Decision Support Project Team

Engineering the System of Healthcare Delivery

ESD.69, HST.926j, HC.750 MIT Seminar on Health Care Systems Innovation
Fall 2010

Engineering IT for actionable information and better health

Author: Jenny Son

Engineering information technology for actionable information and better health

- American Recovery and Reinvestment Act (ARRA) of 2009
  - Achieve widespread implementation of electronic health records across the land and assure that they achieve sufficient levels of meaningful use to improve care, reduce costs and result in better outcomes
- Most likely government will take a top-down approach to setting standards
- Need for a more skilled workforce capable of using informatics – clinicians, managers and informaticians
- Sufficiently robust infrastructure (computer-based standards, databases, and organizational structures) to accommodate changes over time
- Two sets of content: 1) Information such as facts and treatment guidelines, 2) Communications needed to meet practice standards.
  - Simple exchange of information does not ensure that information was accurately communicated. *How* it is communicated is important

- Role of IT and information systems is to take records and integrate them in a way that a learning organization is created and supported
  - Clinicians and patients determine situations in which a given care protocol is adopted by all providers as the standard
  - Secure web portals that allow patients and clinicians to communicate directly with one another: appointments, the problem list, medications, allergies and/or reactions, test results, demographic and insurance information, and educational materials

- How best to accomplish better care outcomes through the *use* of such information
  - Measuring performance to improving actual performance through tools such as Clinical Decision Support for both clinicians and patients
  - Translational Bioinformatics – molecular medicine based upon one's unique biology

- Barriers to rolling out such a comprehensive and integrated system
  - Dysfunctional attitudes and habits, costs, privacy, lack of standard definitions, lack of interconnectivity / interoperability standards, lack of actionable decision support with equal access from clinicians, managers and patients

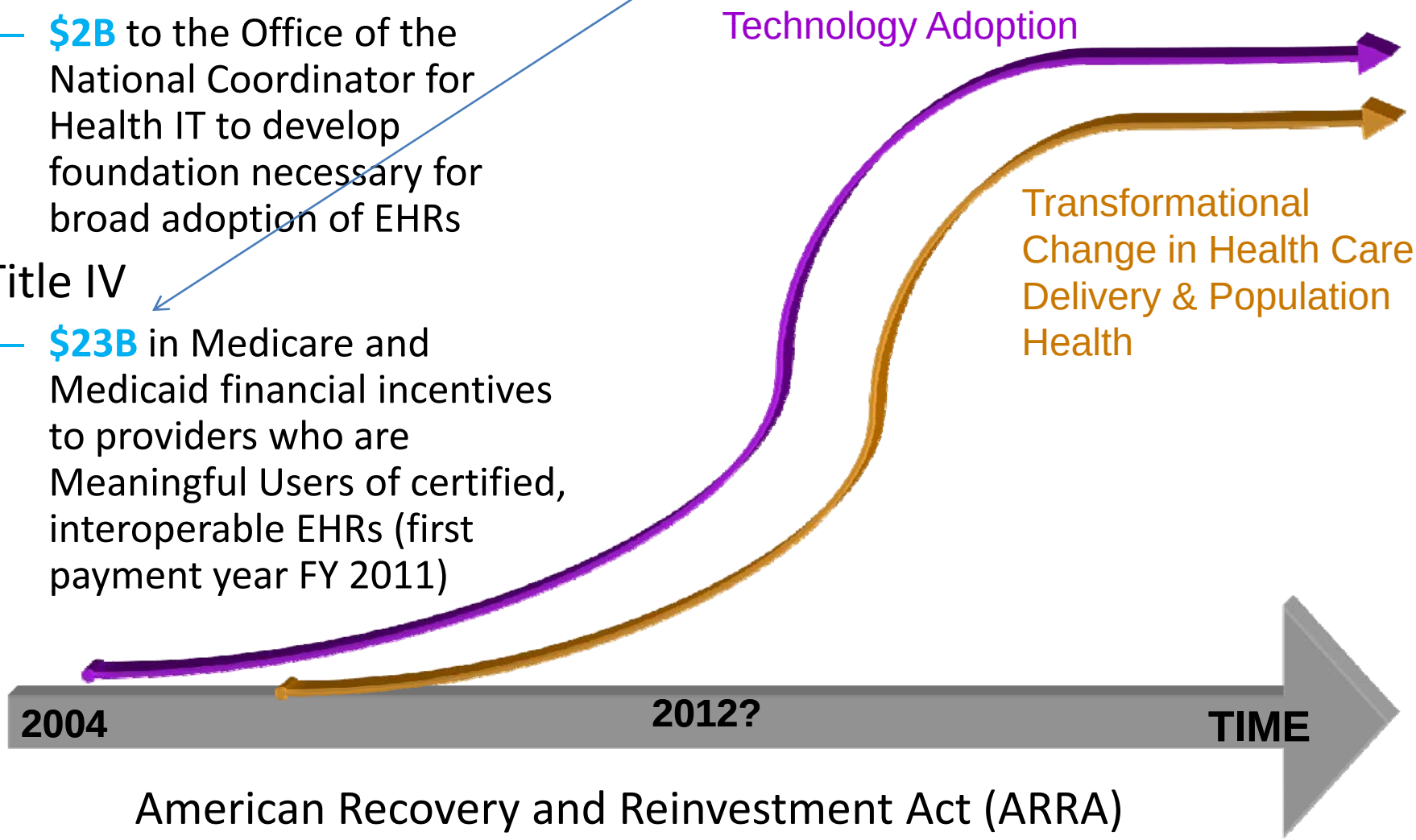
Electronic Health Records (EHR)

Author: Ralph A. Rodriguez

Electronic Health Records (EHR) as a Foundation

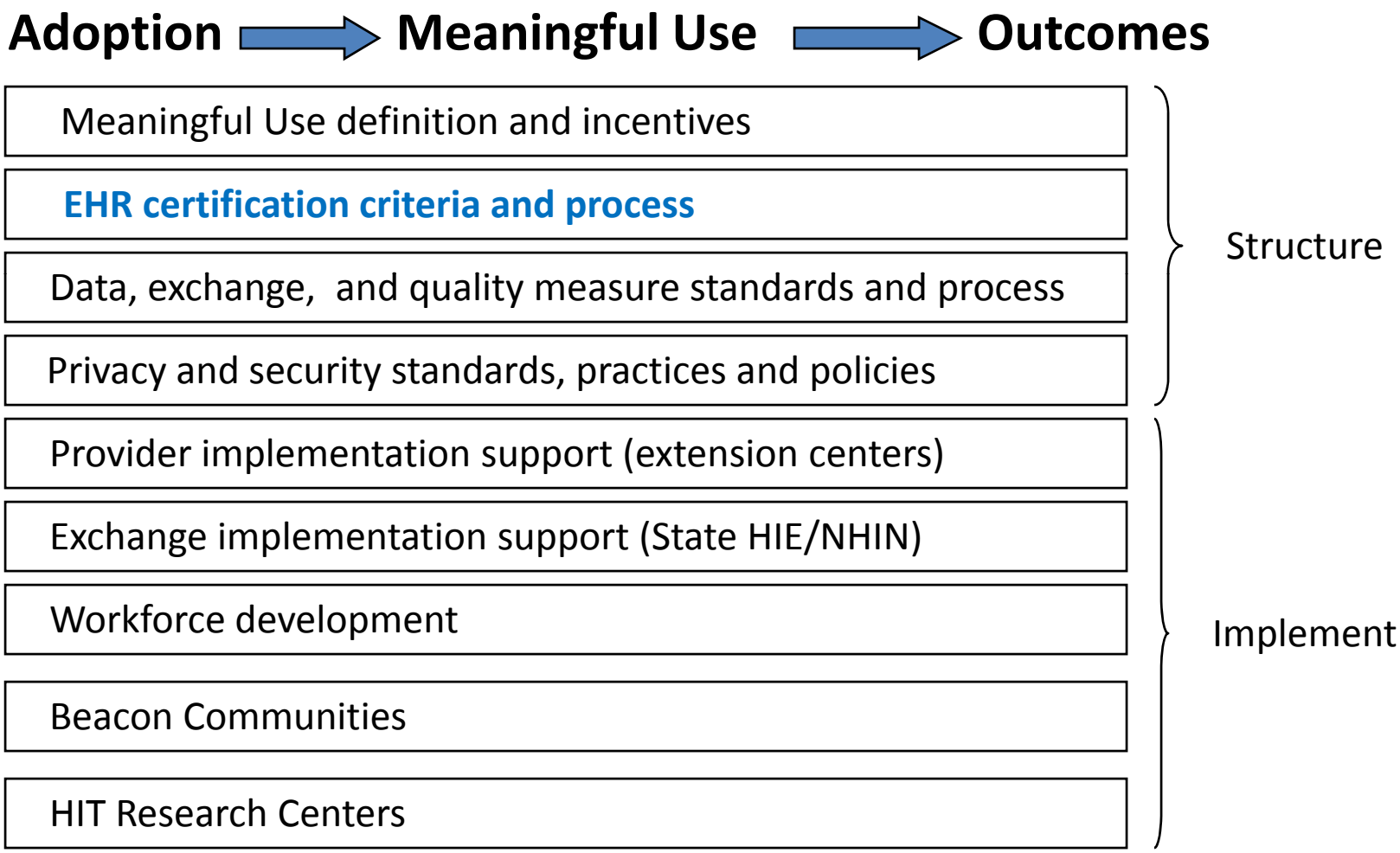
Lots of $$$ but will it work?

- Title XIII
  - **$2B** to the Office of the National Coordinator for Health IT to develop foundation necessary for broad adoption of EHRs
- Title IV
  - **$23B** in Medicare and Medicaid financial incentives to providers who are Meaningful Users of certified, interoperable EHRs (first payment year FY 2011)



American Recovery and Reinvestment Act (ARRA)

An Overview of the National Strategy



Source: Ralph A. Rodriguez, Fellow MIT/HMS 922
John P. Glaser, PhD., Vice President and CIO
Partners HealthCare
March 4, 2010

Examples of Meaningful Use

Maintain an up-to-date problem list of current and active diagnoses	At least 80% of patients seen or admitted have at least one entry
Record smoking status for patients 13 and older	At least 80% of patients seen or admitted have “smoking status” recorded
Send reminders to patients per patient preference for preventive/follow-up care	Reminders sent to 50% of all patients seen that are over 50 years old
Provide patients with an electronic copy of their health information	**At least 80% of patients who request an electronic copy are provided it within 48 hours**
Provide summary of care record for each transition of care or referral	Summary provided for at least 80% of all transitions of care or referrals
Capability to provide electronic syndromic surveillance data to public health agencies	Perform at least one test of capacity to provide such data

Source: Ralph A. Rodriguez, Fellow MIT/HMS 922
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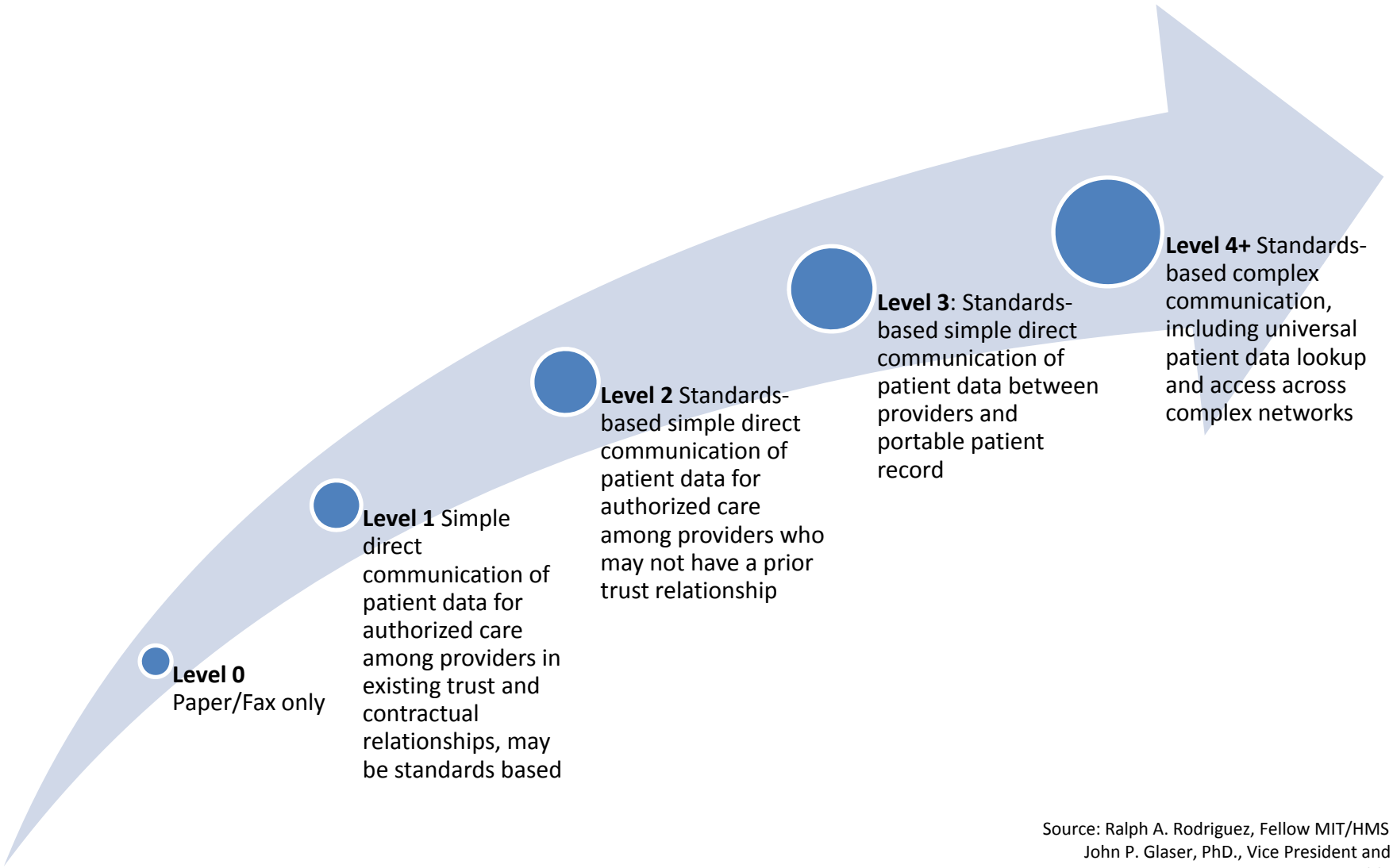
Levels of Exchange Supporting Meaningful Use



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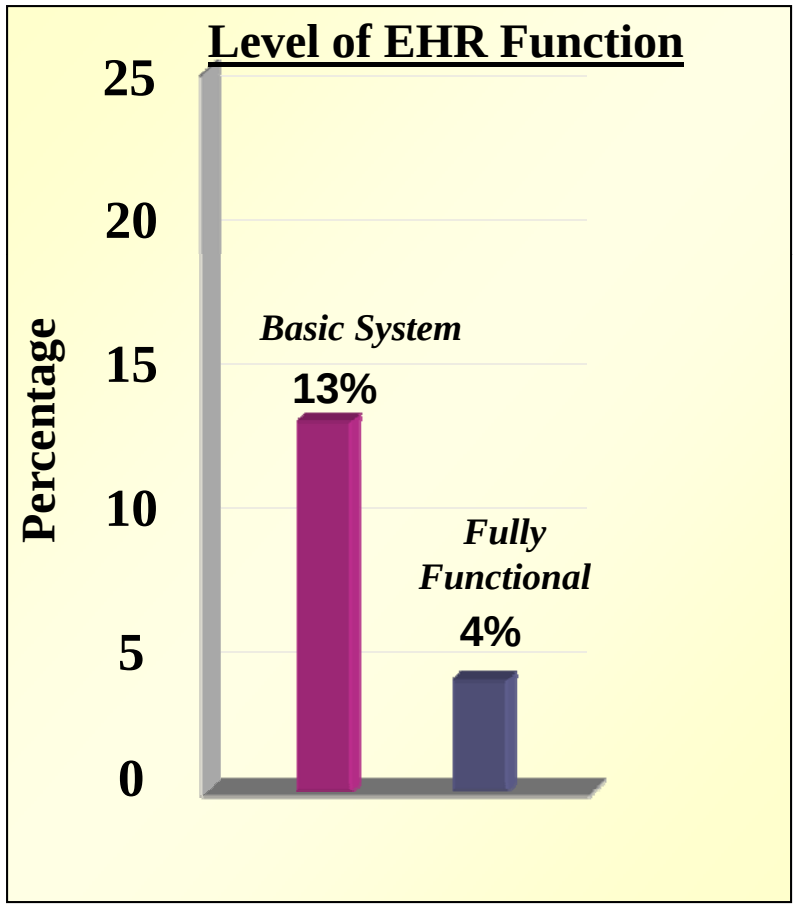
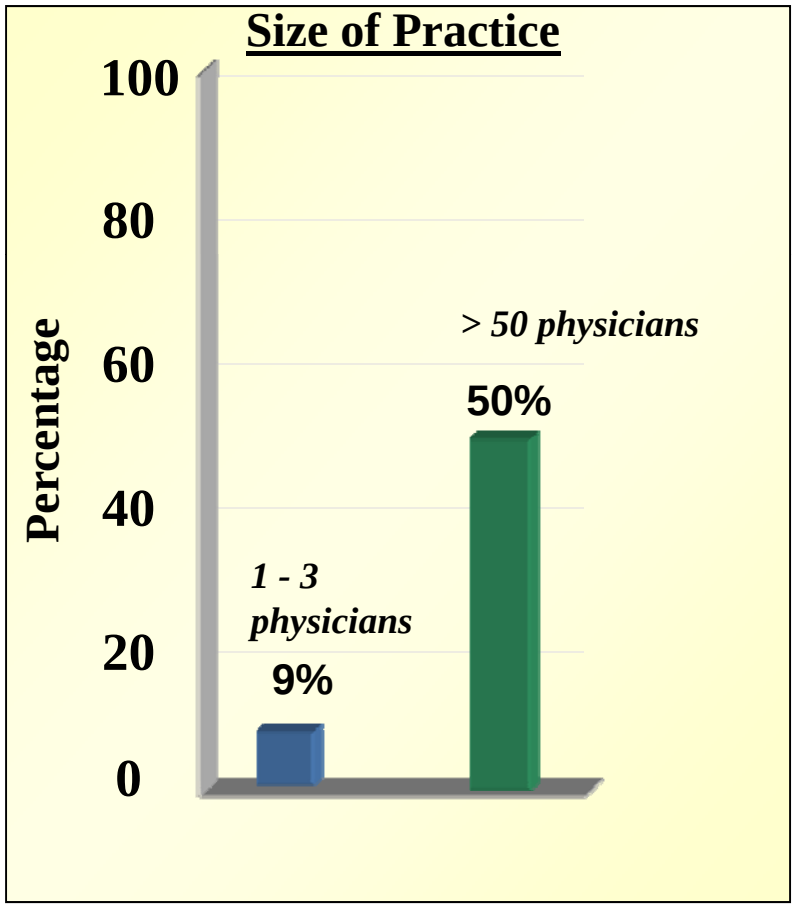
EHR Adoption in Physician Office Practices





DesRoches CM et al., N Engl J Med 2008;359:50-60.

Source: Ralph A. Rodriguez, Fellow MIT/HMS 922
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Imbalance in Healthcare Technology Portfolio

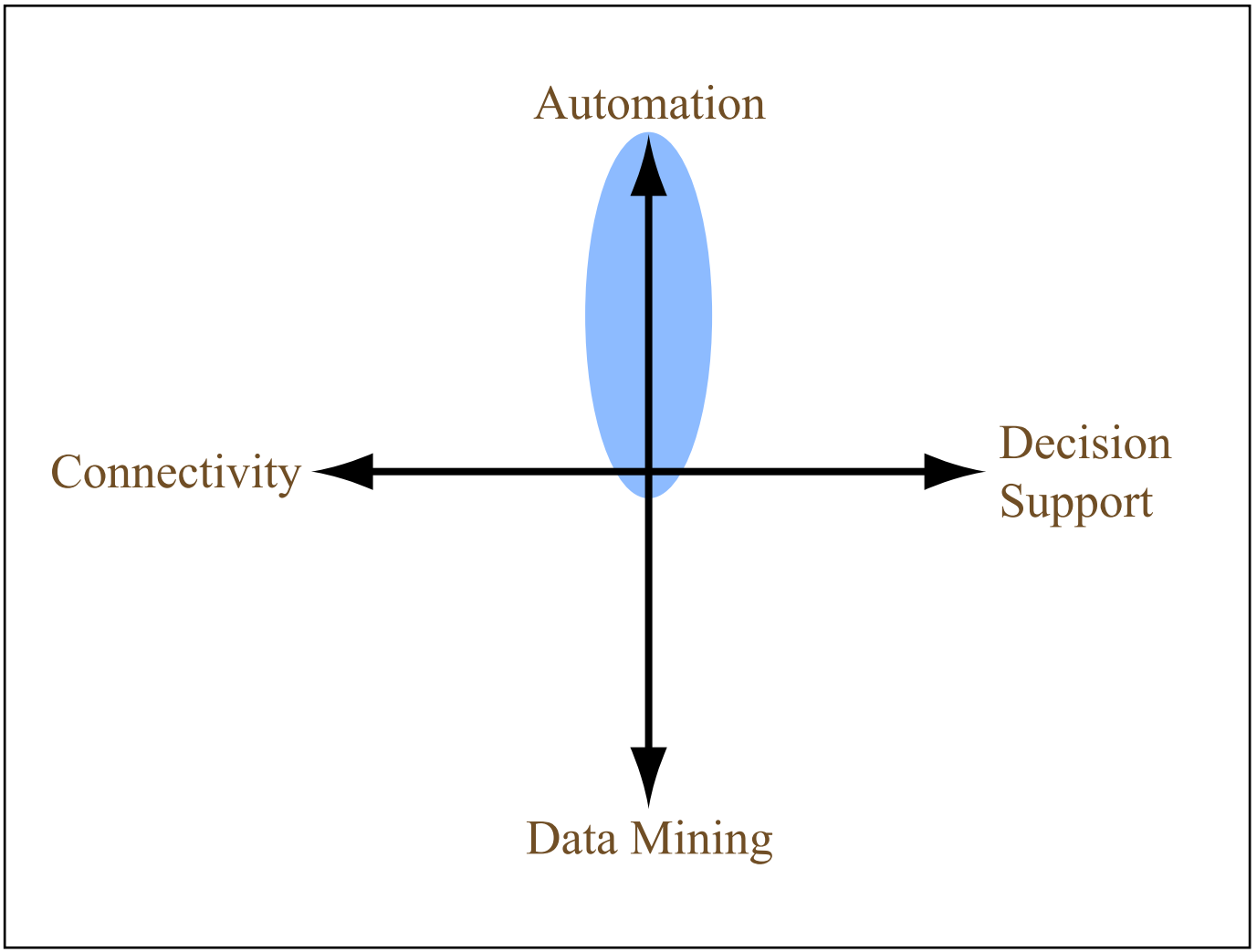

Image by MIT OpenCourseWare. The relatively high use of automation techniques represents an imbalance in the health care information technology portfolio.
Source: Rouse, W.B. and D.A. Cortese, eds. Engineering the System of Healthcare Delivery. Institute of Medicine Press, 2009.

In Press: Rouse WB and Cortese DA, eds, Engineering the System of Healthcare Delivery. Amsterdam: The IOM Press, 2009.

Computational Techniques for HC Technology Portfolio

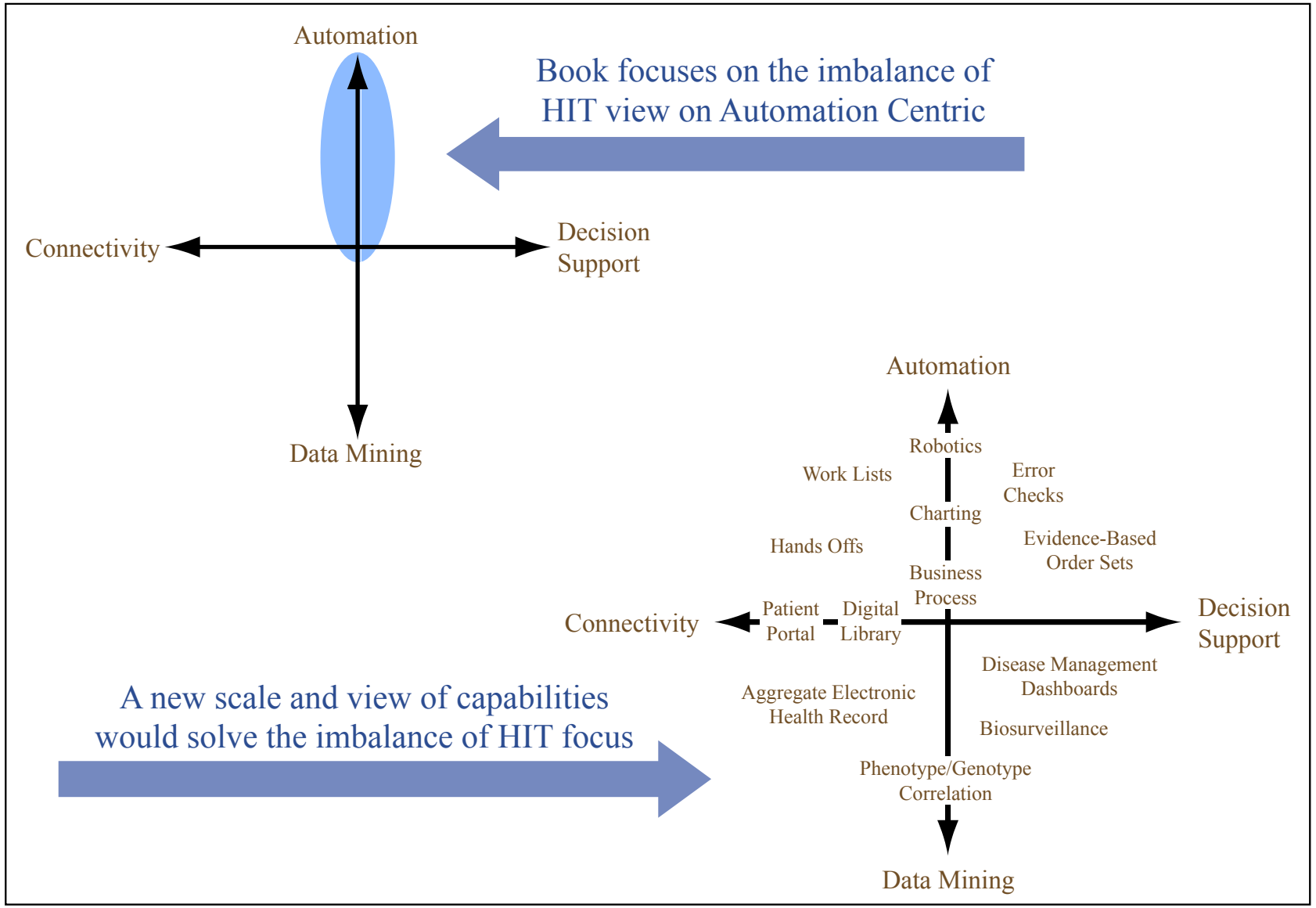

Image by MIT OpenCourseWare. Four domains of computational techniques matched to the capabilities of electronic medical record systems. Source: Rouse, W.B. and D.A. Cortese, eds. Engineering the System of Healthcare Delivery. Institute of Medicine Press, 2009.

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Future Integration of EHR

A future framework is needed!

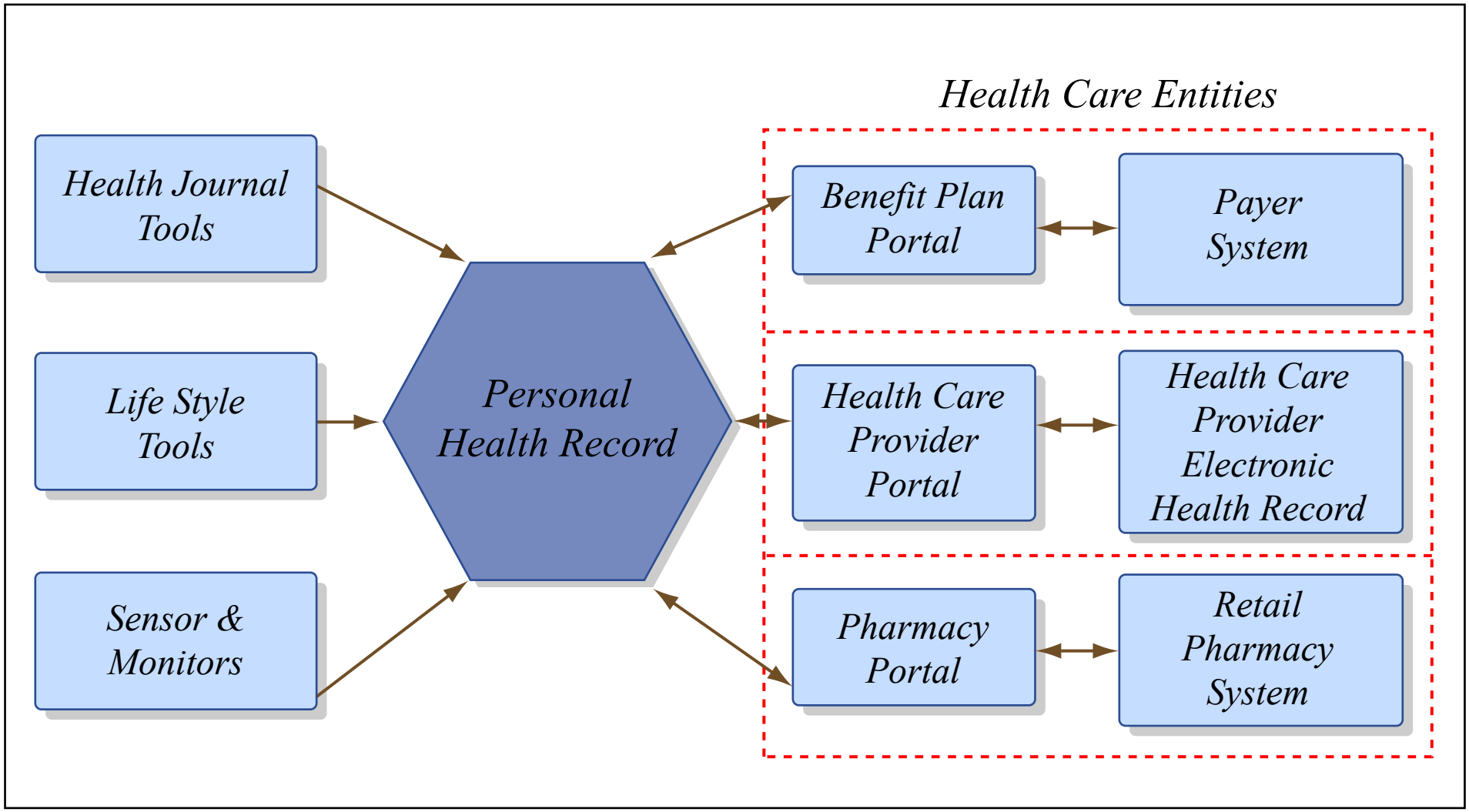


Image by MIT OpenCourseWare. The personal health record aggregates information from health care entities, and provides patient control of their health data. Source: Rouse, W.B. and D.A. Cortese, eds. Engineering the System of Healthcare Delivery. Institute of Medicine Press, 2009.

In Press: Rouse WB and Cortese DA, eds, Engineering the System of Healthcare Delivery. Amsterdam: The IOM Press, 2009.

END

Supporting Material

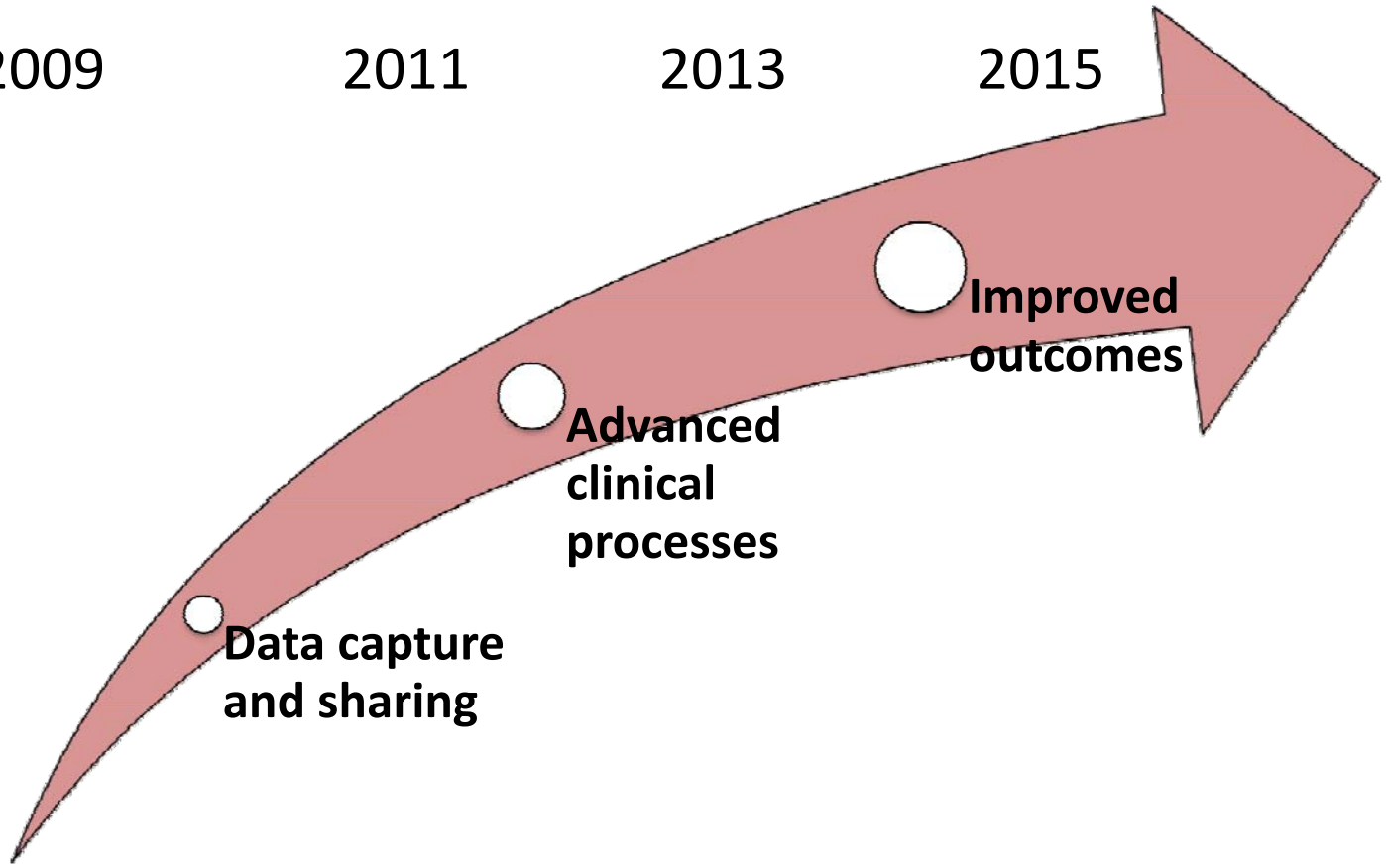
Next-Gen Visualization of EHR

In short, the paradigm shifts from thinking of the electronic health record as a by-product of automating practice — to thinking of it as a visualization of signals accumulated across scales of biology, time and geography. Table 1 summarizes this shift.

OLD	NEW
One integrated set of data	Sets of data from multiple sources
Capture data in standardized terminology	Capture raw signal and annotate with standard terminology
Single source of truth	Current interpretation of multiple related signals
Seamless transfer among systems	Visualization of the collective output of relevant systems
Clinician uses the computer to update the record during the patient visit.	Clinician & patient work together with shared records and information
The system provides transaction-level data	The system provides cognitive support
Work processes are programmed and adapt through non-systematic work around	People, process and technology work together as a system

In Press: Rouse WB and Cortese DA, eds, Engineering the System of Healthcare Delivery. Amsterdam: The IOM Press, 2009.

The Future Direction of EHR/EMR Meaningful Use



Source: Mass Health Data Consortium - Meaningful Use Workgroup Presentation, July 16, 2009

Quality Measures

Physicians	- Core quality measures
	  - Smoking status
	  - Blood pressure
	  - Drugs to be avoided by the elderly
	- Set of 3-5 specialty-specific measures

Hospitals	- Forty-three measures (currently submitting 9)

EHRs Must Support Standards

Problem List (ICD-9-CM or SNOMED)	Patient summary (HL7 CDA R2 CCD)
Lab orders and results (LOINC)	Prescriptions (NCPDP SCRIPT 10.6)
Units of measure (UCUM)	Quality reporting (CMS PQRI 2008 Registry XML)
Medication List (RxNorm)	Submission to public health agencies (HL7 2.3.1)

Evidence-based Medicine

Author: J. Michael McGinnis

Background Statistics

- US Infant Mortality = 29th in the world (6.3 deaths/1000 live births); Sweden = 2.8
- Increase in US Obesity, Diabetes, Alzheimer's cases
- 27th and 30th world ranking in life expectancy for men (75) and women (80), respectively.
- WHO ranks US as 37th in overall healthcare system performance
- US spends $2.5 Trillion/year on Healthcare
  - 16% of US GDP; 50% higher than second place (Switzerland)
  - Avg 6% increase in health prices in 2008-2009 timeframe
  - Increasing cost is burden for households, business, govts
  - Studies show that 30% of services do not improve patient outcome.
  - 50,000 - 98,000 preventable deaths

Some Current Health Care System Failures

- Minimally documented, unjustified, and wasteful variation in practices
- High rates of inappropriate care
- Unacceptable rates of preventable care associated with patient injury and death
- Inability to “do what we know works” practices
- Healthcare delivery inefficiencies leading to substantial waste and increasing costs

Evidence Based Medicine (EBM)

- Focus on improving the effectiveness and efficiency of health care
- Transition from Intuition based to Evidence based practices
- Evidence Based Medicine
  - The use of medical decision rules based on larger knowledge and evidence based data
  - Key advantage is systematic feedback to improve the knowledge base for decisions and practices.
  - Potential application of Engineering practices/ Scientific Method for continuous learning development

Institute of Medicine (IOM)

- Goal is to foster the evolution of a learning healthcare system that delivers the best care every time and improves with each element of the care experience.
  - Apply the best evidence of collaborative health care choices for each patient and provider
  - To drive process of discovery as a natural outgrowth of patient care
  - To ensure innovation, quality, safety and value in healthcare.

- Learning-driven care
- Care-driven learning
- Best practices every time
- Clinician as steward
- Patient at the center

- Seamless cycle feedback
- IT based knowledge engine
- Clinical data as a public trust
- Trusted scientific intermediary
- Networked leadership

Examples of Engineering and Scientific Concept Applications to Healthcare

- Systems approach: Predictive modeling, Operations Research, Lean practices to reduce waste
- Engineering data management systems to generate new and quicker perspectives to inform decisions
- System design using the 80/20 rule
- Design for Safety
- Mass Customization
- Continuous Flow
- Production Planning

Introduce Cultural Changes

- Emphasize continual learning process on the grander scale
- Addressing clinical complexity across the entire context
- Changes in decision making process, payment mechanisms and care planning
- Management of clinical data systems
- Transition from “silo” to “systems” thinking and treatment approach.
- Developing more robust capacity of knowledge management in learning system
- Improving systems for care delivery via team versus individual practitioners

Reform Examples in Healthcare

- Veteran's Health Affairs
  - Historical issues with fragmented, expensive care with accessibility and unfocused on individual patient needs
  - Reforms include
    - Accountable structure
    - Integration and coordination of serves across domains
    - Improve and standardize quality of care
    - Modernize information management
    - Align system's finances with desired outcomes
- Ascension Health
  - Health care that works
  - Health care that is safe
  - Health care that leaves no one behind

IOM Factors for EBM

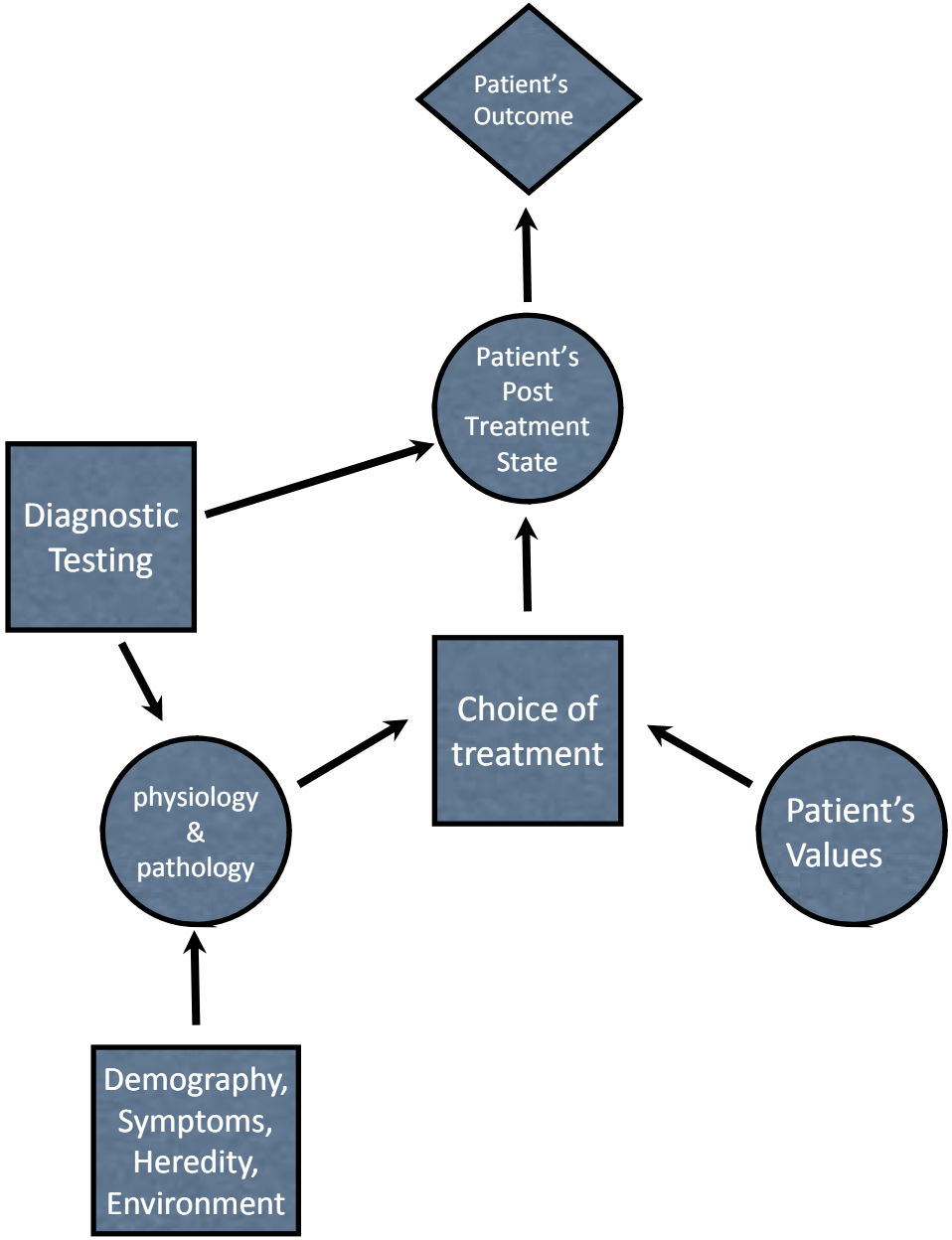
- Patient Experience
- Delivery of established best practices
- Allowance for tailored adjustments
- Non linear learning process
- Systems Thinking mentality
- Focus on Team work rather than individual practitioner
- Performance transparency and feedback used as improvement drivers
- Expect individual performance errors, perfection in systems performance
- Align awards on continuous improvement
- Facilitate the partnership between engineering and healthcare
- Foster a leadership culture, and style that reinforces teamwork and results.

Transforming healthcare through patient empowerment

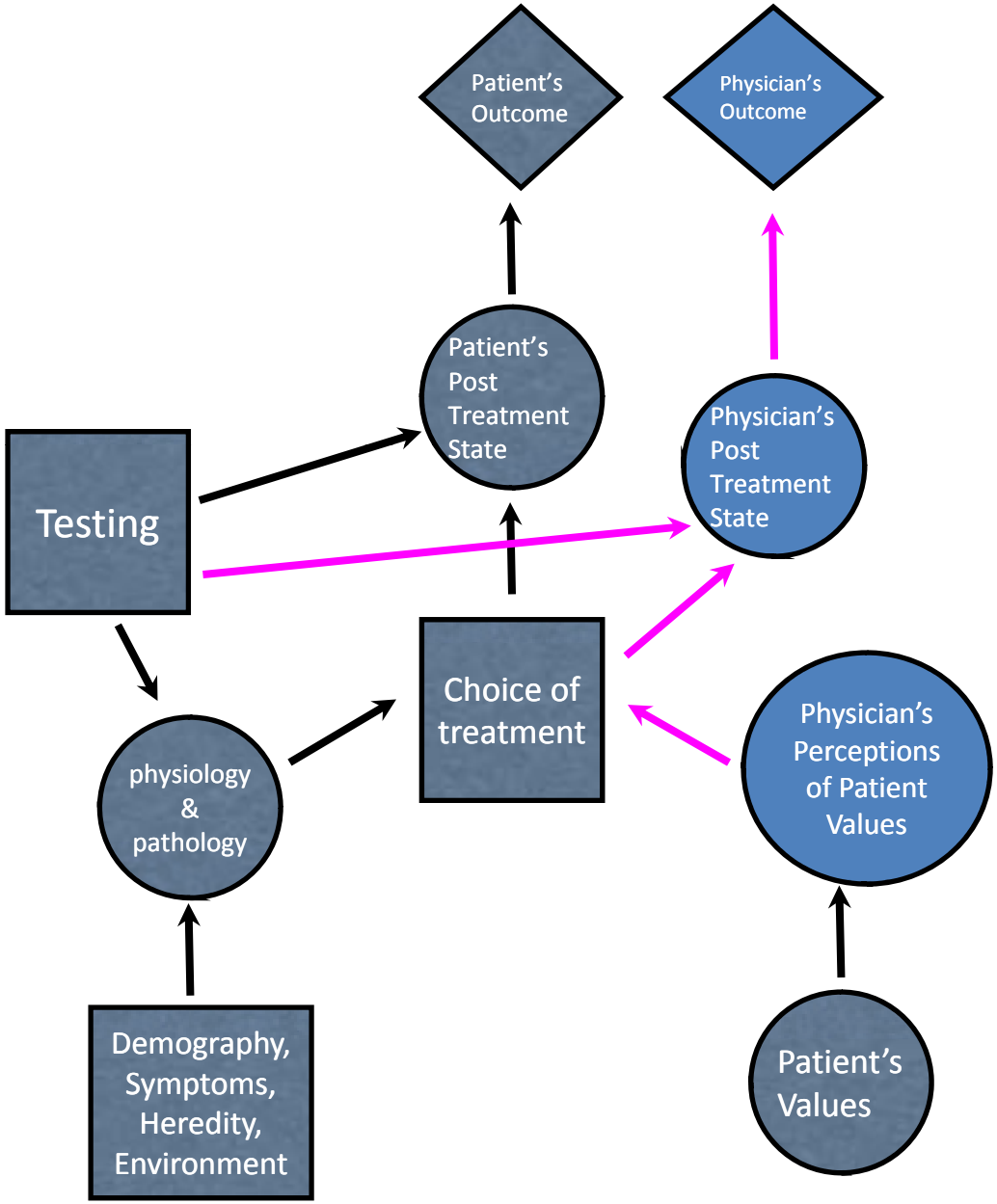
Need for patient-centric healthcare system

- **Problem:** Buying poor value in current healthcare system
- **Cause:**
- misaligned incentives due to fee-for-service (FFS) payment system for physicians with insurance-based financing care
- knowledge imbalance between physicians and patients is linked to how a physician earns income in a FFS environment
- **Solution:** patient-centric healthcare can control cost while improving quality
- more is **not** better: physicians should aim to use care most efficiently
- patient-centric approach to both decision making and to movement of information for care management
- patients should be empowered to make decisions, acting in their own self interest
- shift away from financial reimbursement and provider business process management to patient care management
- can do this through stepwise models

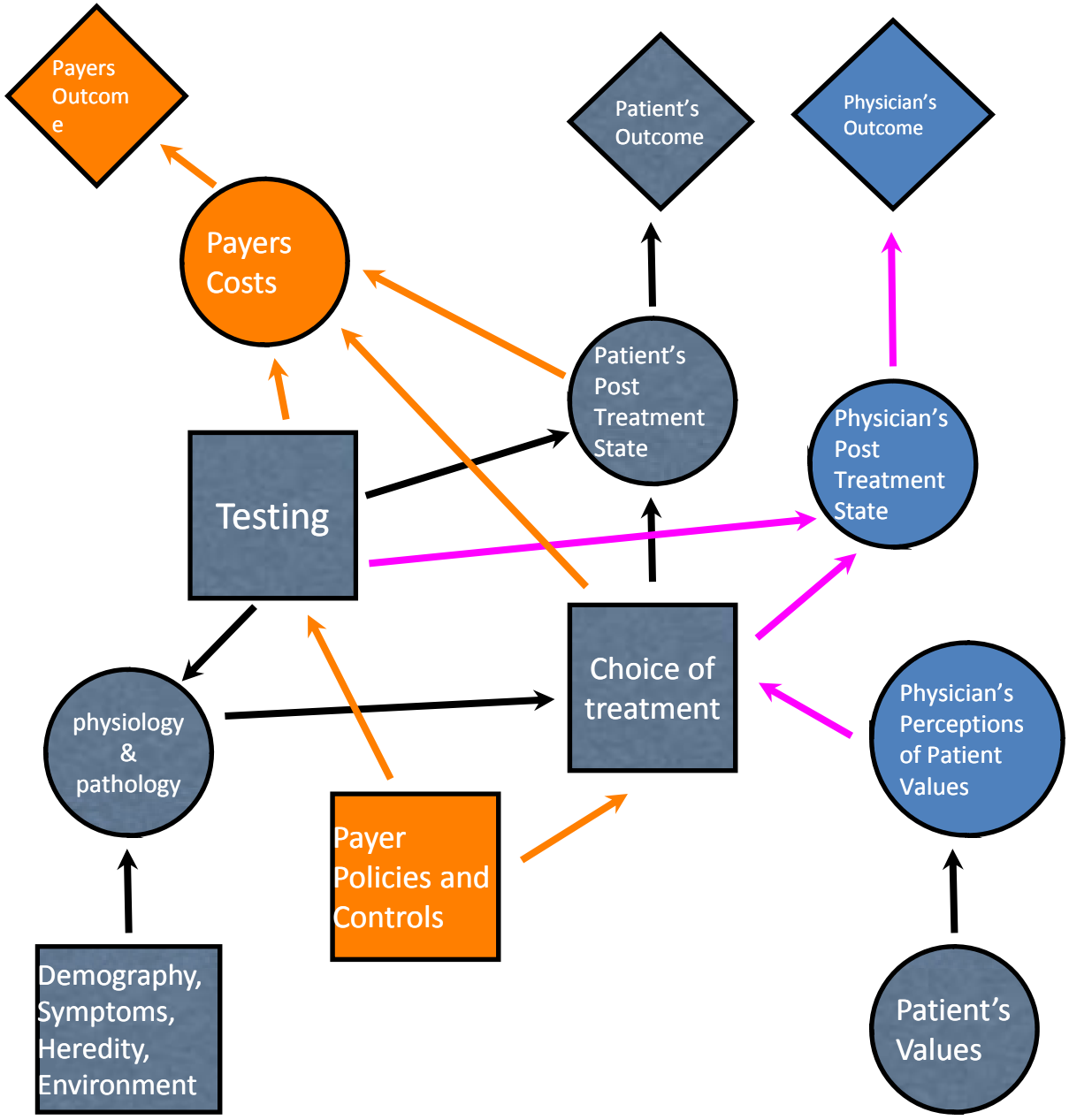
Basic, Patient-Centric Model



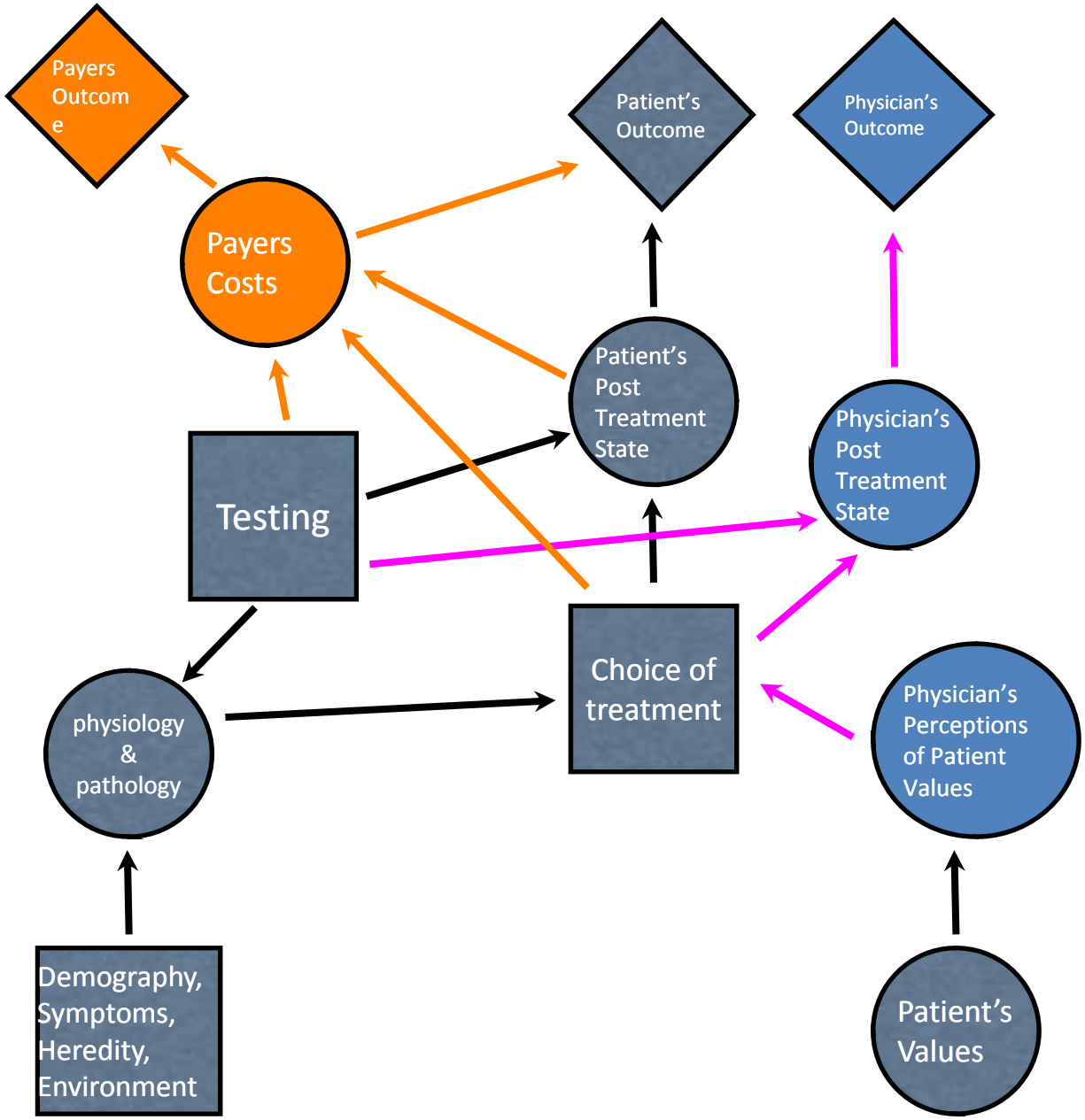
Patient + Physician Model



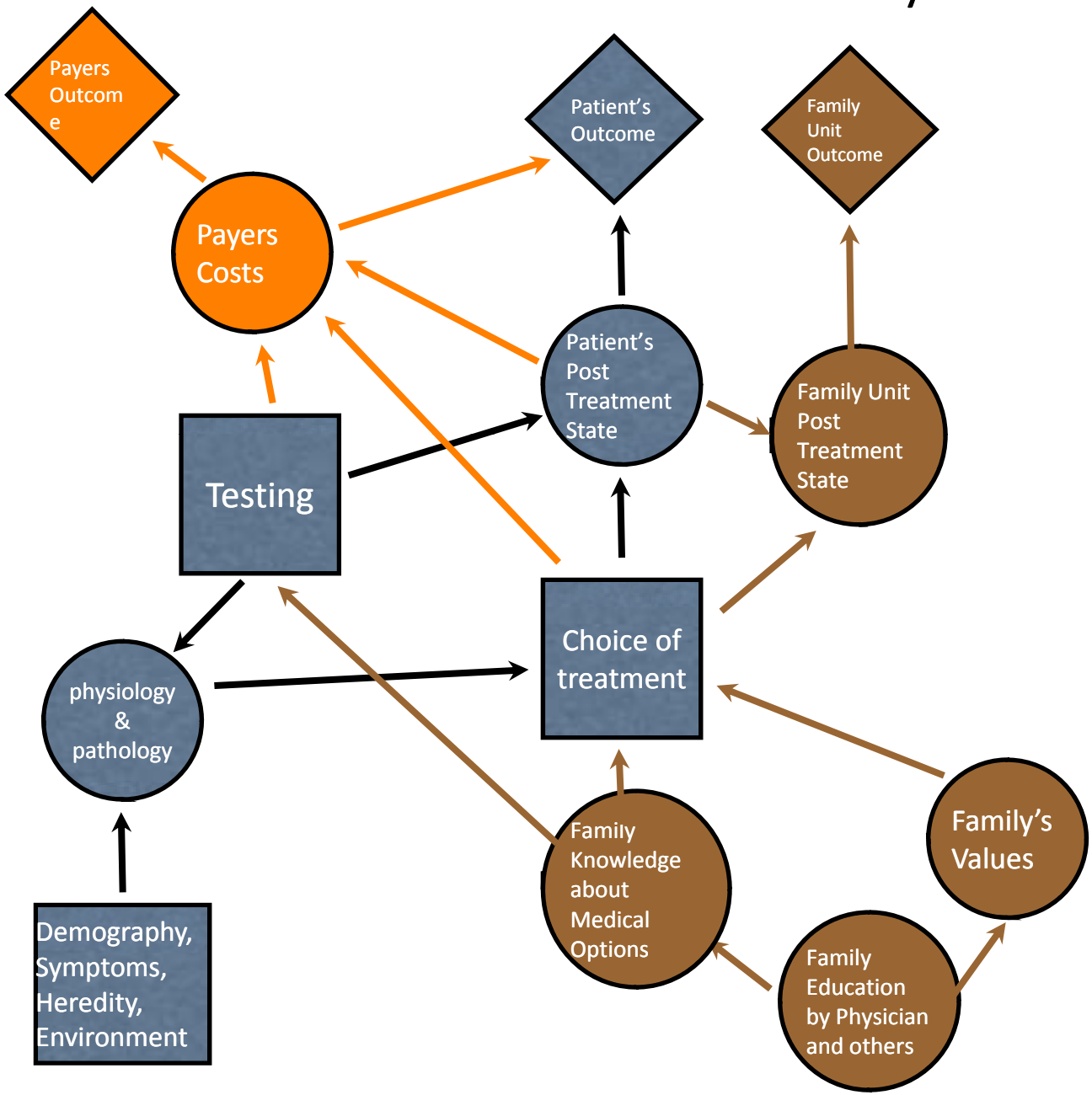
Patient + Physician + Payer Model



Aligning Physician and Payer Interests



Consumer Driven Healthcare System



Objectives for the Future

- Diagnostic tests and treatments chosen must capture a patient's physiology and values so that expected utility is maximized
- Best choice for individual must be represented
- Conflicting objectives of other parties (payers, physicians, etc) impact the choice of treatment and reduce patient-centeredness of decision making --> reducing quality of medical decisions
- Therefore, strategies to control costs should do minimal harm to patient centeredness
- I.E. Difference between the expected utility under a patient centric model and the policy implemented.

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