

# From Molecules to Populations

W. Ed Hammond, Ph.D., FACMI, FAIMBE, FHL7, FIMIA

Director, Duke Center for Health Informatics

Associate Director, Biomedical Informatics Core, DTMI

Professor, Community and Family Medicine

Professor-Emeritus, Department of Biomedical Engineering

Adjunct Professor, Fuqua School of Business

Chair-emeritus, Health Level Seven

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# Silos in Health Care

- Sites of care
- Research funding
- Systems development
- Holistic treatment of diseases
- Stakeholders
- Policy
- Systems
- Venders
- Standards
- Applications
- Planning
- Payment
- Clinical areas
- Governance
- Data use



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# Vision

How bold is your vision of the future? Can you envision a world in which each of the groups engaged in health and healthcare come together to enable a seamless and interoperable flow of data and knowledge bidirectionally to enhance access to data and knowledge? Can you envision a true patient-centric system for health care? Can you envision interoperable access to data across regional and national boundaries?

**That is my vision!**

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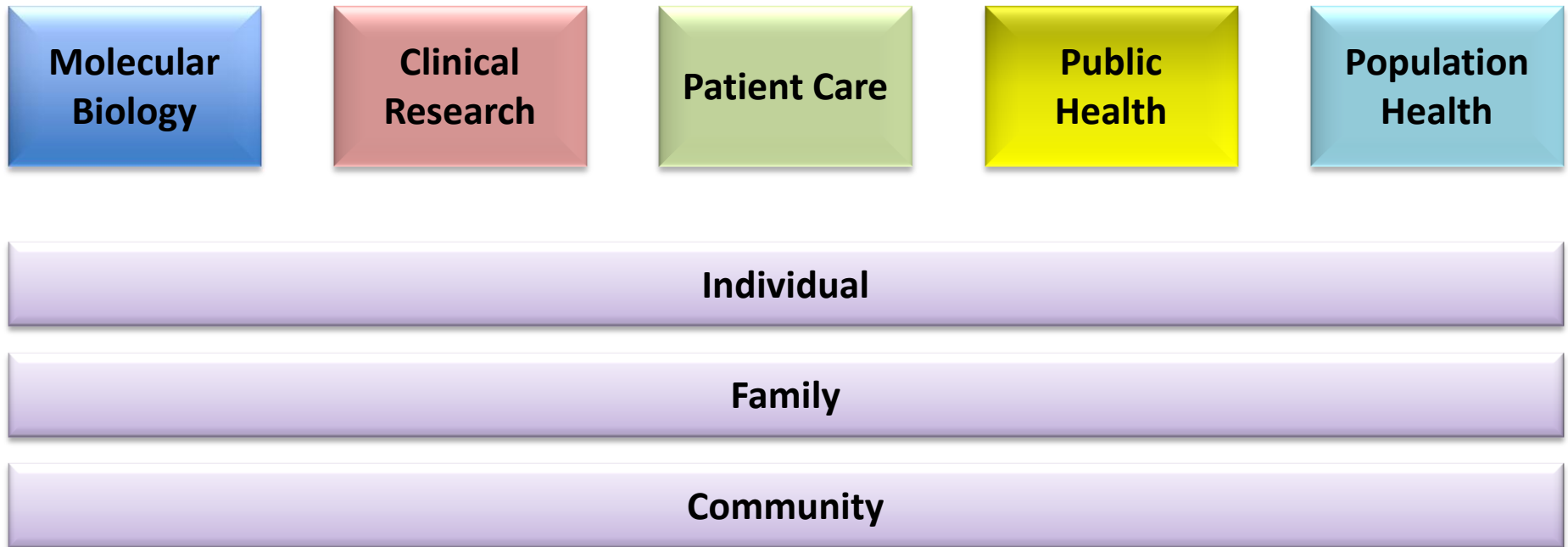
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# From molecules to population



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# Translational Medicine

- Phase 1 – facilitates interaction between basic research and clinical medicine, largely through clinical trials; refers to translation of laboratory-based research into new therapies through drug discovery and development
- Phase 2 – transition of research into routine practice; enables bench to bedside; addresses application of new developments into patient care environments
- Phase 3 – Provides closed loop feed back to evaluate effectiveness of new developments; basis of evidence-based medicine; comparative effectiveness research
- Phase 4 – movement into communities and populations to affect behavioral changes and good health policies

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# Components of communication

- Data
  - Semantically interoperable, assure quality, timely
- Knowledge
  - Appropriate, accessible, comprehensive, trusted
- Information
  - Actionable, focused, clear
- Wisdom
  - Individuals trained in how to use data, knowledge, and information

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# Biomolecular Informatics 1/2

- Genomics, proteomics, pharmacogenomics, computational biology, basic science
- Understanding the genetic basis of disease; establishing role of genetics in treatment
- Within domain – registries, data sharing, analytic tools, indices, provenance, query tools, data capture tools, other
- Clinical research – requirements, targeted diseases, clinical trials, biobanks

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# Biomolecular Informatics 2/2

- Patient care – target disease identification (rare diseases), knowledge requirements, genetic information to influence treatment and to enable personalized care
- Population Health – research in understanding genetic disease factors related to ethnicity, geographic, cultural, and environmental factors

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# Clinical Research Informatics 1/2

- Within domain – registries, controlled data exchange among researchers, provenance, data capture tools such as RedCap, query tools such as i2b2, analytics tools, management of clinical trials
- Patient care – reuse of patient care data, shared collection of data, cohort identification, discovery of target drug requirements, early translation of research into routine patient care
- Population Health – understanding of prevalence of disease, identification of new drug targets

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# Patient Care 1/2

- Within domain – Meaningful use of data, EHR systems, data exchange, decision support, supporting safe and high quality health care effectively and efficiently at best cost, interoperability among all sites of care, embracing preventive and personalized care, clinical data warehouses, creation of new knowledge, supporting patient-centric EHRs
- Adverse events fed back to clinical research and ‘omics research

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## Patient Care 2/2

- Public Health - addressing community needs, accepting responsibility for promoting good health behavior
- Population Health – accepting responsibility for populations in their areas of responsibility, understanding prevalence of disease, characteristics of their population, addressing society needs including disabled, aging and underserved

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# Public Health

- Within domain – acquisition of data and structured reports, tracking of disease outbreaks, control of epidemics, insuring appropriate immunization and vaccinations, analytics, infectious disease control, disaster management
- Patient care – source of data from health surveillance and disease management

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# Population Health

- Within domain – understand disease prevalence, understanding environmental factors through use of geospatial coding and impact on health, insuring adequate resource funding by governments; help determine priorities in health

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# The Individual

- Pledge – to empower individuals to be partners in their health through health IT.
- Personal Health Records – loaded from each and all sites plus individual entries
- New models
  - Self care
  - Medical home
  - Behavior modification
- Social networks

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# Informatics enables ...

- Patient-centric care means holistic care – comorbidity as accommodated in treatments.
- Personalized care becomes reality with an understanding of the role of genetics in treatment.
- Evidence-based medicine becomes a reality.
- Health care includes the individual, the family the community, the nation, and the world.

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# Challenges 1/2

- Acceptance that cooperation and sharing is a win-win situation
- Single ontology that links all domains; that is an open process; that uses a common process in which expertise is the dominant factor; identifies stewardship of each ontological term
- Ontology removes all ambiguity in associated attributes; ontology matches terms that are used in the process of research and care

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## Challenges 2/2

- Solves privacy issues; recognizes that personal control of data may harm creation of new knowledge and seamlessly connecting the contributing domains for the most effective care
- Identification and implementation of standards for data and data exchange
- Controlled and purposeful exchange of data
- Quality of data is insured through process, algorithms, and certainty factor

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# Return on Investment

- How much will enablement of this vision cost?
- How much will good health care cost?
- What is the cost of bad health?
- Faster, less expensive, more honest research through informatics

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# Conclusion / Summary

- The pace of technology has been paced by Moore's law: roughly, computational power doubles approximately every two years
- Use of technology – informatics – has not kept pace. The future of health care depends on our getting ahead of the curve
- That step demands a step change – revolution, not evolution!

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# Informatics

- Within Informatics is the power to bridge these silos and significantly advance health, longevity and quality of life for all citizens of the world.
- This achievement can only happen through the global community acting together, sharing costs and responsibility.
- The inequalities of the world, the globally growing aging population, and economics demand this action be taken.

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# Thank you!

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