Technology-Enabled Medicine

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The Mayo-Illinois Alliance aims to blend the technical engineering expertise of Illinois with the clinical practice expertise of the Mayo Clinic to develop new technologies that will transform the practice of medicine.

- Providing **innovative educational programs** to train the next generation of clinicians and biomedical scientists
- Integrating **cutting-edge research** activities that focus on information-based medicine and point-of-care diagnostics
- Discovering **new technologies** and bringing them to practical use to improve healthcare outcomes
Top-Ranked Medical Center, World Renowned Tradition in Quality Health Care Delivery

Top-Ranked Programs in Engineering, Computation, Bioinformatics, Genomics and Nanotechnology

INFORMATION-BASED MEDICINE

GENOMICS

POINT-OF-CARE DIAGNOSTICS

EDUCATION

ENTREPRENEURSHIP
Leveraging Existing Campus Strengths

- Image Science
- Electronic Devices
- Materials
- Bio-Nano-Tech
- Computational Sciences
- Genomics
Microbiome Program

Focuses on understanding the structure and function of microbial communities in the human body by using next-generation ‘omics technologies.

Disease and Health Conditions:
• Pre-term birth
• Colorectal cancer
• Autoimmune diseases
• Obesity
• Aging
• Cognition

Outcomes:
• Biomarker discovery
• Therapeutic interventions
Computational and Genomic Medicine Program

Developing new and innovative processes that facilitate the translation of genomics and other complex data into clinical care.

Examples and Outcomes:

- Visual analytics in support of pharmacogenomics research
- Using EMRs to predict heart failure therapy response
- $9.3M award from NIH to create a Big Data to Knowledge Center of Excellence. Mayo and Illinois are calling this center the Knowledge Engine for Genomics, or KnowEnG.
Devices and Detection Program

Development of new devices and diagnostic tools; application of genomic and genomic-driven testing to disease prevention, early detection, prediction and intervention.

Examples:

- “Lab-on-a-chip” to detect DNA or RNA sequences
- 3-D tissue models for high throughput rapid screening of cancer drugs without the need for animal models
- Sensor for detecting modified DNA that points to tumor development

Outcomes:

- Technologies enabling rapid detection, diagnosis and treatment of cancer (drug delivery)
Technology-Enabled Medicine

Disease Progression

EXAMINE, DIAGNOSE, TREAT

Today

Future

Health & Wellness, Disease Etiology

SYSTEMS OR PRECISION MEDICINE

The Human System – A Grand Challenge

How does the system work

How to model the system

How to improve the system

Medical Imaging
Advanced Microscopy

Sensing & Imaging
Personalized Diagnostics
Bionanotechnology

Computational Medicine
Data Integration

Computational Modeling
Systems Biology
Omic Networks

Regenerative Medicine
Therapeutic Delivery

Cell and Molecular
Reengineering

Synthetic Bioengineering
Drug Discovery

BIOMEDICAL IMAGING

COMPUTATIONAL MEDICINE

BIOMATERIALS & DEVICES

NANOTECHNOLOGY
& NANOMEDICINE

HEALTH INFO, PRIVACY & SECURITY

STEM CELLS AND REGENERATIVE MEDICINE
Big Data