# *Genetic Testing: Building the Evidence Base for Population Health Benefits*

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# My Personal Odyssey into Genomics

- Retired from CDC in 1997 after a career in parasitic disease, kidney disease, diabetes, surveillance, and prevention effectiveness
- Worked on evidence-based projects – USPSTF, Community Guide, IDSA guidelines
- Muin roped me into writing a chapter for his book
- Work on Guidelines for Genomics (EGAPP)
- Sec's Advisory Committee on Genetics Health and Society
- AHIC Personalized Health Care Work Group
- IOM Roundtable on Genomics

# So Why's an Epidemiologist Working for Big Pharma Talking to You About This?

- We need to deliver cost-efficient, evidence-based care into practice
- How do we do evidence-based reviews of genomic applications?
- How do we translate that information into public health and clinical practice?
- How do we know if any of this matters?

# So What's Going On?

- Human Genome Project
- Incredible hype
- Great potential
- Major concerns
- Enormous challenges

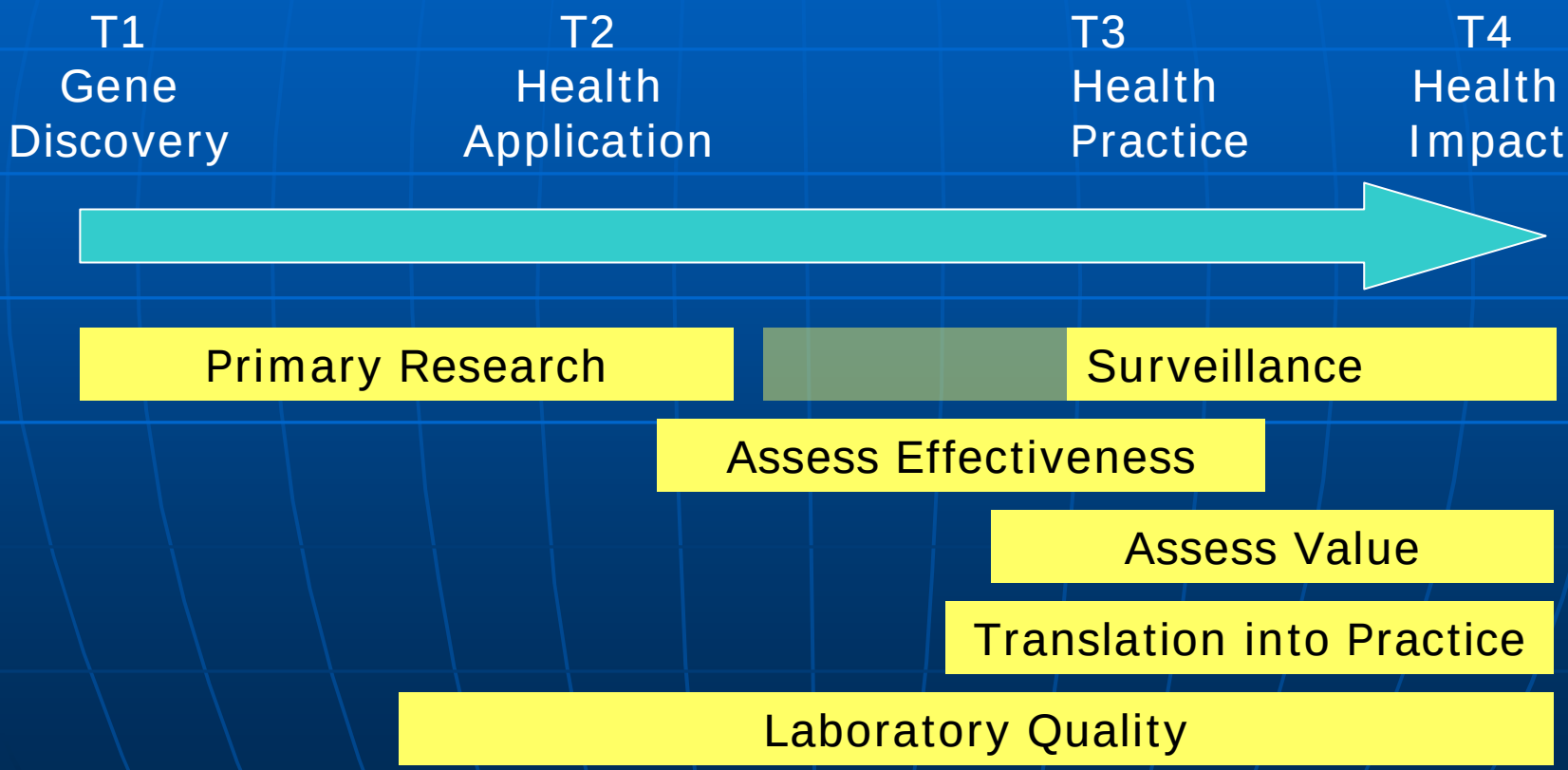
# The Challenge

- About common conditions:  Not just rare, single gene mutations
- Complex gene/ environmental interactions
- Pharmacogenomics
- Explosion of information and easy availability
- How do we extract meaningful, actionable information
- Will this yield effective, efficient health care?
- Will it improve population health?

# The Translational Process


Adapted from Khoury

# The Translational Process and Public Health Roles




Adapted from Khoury

# Primary Research and Systems

- Information systems and biobanks
- Natural history studies
- Genome-wide association studies (GWAS)
- Intervention development

# Public Health Surveillance

- Risk Factors
- Understanding and knowledge
- Testing (appropriateness)
- Interventions (use)
- Health care system (process, structure, function, incentives)
- Impact (health, utilization, cost)

# From Evidence Base to Practice:
## Evolving the Laboratory and use of its Services

### Translating Science to Practice

GeT-RM
Genetic Testing Reference Materials
PROGRAM

Access to Quality
Testing for Rare Diseases: A National Conference
September 26-27, 2005 • Rockville, Maryland
Doubletree Executive Meeting Center and Hotel

Rare Genetic Diseases
CETT

NLN

### Promoting Professional Competency and Best Practices

COMMUNICATION:
Key to Appropriate Genetic Test Referral, Result Reporting and Interpretation

Genetics in Clinical Practice:
A Team Approach

GeT-EQuIP

### Promoting a Framework for Quality in Genetic Testing

CLIA

CLINICAL AND LABORATORY STANDARDS INSTITUTE®
(Formerly NCCLS)

ISO International Organization for Standardization

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
OECD

# Translating Science to Practice: Creating Access to Quality Laboratory Testing

GeT-RM
Genetic Testing Reference Materials
PROGRAM

Facilitate partnerships to identify reference materials needs


Rare Genetic Diseases
CETT

NLN

Promote access to rare disease testing

# Promoting Professional Competency and Best Practices

**COMMUNICATION:**
**Key to Appropriate Genetic Test Referral, Result Reporting and Interpretation**

Helping laboratories to report results in terms useful for clinical decision making

**Genetics in Clinical Practice: A Team Approach**

CD ROM for training clinicians

**GeT-EQuIP**

Genetic Testing Electronic Information Portal

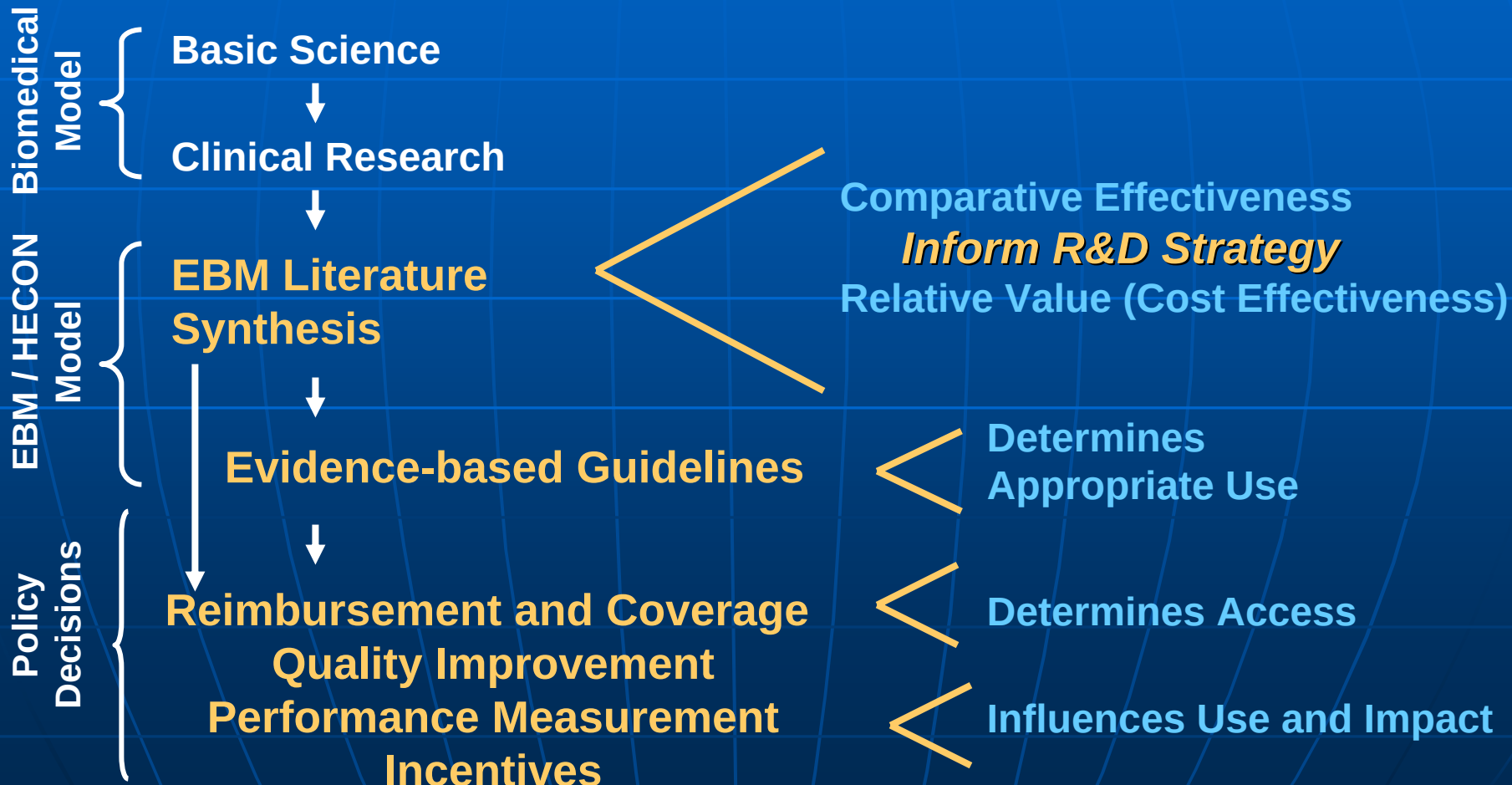
# Laboratory Standards and Quality



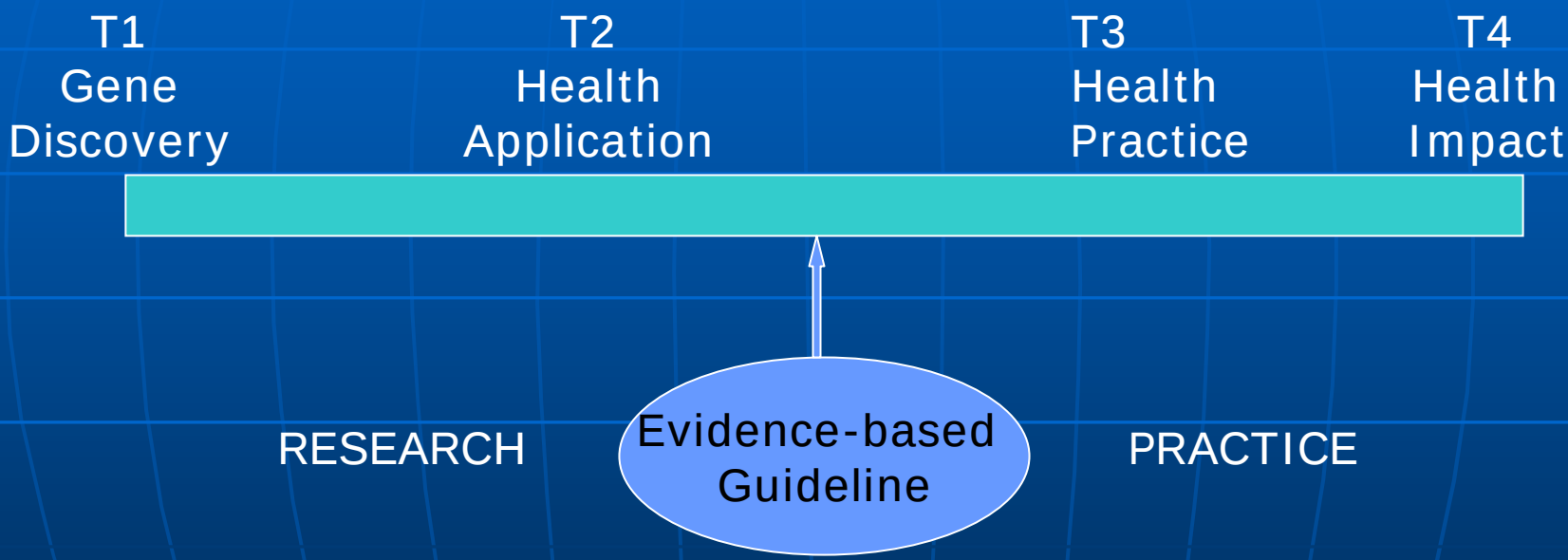


- Developing standards
- Analytic validity
- Proficiency testing
- CLIA

# The Emerging Evidence-Based Decision Making Paradigm in Health Care

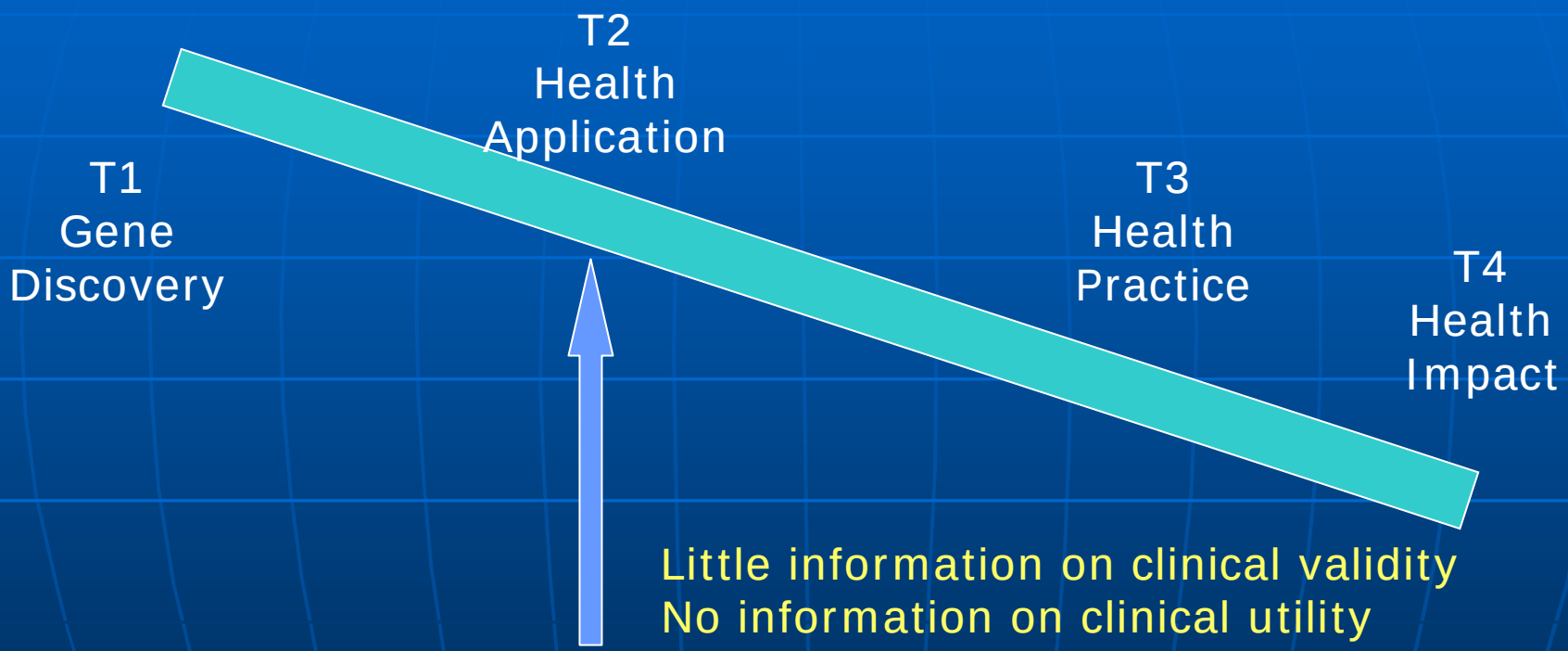


# The Translational Process



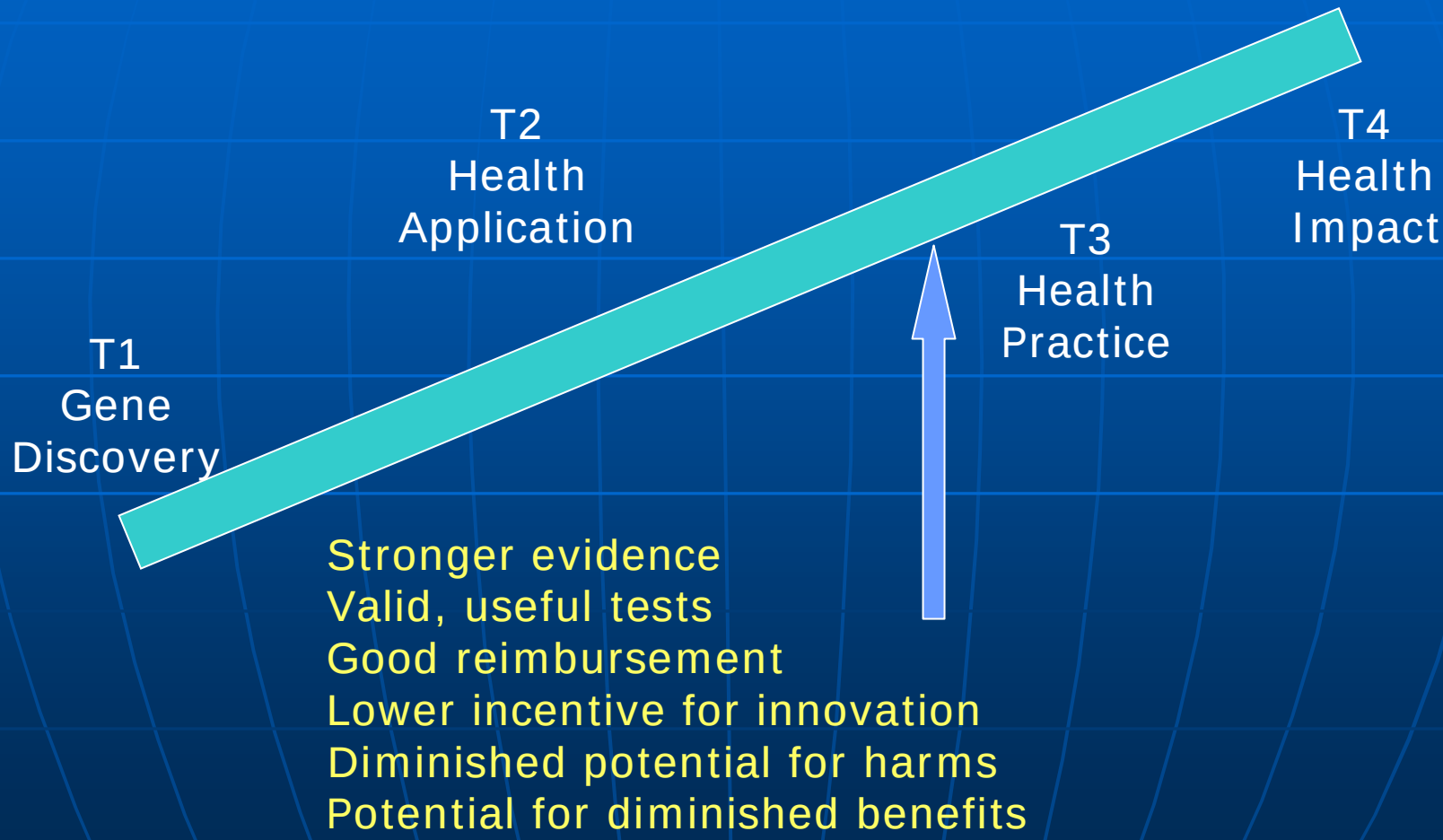
# How High Should the Evidence Bar Be?

# Lowering the Threshold for Translation into Practice




Little information on clinical validity
No information on clinical utility
Potentially no coverage
Potential for increased harms
Potential for increased benefits
Use based on expert opinion
Stimulate innovation

# Raising the Evidentiary Threshold for Translation into Practice



# Evaluation of Genomic Applications in Practice and Prevention (EGAPP)

- Developing and testing an evidence-based process for evaluating genetic tests and other genomic applications
- Work Group: A 13-member independent, non-federal panel

# Working Group Roles

- Establish methods and process
- Select topics for review
- Participate in technical expert panels for commissioned evidence reviews
- Develop conclusions or recommendations based on the evidence
- Provide guidance and feedback on other project activities.

# Evidence-based Approach

- Adapting methods of the US Preventive Services Task Force
  - Assessing balance of benefits and harms
- Systematic reviews of the Evidence
- Make evidence-based recommendations

# Topics Under Review

| Disorder/Effect | Test to be Assessed* | Clinical Scenario | |
|---|---|---|---|
| | | Target Population | Intended Use |
| Breast Cancer | Gene expression profile | Women diagnosed with breast cancer | Treatment and recurrence risk |
| Cardiovascular Disease | Multigene panel | General population | Risk prediction or nutritional/lifestyle management |
| Colorectal Cancer (CRC) | *UGT1A1* | Individuals diagnosed with CRC | Treatment with irinotecan |
| Depression | *CYP450* | Individuals diagnosed with depression | Treatment with SSRI drugs |
| Hereditary Nonpolyposis Colon Cancer (HNPCC) | Mismatch repair gene mutations | Individuals diagnosed with CRC and their family members | Management of individuals and early detection/prevention for family members |
| Ovarian Cancer | Genomic Tests | 1) General pop. of women;<br>2) women at increased risk for ovarian ca | 1) and 2) Detection and management |

# EGAPP
# Assessing Effectiveness

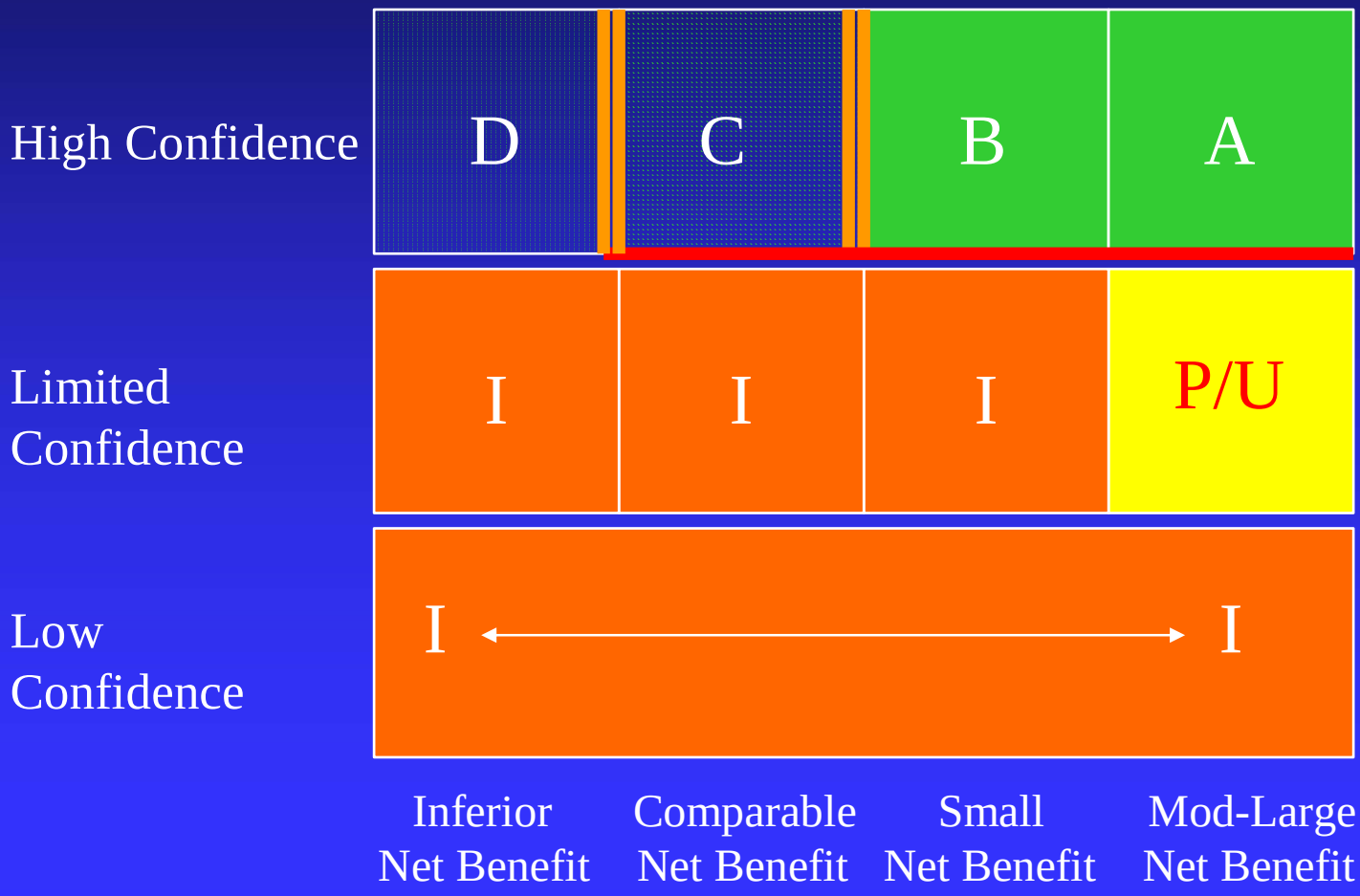
- Methods to assess diagnostic tests
  - What are outcomes
  - Bridging two cultures– genetic and evidence- based communities
  - Differing framework
    - analytic validity
    - clinical validity
    - clinical utility
    - (clinical value)

# Methodologic Challenges

- Titrating evidence to the problem
- How certain do we need to be for
  - Risk assessment (prediction)
  - Diagnosis
  - Treatment

# AHIP EBM Roadmap Group Matrix

## Comparative Clinical Effectiveness
## Comparing tech ___ vs. ____



# SACGHS

- Oversight of genetic tests
- Pharmacogenomics
- Economics
- Workforce
- Reimbursement
- GINA

# Public Health Opportunities

- Empower patients and communities
- More effective risk management
  - Threat: Perception of lower risk
- More effective / efficient care
  - Threat:  More costly care, more disparities
- New tools for unmet needs
  - Mental health, neurological disease, cancer
- Monitor impact (surveillance!)

# Translation into Practice

- Delivering the right test to the right person at the right time
  - EHRs
  - Decision support systems
  - Performance metrics
  - Assure access

# Economics

- The cost of genetic testing will be low
- The overall economics remains to be evaluated:
  - Will drug development become cheaper?
  - Will smaller target pops make drugs more costly?
  - Will there be more/ more costly management strategies
  - Consequences for managing populations

# Economics of Genomics in the Health Care System

- Need to assess the value of tests and their consequences
- Use to set priorities and policies
- Technology contributes to rising cost

# Genetics

- Drive towards tailoring and individualization
- Challenge to integrate with models of population health
- Important role for public health to assure that this leads to better health for the population

Kudos to CDC

Congratulations!

The next decade should be an exciting one!