# CONTROLLING HEALTHCARE COSTS: THE ROLE OF PREDICTIVE MODELING

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2009 Predictive Modeling Summit Presentation

# Key Takeaways

- Predictive and prognostic modeling have been used in a variety of healthcare settings and by a variety of stakeholders, but overall clinical impact has been limited
- General predictive models (typically cost-focused) being used by payers and other risk-bearing entities continue to improve, but impact on overall costs (and quality) is low
- Validated point of care models with adequate statistical performance and clear clinical actions associated with them could have a major impact on both cost and quality

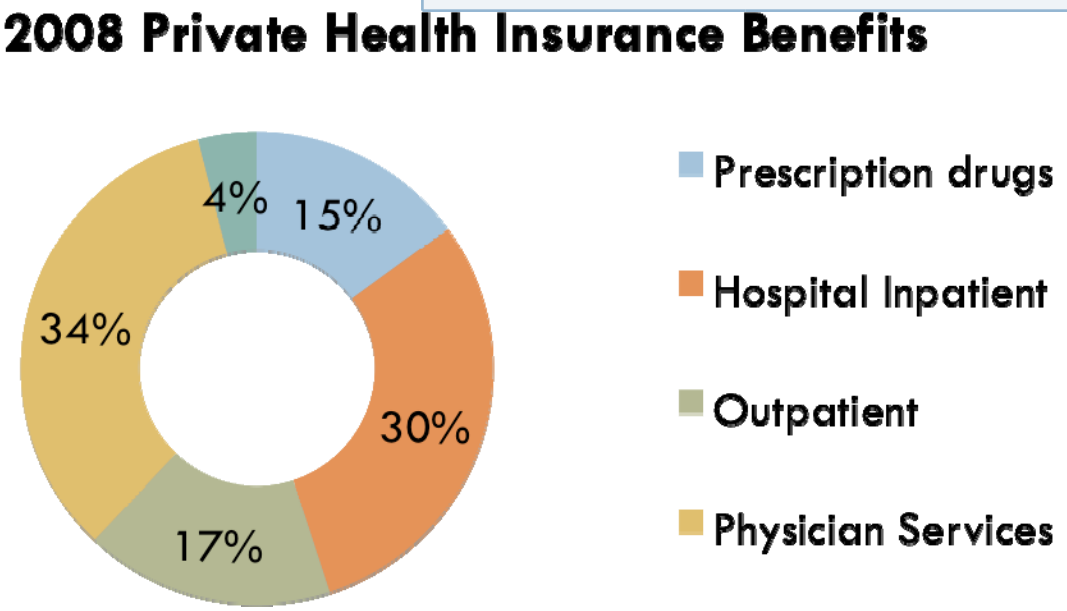
# Outline

1. Healthcare costs and control initiatives
2. Predictive Models: broad use scenarios
3. Personalized, predictive medicine: more than genomic medicine or macro analysis alone
1. Injecting predictive models at the point of care: the path to success

# The Ascent Slows, but Continues

Costs continue to rise, but the recession, cost-control initiatives, and proposed reform are combining to slow the rate of growth

| | 2008 | 2009 | 2010 |
|---|---|---|---|
| Medical Cost Trend | 9.9% | 9.2% | 9.0% |




Sources: 1. PriceWaterhouseCoopers Health Research Institute. Behind the Numbers: Medical cost trends for 2010. 2. Milliman. 2009 Milliman Medical Index.

# Cost Control Initiatives: Inpatient

## Risk-bearing entities take action … [1]

- Focus on preventing readmissions – led by public reporting & decrease in reimbursement/bundled payments
- Expansion of "never events"
  - New events determined by CMS
  - Adoption by commercial payers
- Increase in audit activity
  - Medicare Recovery Audit Contractors (RACs)
  - Inpatient utilization review by

## … eliciting some provider reactions

- Increase in provider risk contracting and accountable care organizations (ACOs)
- Increased focus on prevention of the twenty-eight never events (cost impact appears limited)[2]
- Increase in uptake of services aimed at helping hospitals proactively prepare for audits and improve documentation

Sources: 1. Milliman. 2009 Milliman Medical Index. 2. McNair et al. Medicare's Policy Not To Pay For Treating Hospital-Acquired Conditions: The Impact. *Health Affairs.* Sept-Oct 2009.

# Cost Control Initiatives: Outpatient

- Growth in Wellness programs
- Adaptation and expansion of Medical Home model primary care
- At-risk Disease Management programs
- Continued shifting of cost and responsibility to patients – through shared decision-making models, and increased out-of-pocket expenses
- More closely managed pharmacy benefits

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# Population and Individual Level Applications

| Example Endpoints | Users and applications |
| --- | --- |
| ▫ Cost (group and individual)<br>  ▫ Short-term (<12 mo)<br>  ▫ Long term cost (>12 mo) | ▫ Payers, employers, care management organizations |
| ▫ Length of Stay (LOS) | ▫ Payers, clinicians, hospitals |
| ▫ Mortality<br>  ▫ In hospital<br>  ▫ Short-term (30 day)<br>  ▫ Longer term (12 months) | ▫ Payers, clinicians, hospitals |

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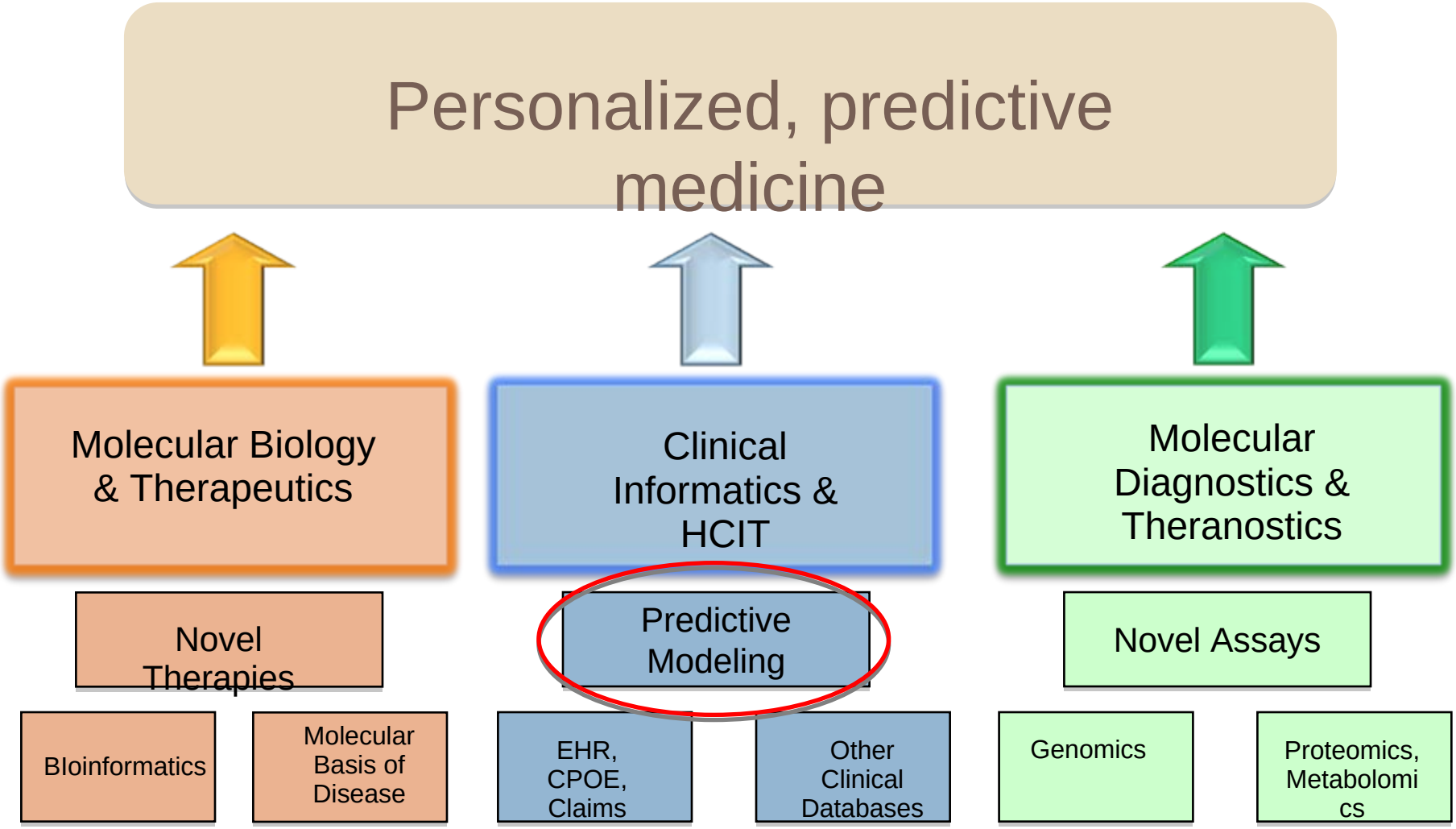
# The Foundation of Personalized, Predictive Medicine



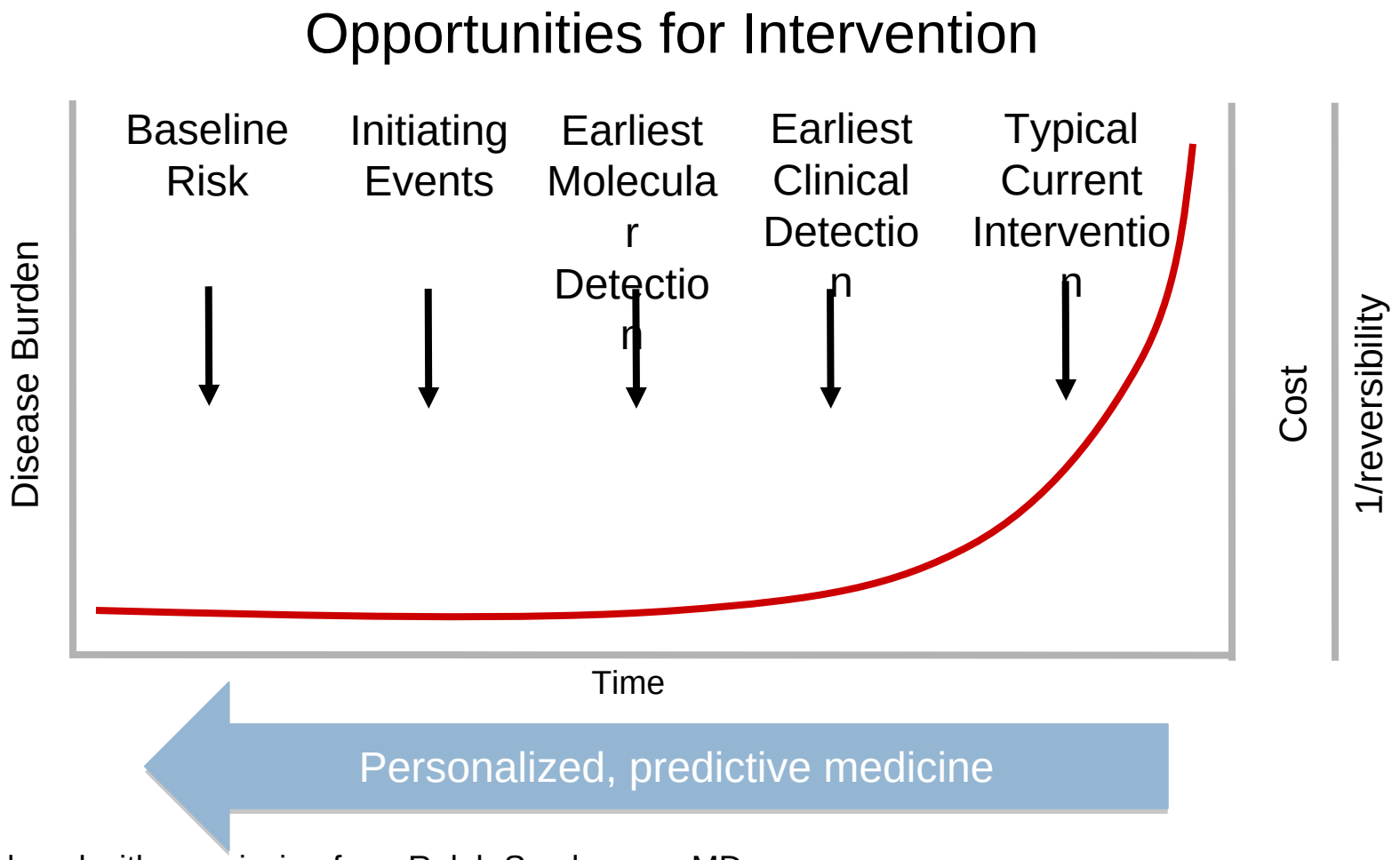
# Proliferation of Testing

- Genetic Testing
  - 1,200 + genetic tests now commercially available; volume growing by >10% annually
  - Expenditure of genetic testing is growing 40-50% annually; current overall spend ≈ $2 B
  - Potentially clinically useful for a small portion of the population today (<2%), and significant barriers remain to broad appropriate use[1]

- Other Biomarker-based Testing
  - Already heavily utilized in several specialties and rapidly growing
  - Annual growth in number of tests available >15%
  - Impact on clinical decision making continues to evolve (e.g., BNP for heart failure, ischemia[2])

Sources: 1. Feero et al. The genome gets personal – almost. *JAMA 2008, 299:1351-1352.*
2. BNP = B-type Natriuretic Peptide

# The Inflection and Opportunities for Intervention

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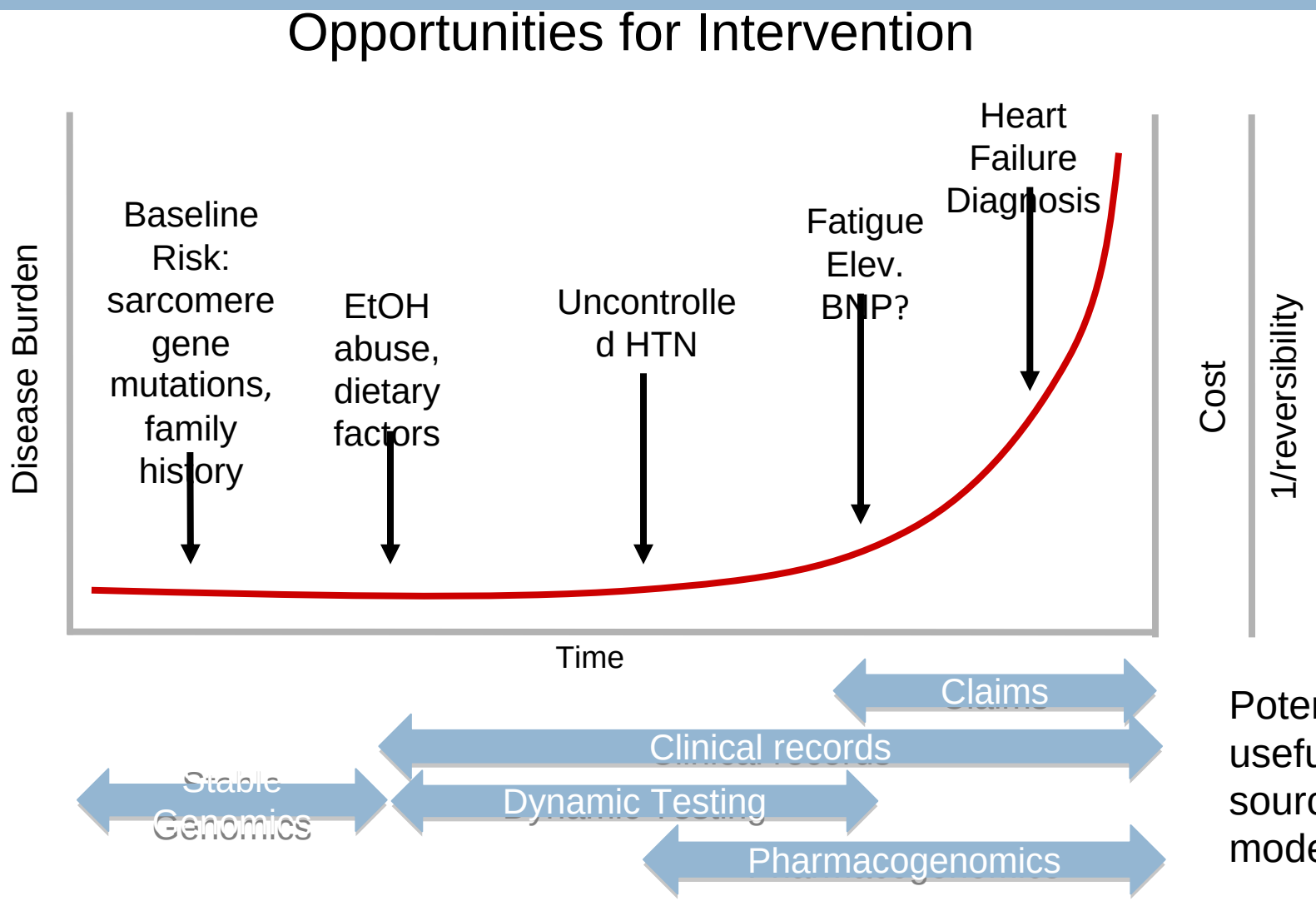
# The Inflection: Heart Failure example




Potentially useful data sources for modeling

# Personalizing Care with Today's Data

- Most currently utilized clinical predictive models use readily produced clinical data and not genomic, proteomic, or metabolomic data
  - PORT/PSI score
  - CHADS2, TIMI, Wells criteria
- Additional opportunities for model development exist through use of currently available/generated clinical data
- Critical to focus on adoption of methods and tools for personalization of care that are easy to access and *can be used at the point of care*

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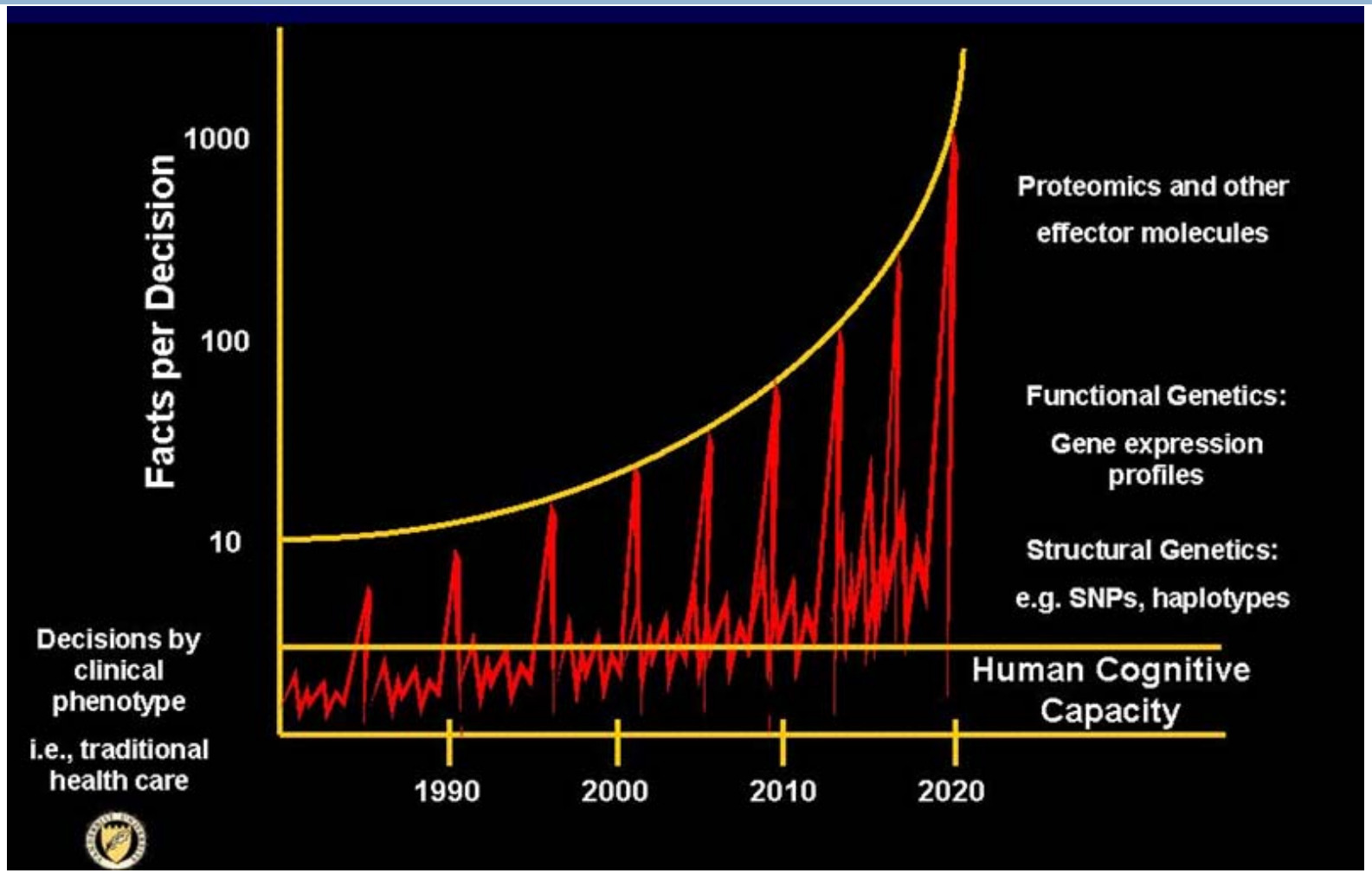
# The Volume of Clinical Data in Routine Medical Practice




Source: McKesson Corporation and Bill Stead, Vanderbilt University

# Impact of Predictive Modeling

- Relatively few *impact or adoption analyses* of predictive models have been published[1]
- However, a number of extant models have been prospectively and externally validated and could both lower costs and improve quality were they to gain broader adoption:
  - CHADS2 score for stroke prediction in atrial fibrillation
  - TIMI score for acute coronary syndromes
  - PSI/PORT score for community-acquired pneumonia
  - Wells score for pulmonary embolism

Sources: 1. Reilly and Evans, "Translating Clinical Research into Clinical Practice: Impact of Using Prediction Rules To Make Decisions," *Annals of Internal Medicine* 2006

# Impact of Predictive Modeling: Case Study

## Impact of a Clinical Decision Rule on Hospital Triage of Patients With Suspected Acute Cardiac Ischemia in the Emergency Department

Brendan M. Reilly, MD
Arthur T. Evans, MD, MPH
Jeffrey J. Schaider, MD
Krishna Das, MD
James E. Calvin, MD
Lea Anne Moran, MSc
Rebecca R. Roberts, MD
Enrique Martinez, MD

**Context** Emergency department (ED) physicians often are uncertain about where in the hospital to triage patients with suspected acute cardiac ischemia. Many patients are triaged unnecessarily to intensive or intermediate cardiac care units.

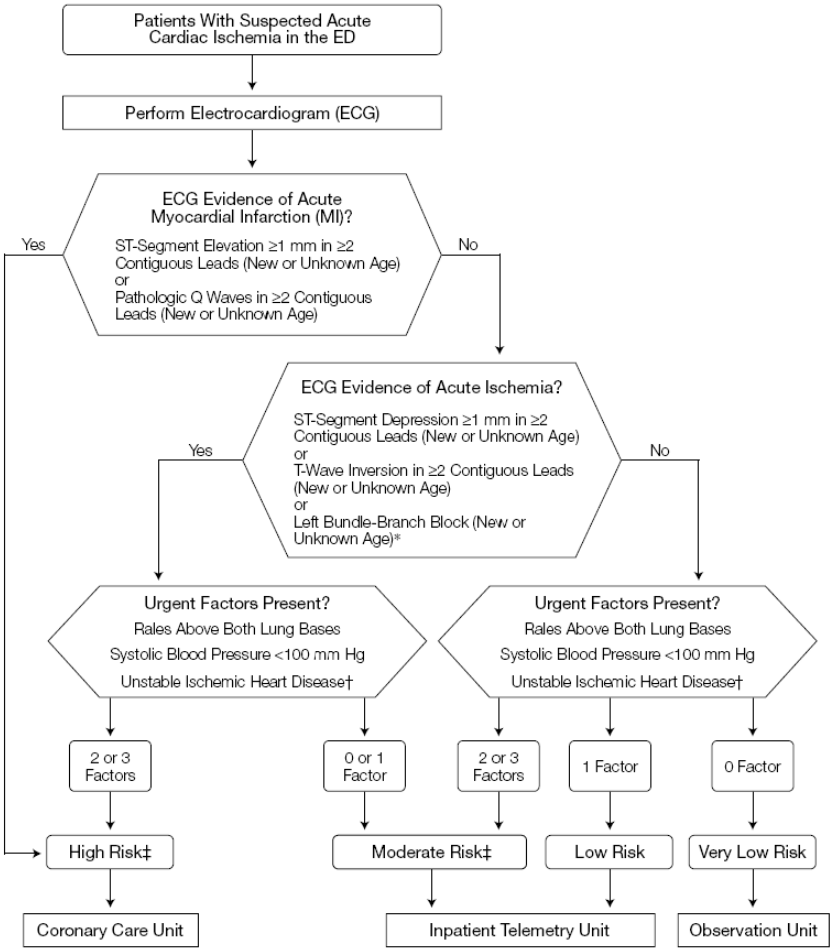
**Objective** To determine whether use of a clinical decision rule improves physicians' hospital triage decisions for patients with suspected acute cardiac ischemia.

**Design and Setting** Prospective before-after impact analysis conducted at a large, urban, US public hospital.

**Participants** Consecutive patients admitted from the ED with suspected acute cardiac ischemia during 2 periods: preintervention group (n=207 patients enrolled in March 1997) and intervention group (n=1008 patients enrolled in August-November 1999).

Source: Reilly et al., *Journal of the American Medical Association* 2002

# Impact of Predictive Modeling: Case Study




- Major results from application of this clinical decision rule:
  - Efficiency (defined as the proportion of patients appropriately triaged to low-intensity interventions, such as an ED observation unit) increased while safety (proportion of patients with major cardiac complications who were admitted to inpatient cardiac care) was not significantly different.
  - Improved efficiency (36% vs.

Source: Reilly et al., *Journal of the American Medical Association* 2002

# Implementation of Predictive Modeling at the Point of Care: Challenges

- Skepticism about “algorithmic” or “cookbook” medicine and loss physician autonomy
- Significant influence of defensive medicine and related fear of medicolegal risk
- Belief that physician evaluation and heuristic process is superior to any predictive model
- Logistic difficulties of using predictive models at a point in physician workflow and in a timeframe that is clinically relevant
- FDA Regulation of point of care predictive models as medical devices

# Point of Care Predictive Modeling: Potential Economic Impact

| Clinical Target | Existing Model(s) | Number of Patients Affected Annually | Estimated Annual Affected Market (direct costs only) |
|---|---|---|---|
| Myocardial Infarction | TIMI, GRACE, Goldman | ~13 million | ~$75 billion |
| Venous thromboembolism | Wells score | ~16 million | ~$32 billion |
| Heart failure | OPTIMIZE-HF, ADHERE, Seattle HF Model | ~6 million | ~$32 billion |
| Atrial fibrillation | CHADS2 | ~3 million | ~$10 billion |
| Chronic obstructive pulmonary disease | BODE index | ~4 million | ~$8 billion |
| Community-acquired pneumonia | PSI/PORT score | ~1 million | ~$4.5 billion |

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# Q&A

Thank you for your attention!

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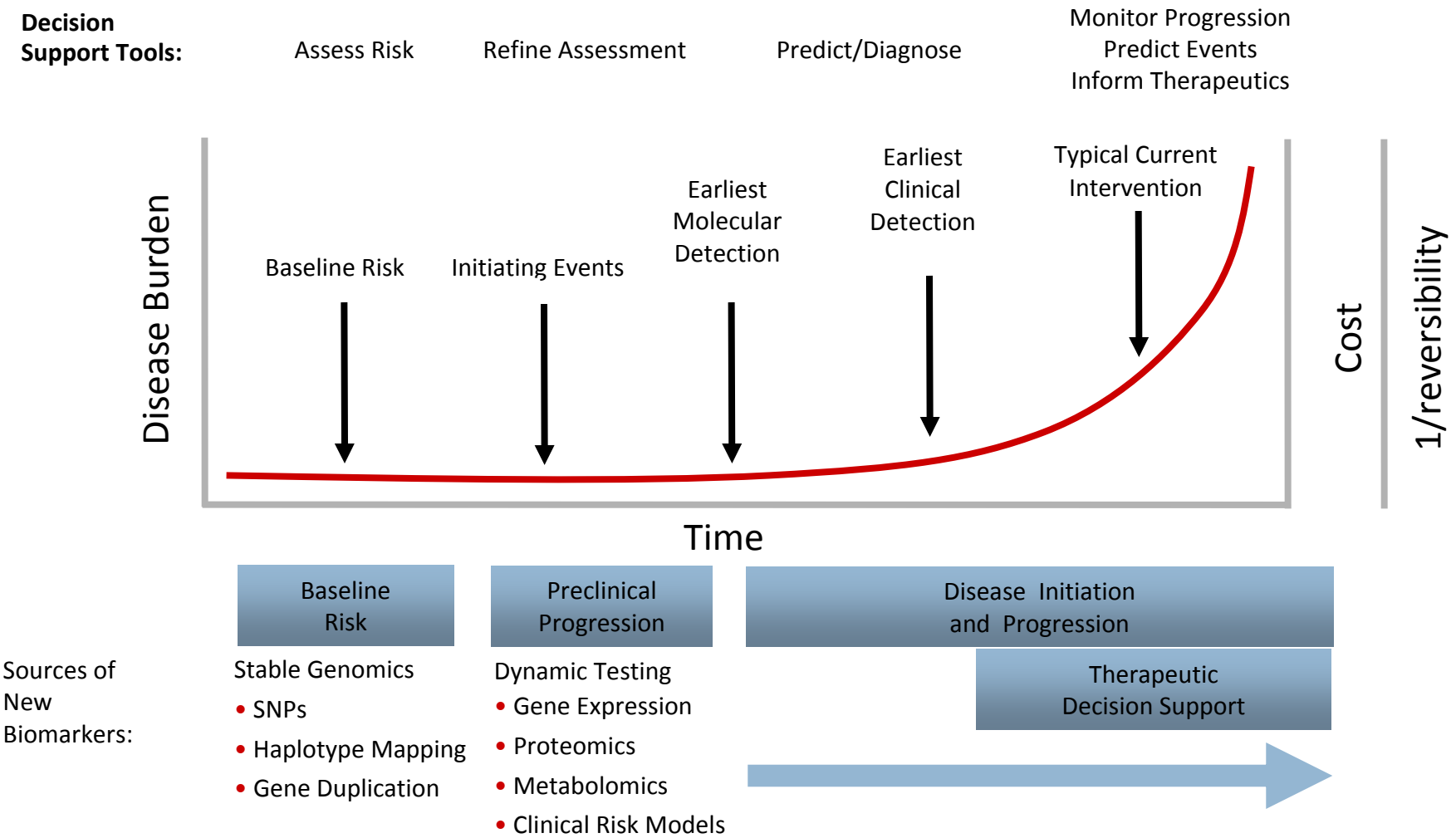
# Appendix

# The Inflection in a Personalized, Predictive System

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