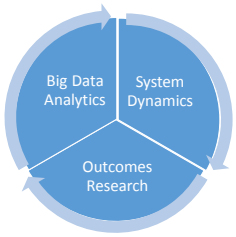
Combining System Dynamics with Big Data Analytics and Outcomes Research to Create Learning Health Care Organizations



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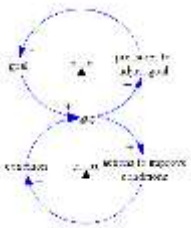
Outcomes Measures Reveal the Performance Gap

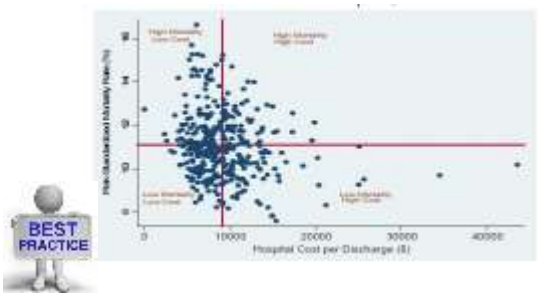
- Highly variable quality of care
- Significant disparities
- Frequent errors
- Fragmented care
- Ever-rising costs

The Performance Gap Creates Pressure to Change

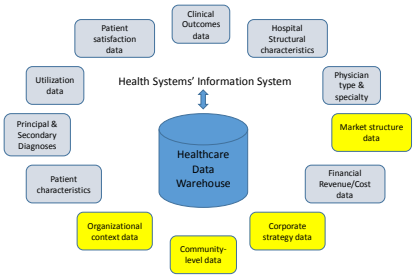


Patients, Employers, Payers, and Policy Makers Demand "Higher Value" Care

How Some Hospitals Achieve Better Outcomes at Lower Cost than Others?

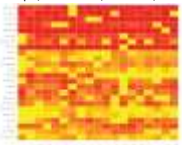


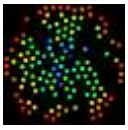
An Enabling Information Technology Platform is in Place



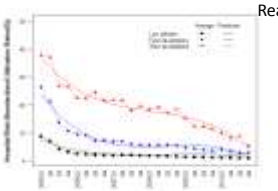
High-Throughput Multidimensional Phenotyping of Health Systems Cross-sectional and Longitudinal, Structural and Behavioral

People, Information, Processes, Outcomes, $, Strategy





Fast vs. slow learners



Readiness for Change

- Reactor
- Defender
- Analyzer
- Prospector

Super Computers Deal with Detail Complexity

What patterns of structure and/or behavior are associated with:

- higher value?
- Better Performance?
- Readiness for change?
- Learning ability?

A Complex, dynamic, policy-resistant Problem

LA Times 3/20/96: "Use of cheaper drugs pushes cost up, not down"

Journal of Policy History, Rick Mayes: "How Medicare's rescue inadvertently triggered the managed care revolution"

Counterintuitive behavior
Unexpected dynamics
Policy resistance

"Do not micromanage by putting fees on services or by restricting care options"

System Dynamics Guides Change by Focusing on Dynamic Complexity

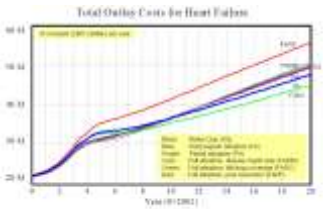
- Many interacting actors, multiple goals, and conflicting interests
- Interactions among the system components=> Complex behaviors
- Time delays => instability
- Reduced stakeholders' ability to discern cause, effects, and confounding factors

Figure 1.1 The Healthcare System.

System Dynamics Guides Change by Focusing on Dynamic Complexity

SD model takes into account the effects of accumulations, time delays, resource constraints, and behavioral feedback to:

- Produce intervention options for simulation
- Quantify the net impact of interventions
- Identify robust strategies for guiding the change process

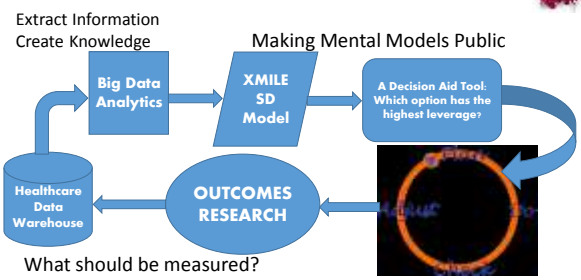


The Final Product: a Simulator, a Learning Lab

Interactive computer-based tool to experientially communicate an integrated set of learning points supported by data to organization's administrators, physicians and staff, other key stakeholders

Crucial that front-line teams be involved in decision making, understand how and why these change strategies have been chosen, how these are going to impact their workflow and responsibilities, patient outcomes, cost, revenues and benefits.

How to create "Learning" Health care Organizations



Thank you!

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