The heart and science of medicine.

Genomic Medicine for the University of Vermont Health Network

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Why Genomic Medicine in Vermont?

John Brumsted, MD, CEO UVM Health Network

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Affiliation Agreement

The University of Vermont

The University of Vermont LARNER COLLEGE OF MEDICINE

COLLEGE OF Nursing AND Health Sciences

UVM Medical Center
Porter Hospital
Central Vermont Medical Center
Alice Hyde Medical Center
Champlain Valley Physicians Hospital
Elizabethtown Hospital

THE University of Vermont HEALTH NETWORK Medical Group

OneCareVermont

Adirondacks ACO

+

2 FQHCs =
Vermont Care Organization

VERMONT ALL-PAYER ACCOUNTABLE CARE ORGANIZATION MODEL AGREEMENT

This Vermont All-Payer Accountable Care Organization ("ACO") Model Agreement ("Agreement") is dated October 27, 2016, and is between the Centers for Medicare & Medicaid Services ("CMS") and the Governor of Vermont, the Green Mountain Care Board ("GMCB"), and the Vermont Agency of Human Services ("AHS") (collectively, "State" or "Vermont"). Each Vermont entity, and CMS, is a party to the Agreement.

Percentage of Vermont Beneficiaries Aligned to an ACO.

Percent (%)	By end of PY1 (2018)	By end of PY2 (2019)	By end of PY3 (2020)	By end of PY4 (2021)	By end of PY5 (2022)
Vermont All-Payer Scale Target Beneficiaries	36%	50%	58%	62%	70%
Vermont Medicare Beneficiaries	60%	75%	79%	83%	90%

All-payer Total Cost of Care per Beneficiary Growth Target.

$$\left(\frac{\left(\frac{Vermont\ all-payer\ TCOC_{2022}}{Vermont\ all-payer\ beneficiaries_{2022}}\right)}{\left(\frac{Vermont\ all-payer\ TCOC_{2017}}{Vermont\ all-payer\ beneficiaries_{2017}}\right)}\right)^{\frac{1}{5}} - 1 \leq 0.035$$

Changing World View For Healthcare

Fee for Service

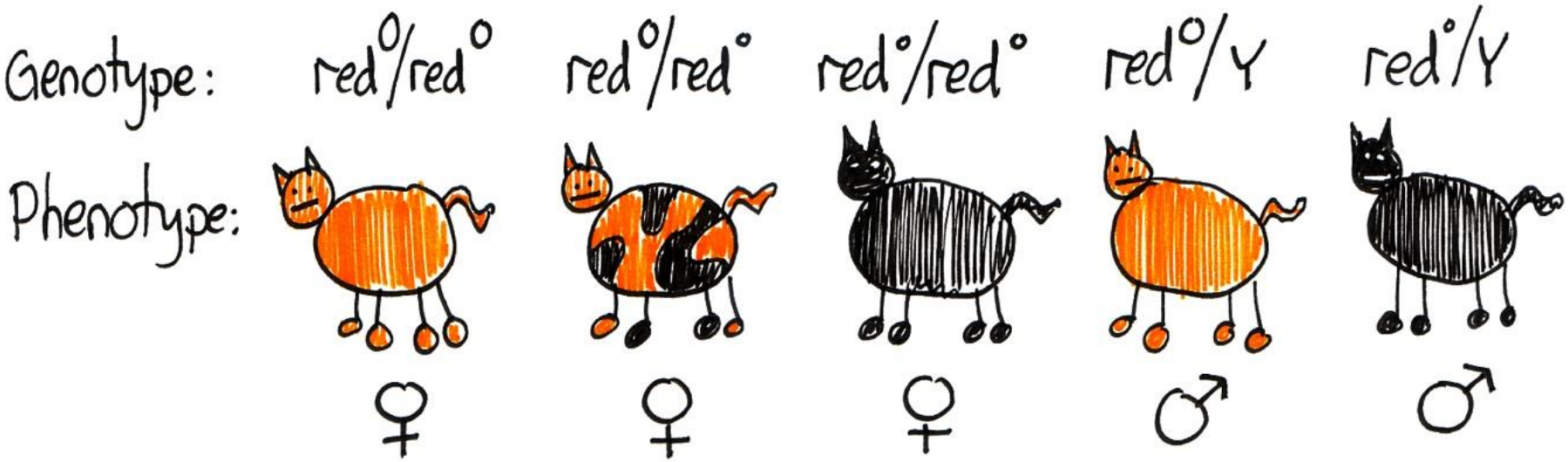
>Do = More $

Global Payment

< Do & Cost (IF keep people healthy) = More $

2017: 30% Medicaid is global payment in Vermont
2022: ≥70% of all payments will be global

Genotype Drives Phenotype



A Genome contains Fundamental Medical Information

Promise of Genomic Medicine

- Improve patient outcomes
- Improve population health, especially for families
- Improve cost-effectiveness of care

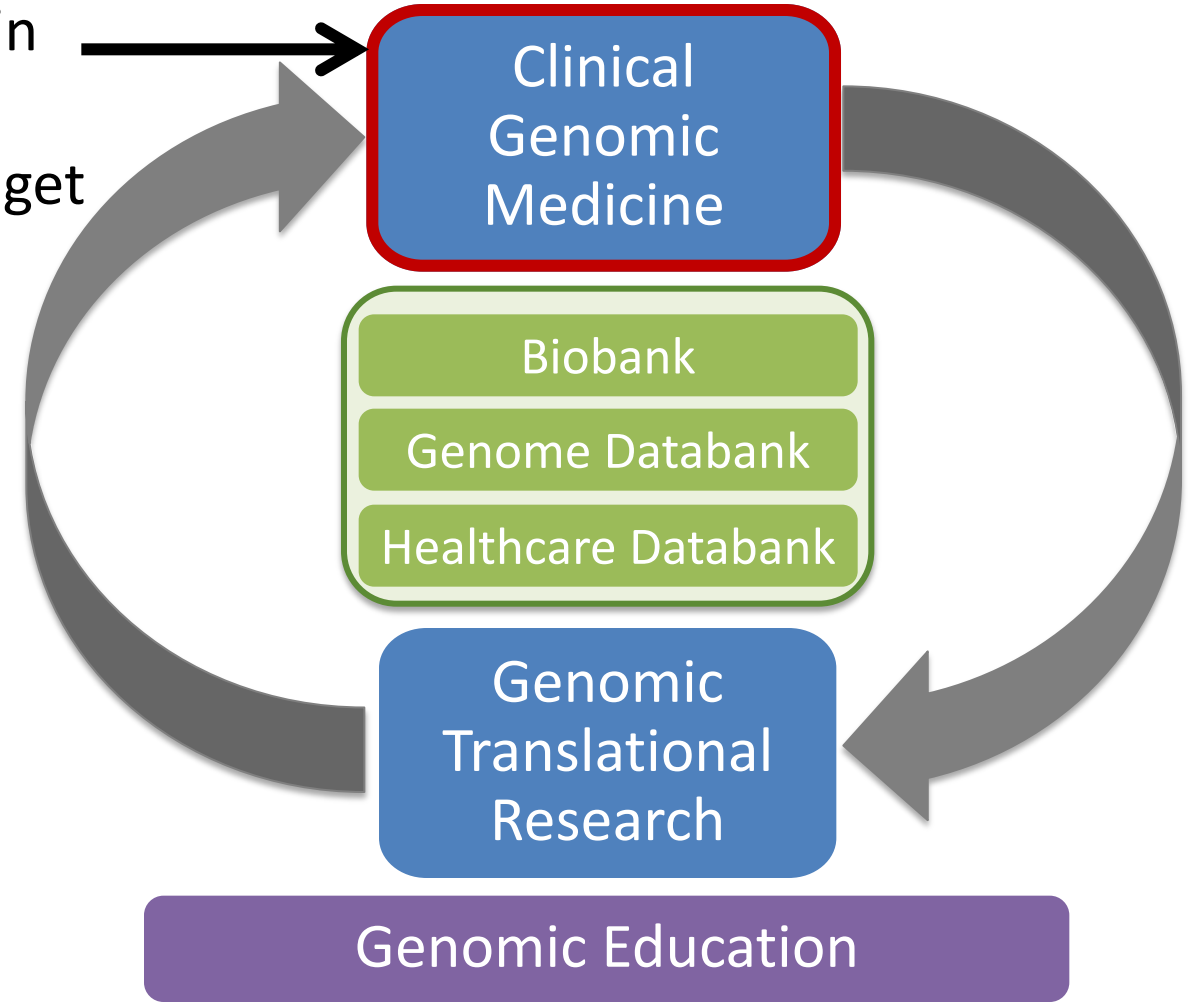
Genomic Medicine Promise aligns with Healthcare Reform Goals

UVMHN Vision: Genomes for All

Population of ~1 million in rural Vermont & northern New York

UVMHN Genomic Medicine Program

Funding operationalized in UVMHN Pathology & Laboratory Medicine budget



Our Genomic Medicine Team











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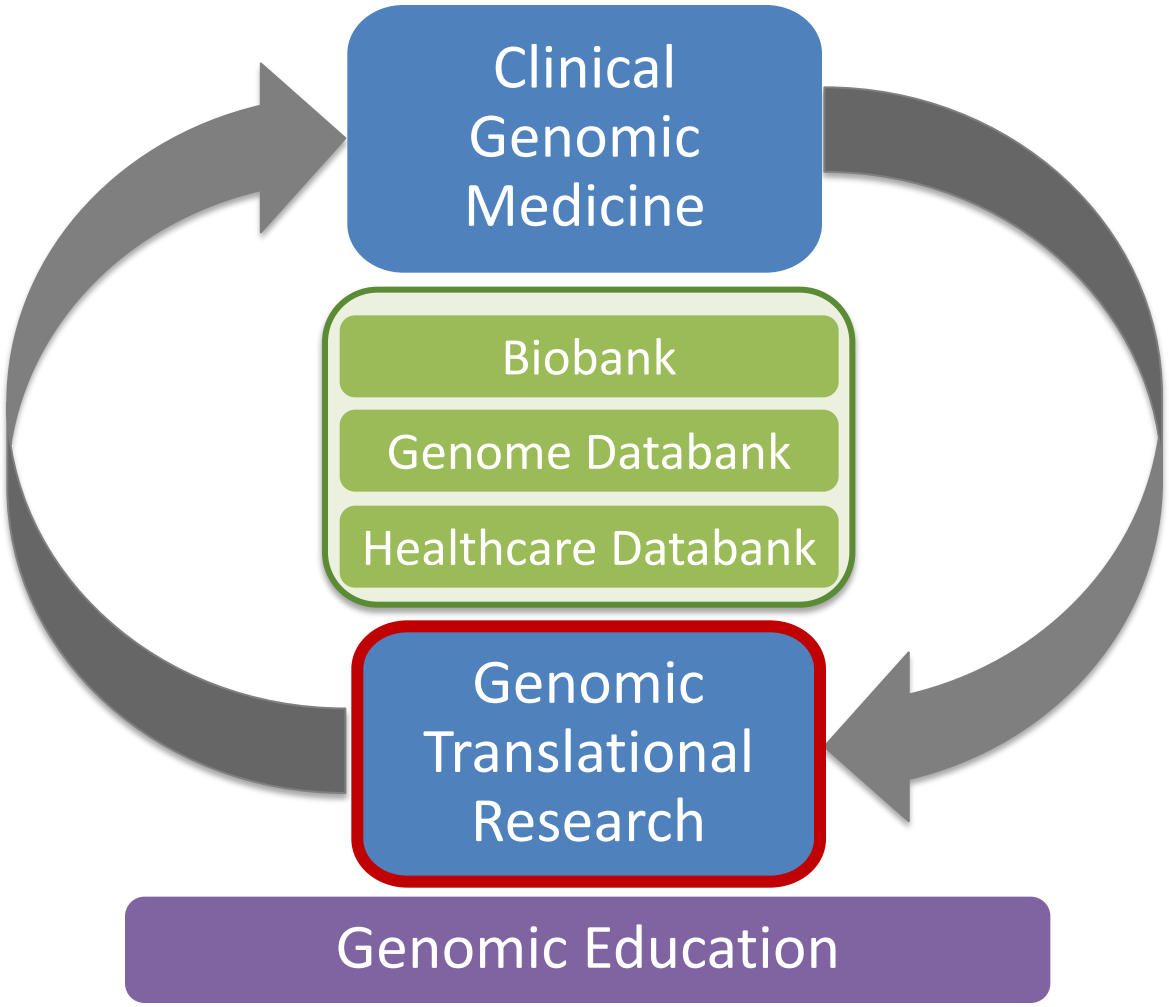
enabling personalized medicine

Clinical Genomic Medicine Test Roll Out

- Cancer Gene Panels (Somatic Variants)
  - GenePanel Solid Tumor: 29 genes for breast, colon, lung, etc.
  - GenePanel AML: rapid 7-day TAT from AML presentation
  - GenePanel Heme: ~100 genes for leukemia, lymphoma, MM
- Pharmacogenomics Gene Panel (50 to 80 genes)
- Inherited Disorders (exome or genome)
  - Cardiovascular
  - Neurologic/neuromuscular
  - Unidentified inherited disorder in children
  - Add patient cohorts by disease
  - Everyone, if demonstrate value

UVMHN Genomic Medicine Program



Genomic Value Research: Partnerships

$$ ← THE University of Vermont HEALTH NETWORK

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PRECISION HEALTH ECONOMICS
PART OF PRECISION FOR VALUE

GENOSPACE

Genomic Value Data for GPST Test

- Health Outcomes with dates
  - Diagnosis
  - Genomic & other test results
  - Treatment(s) & response
  - Progression characteristics
  - Death
- Costs from Claims Data & Billing Data
  - Inpatient LOS, location & procedures
  - Outpatient appointments & procedures
  - Out of pocket costs
- Disease Status
- Patient Demographics

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PRISM

AXIUM

OneCareVermont

Genomic Value Research for GPST Test

Select baseline solid cancer patient cohort from 2013-2015 as control group before GPST testing

Identify current solid cancer patients with GPST testing as ongoing enrollees

Oncology care proceeds after GPST testing

Inclusion: All patients with solid cancer receiving treatment at UVMMC
Exclusion: >89 years old

Group 1: Received targeted therapy

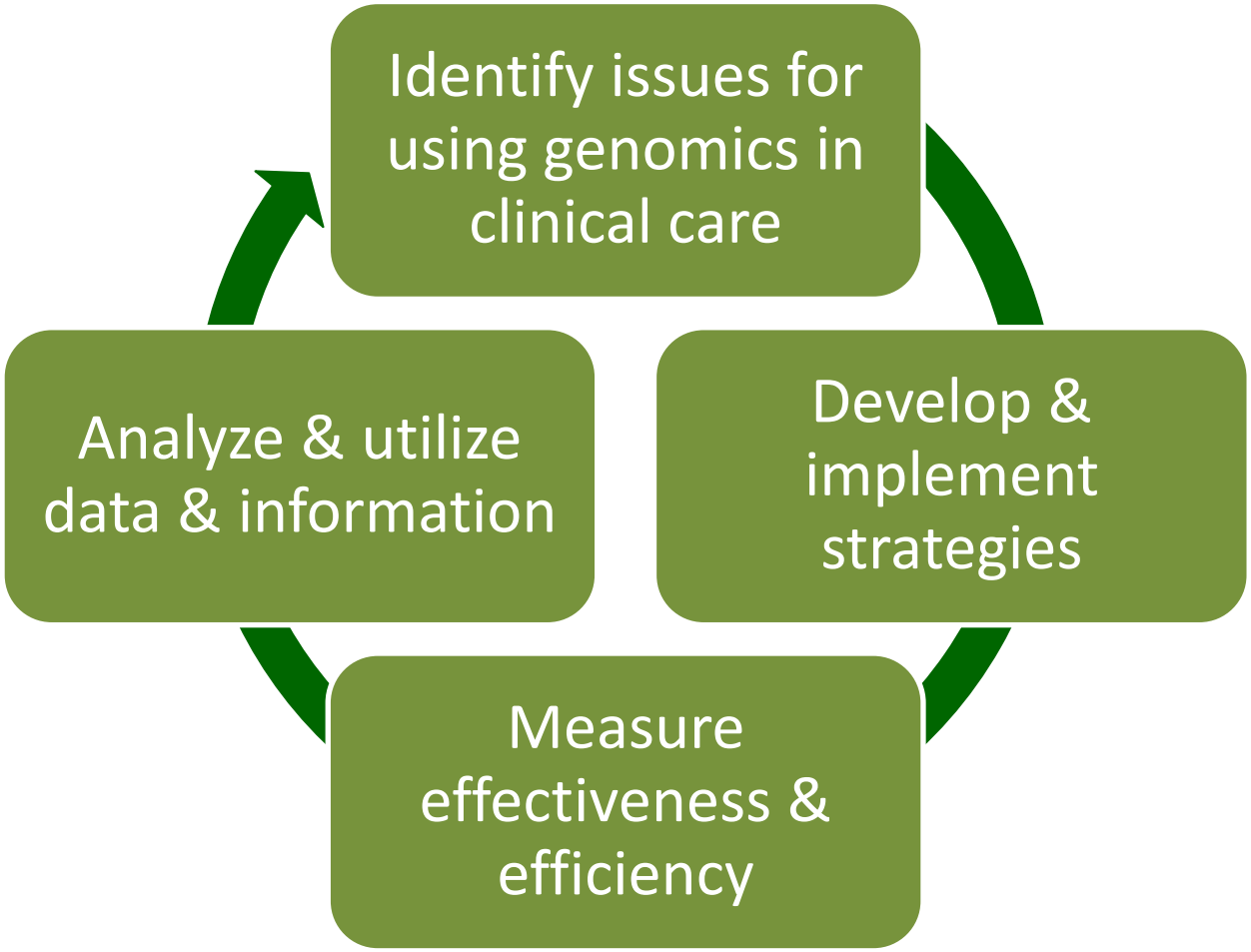
Group 2: No targeted therapy indicated

Group 3: Targeted therapy indicated, but not given

Data over 36 months pulled for patients of each intervention group

Analysis of historical control vs. intervention groups & between intervention groups: Health Outcomes (Tumor Response, PFS, OS) & Total Costs of Care

Genomic Medicine Implementation Research



Functional Genomics Research

Clinical Variants of Uncertain Significance from Genomic Medicine

↓

Build Variants into Model Systems to Determine Functional Effects

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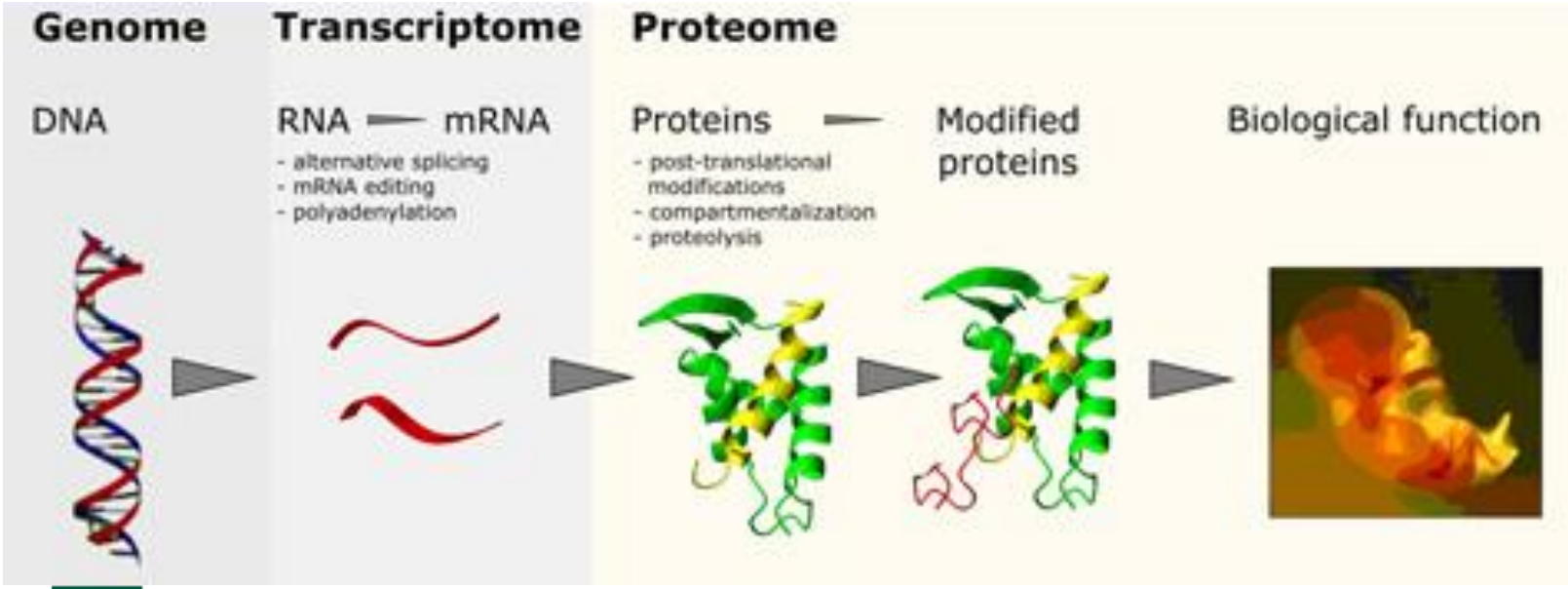
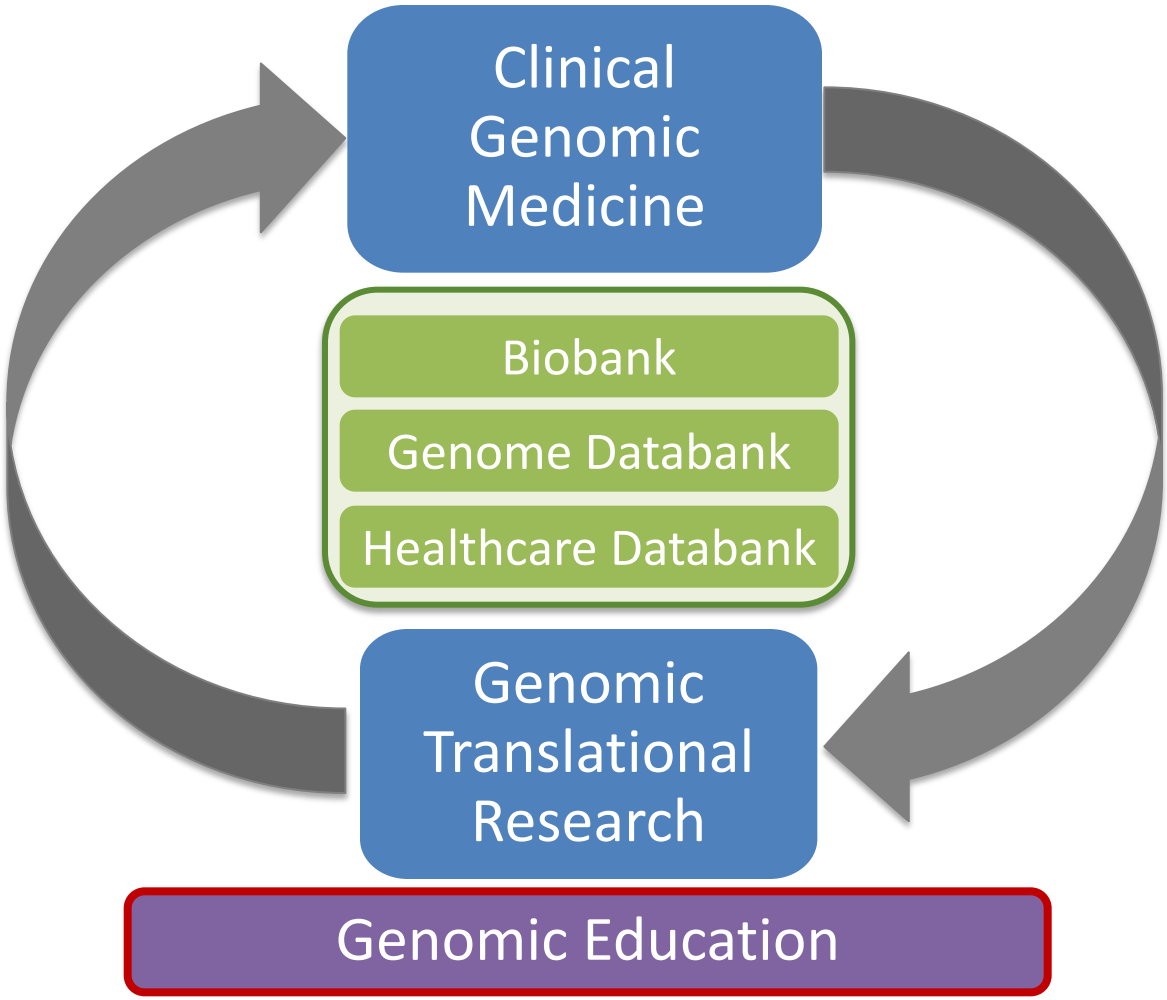
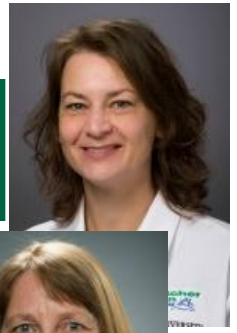
Feedback into Clinical Care



UVMHN Genomic Medicine Program



Genomic Education



- Undergraduate education → UVM Honors College: Controversies in Modern Genomics
- Medical student education → Integrate Genetics & Genomic Medicine UVM COM Curriculum
- Resident & Fellow Education → Molecular Pathology Rotation
- Healthcare provider education → illumina® Understand Your Genome

+ MDCs

- Patient, family & public engagement & education

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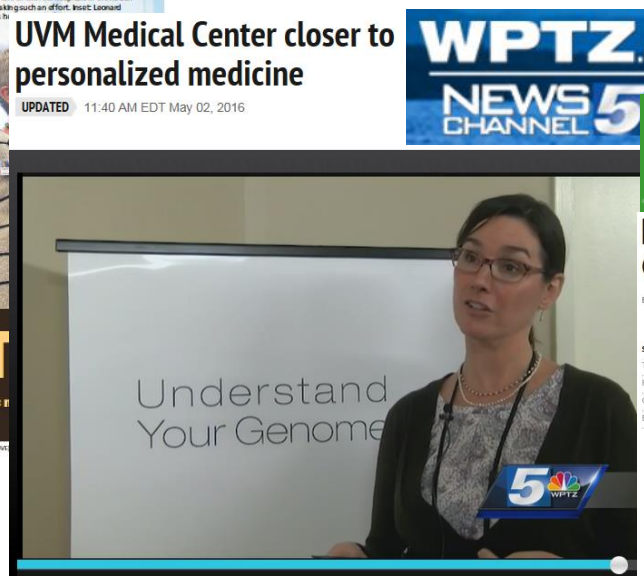
Press, Community Talks, Focus Groups



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Key Question 1

What evidence will your program generate and how will it be useful in the future in terms of evaluating the value and utility of these activities?

- ***Gene panels & exomes/genomes***
- ***Collect other data: pathology, radiology, treatment(s), response(s), costs, billings, claims, demographics***
- ***Treatment based on genomics or not***

Key Question 2

Are you currently sharing information from your genomic-based program or data across systems or organizations? How and with who?

- ***No, not at present time.***
- ***Could submit to ClinVar & ClinGen.***
- ***No cancer database available yet.***
- ***No place for total care & cost data.***
- ***Will All of Us build a genomic/medical database that could be adapted?***

Key Question 3A

What outcomes are important for genomic-based programs to measure?

- ***Depends on purpose of genome test***
- ***Cancer: tumor response, PFS, OS***
- ***PGx: adverse reactions, drug choice, dosing adjustments***
- ***Genome: Dx, secondary findings, Tx options***
- ***For all: Total costs of care & harms***

Key Question 3B

What potential impacts are there on care when deciding to invest in genomic-based programs?

- ***Clinical genetics now provided by individual departments (Peds, OB/GYN, Onc, P&LM) without sharing resources***
- ***Strategic & business planning underway for coordinated clinical genetics services for our 6 hospital Health Network to integrate with Genomic Medicine Program***

Key Question 4

If you run into challenges such as a lack of evidence utility or any harms (e.g. privacy, discrimination) to participants from implementing a genetic test in your program, how do you plan to track these outcomes and address them?

- ***Challenge: Not treating based on genomics***
- ***Lack of value -> End of Genomic Medicine***
- ***Have not thought about how to track harms (Thank You!)***

Key Question 5

How will you address equitable access to genomic testing?

- ***Genomes for All model with genome testing for identified disease cohorts***
- ***Test access not based on ability to pay in global payment model***
- ***Do not anticipate access issues***
- ***More based on personal choice***
- ***In population health management model, is patient choice optimal if genomics does improve health outcomes & reduce costs?***