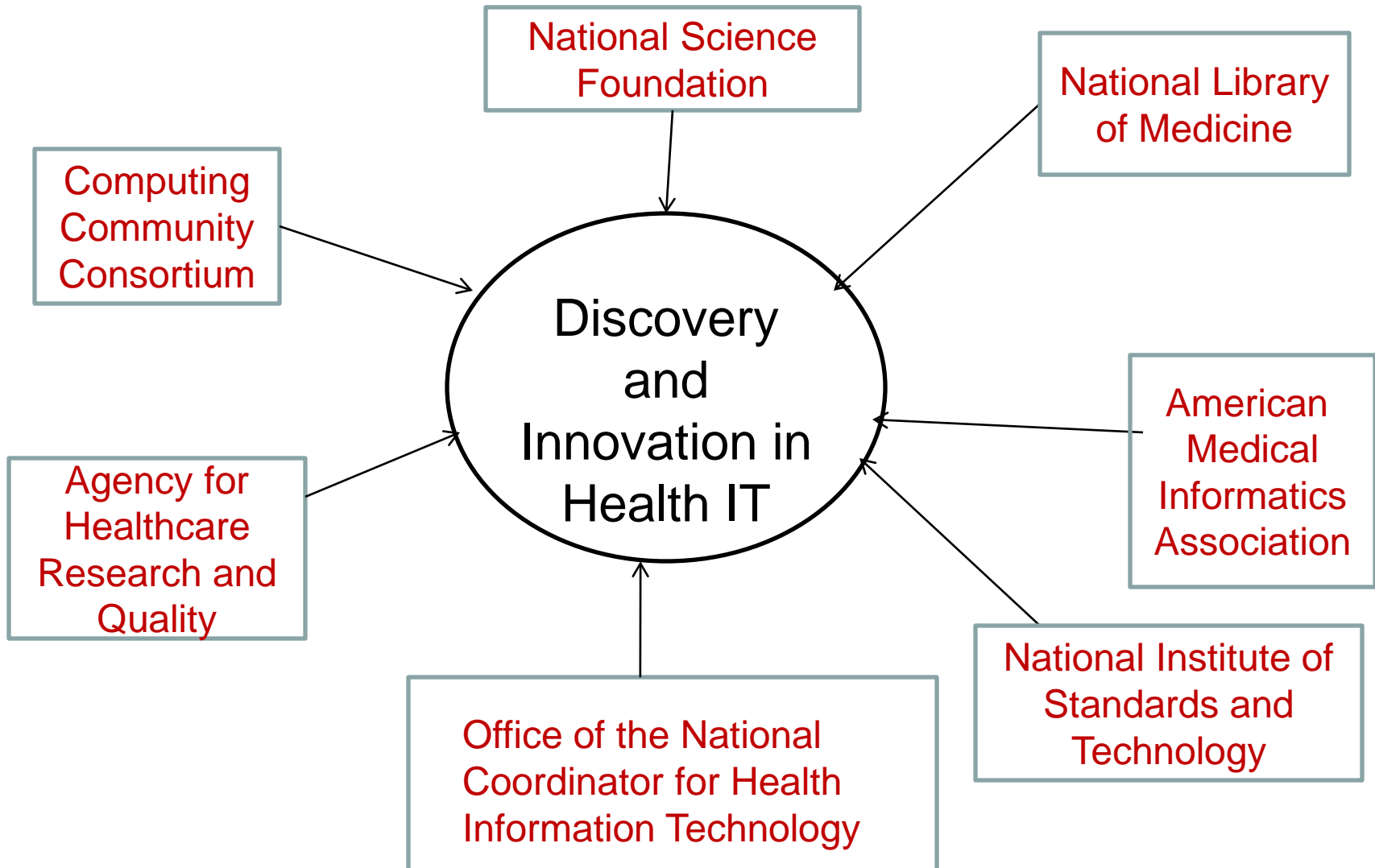
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Healthcare Is Changing



- Changing responsibilities
- Prevalence of chronic conditions
 - More healthcare at home
 - Individuals manage their own health
 - Family members act as caregivers
- Increased IT for professional caregivers
 - Promise not yet realized
 - Inefficiencies and barriers exist
- Business of healthcare delivery is increasingly complex

Powerful Emerging Technologies Create Opportunities for CS Research Contributions



- Sophisticated imaging, sensing, monitoring and communication technologies
- Massive amounts of multi-media electronic data about individuals, disease, treatments
- Increasingly powerful data analysis methods
- Robust robotic and speech technologies
- Advancing understanding of human behavior, cognition, and incentives

Why Health Applications Are Different



- Multi-modal data – e.g. quantitative metrics, continuous readings, human reports
- Data are incomplete and may be contradictory
- Poorly defined noise models
- Sampling bias towards the sick
- Poorly characterized individual and population variations
- Complex social dynamics

Facilitating Research Progress



- Publically available de-identified data sets
- Open research infrastructures
- Mechanisms for migration of research results to deployment
- Lowering of legal barriers to research
- Coupled computing and medical expertise
- Appropriate forums to report multi-disciplinary research results

What to do with all that data?



- Government is pushing electronic health records
- Short-term technical challenges are privacy, security and trust, integration and systems, workflow
- Long-term opportunity is “secondary use”
 - Powerful decision support
 - Aggregation of individual information for public health

What if we could put it all together?



- Complete genomic data on individuals and on populations
- All the continuously changing literature on the biochemistry of diseases and of drugs
- Analysis and visualization of composable images
- Life-long, continuously updated, contextual health histories of individuals



Could drive prediction, prevention, diagnosis, and treatment