

# Applying Evidence to Practice: Gaps, Barriers, Lessons Learned from Healthcare

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# Overview

1. Background
2. Evidence to practice: what is known
3. Evidence to practice: a case study
4. Implications for EBLIP
5. The way forward

# 1. Background

# The 17-Year Journey

- Institute of Medicine's report Crossing the Quality Chasm (2001)
- From evidence to practice takes an estimated 17 years
- 4 recommendations:
  - Develop guidelines based on evidence
  - Disseminate guidelines through application of IT
  - Develop financial incentives for adoption
  - Prepare the workforce—set goals for improvement

# LIS Approaches

- Evidence-based information services
  - Information professionals filtering literature, providing best evidence to clinicians
  - Participation in Systematic reviews, Cochrane
  - Teaching evidence based medicine
  - Informationist services
  - Clinical librarians & LATCH services
  - Embedding information professionals at the point of care

# Milestones in My EBM/EBLIP

- Chaired 1<sup>st</sup> MLA Research Policy TF Using Scientific Evidence to Improve Information Practice
- 1997-1999, EBM at College of Medicine, UIC
- 2000 Woods Hole Informatics seminar
- 1998-2002 NLM Study section
- 2003, 2007 Presenter, EBLIP Conferences
- 2005-2007 National Library of Medicine Informatics training fellowship at Johns Hopkins School of Medicine, Baltimore
- 2008 Authored EBLIP entry for Encyclopedia of





**Billings Administration  
Building, Johns Hopkins  
Hospital**

**“The Dome”**



**Founders of Johns Hopkins Hospital:  
William Henry Welch, William  
Stewart Halsted, William Osler.  
Howard Kelly**

**Portrait by John Singer Sargent  
Hangs in the Welch Medical Library**

# The Fellowship Experience

- Tension between information professional role and clinical and research trainee
- Acquiring the language of informatics, the skills of IT and the culture of healthcare
- Classes, research seminar, practicum
- Appreciating “clinical epidemiology”
  - The epidemiology of information

# Transfer of Research into Practice

- Understanding how guidelines were produced
  - Cochrane Center
- Observing how guidelines were applied
  - SICU, managing heparin
- Health education: communicating information to effect behavioral change
  - End of life qualitative study

## 2. Evidence to Practice: What is Known

# Sources of Theory

- Theory drawn from many disciplines
  - Individual attributes
  - Diffusion of innovation
  - Implementation & team science
  - Systems thinking
  - Change management

# Individual Attributes

- Cabana: Why don't physicians follow clinical practice guidelines?: a framework for improvement. JAMA, 1999
  - cited self-efficacy to explain lack of adoption; other individual level variables were: including awareness, familiarity, agreement, outcome expectancy, ability to overcome the inertia of previous practice\*
  - **Self-efficacy** is the belief (whether or not accurate) that one is capable of performing in a certain manner to attain certain goals. For example, a person with high self-efficacy may engage in a more health related activity when an illness occurs, whereas a person with low self-efficacy would harbor feelings of hopelessness. (Bandura)
  - \* also cited absence of external barriers to perform recommendations

# Cognitive Processing

- Suggests that individual differences in cognitive processing affect the uptake of evidence (Sladek)
- Individual level theories are relevant to CDSS
  - Patel and Kaufman’s work is used to model the cognitive processes used in the design of CDSS to support guidelines
- Individual differences in decision making:
  - “fast and frugal” compared to “rational, analytic”.



# Diffusion of Innovation

Diffusion is the process by which an innovation is communicated through channels over time among members of a social system. (Rogers)

Key elements in diffusion theory are:

- the innovation
- the communication channel
- the rate of adoption
- the social system –context and organizational environment

# Components of the theory

- Process
- Adopters
- Innovation
- Channels
- Environment

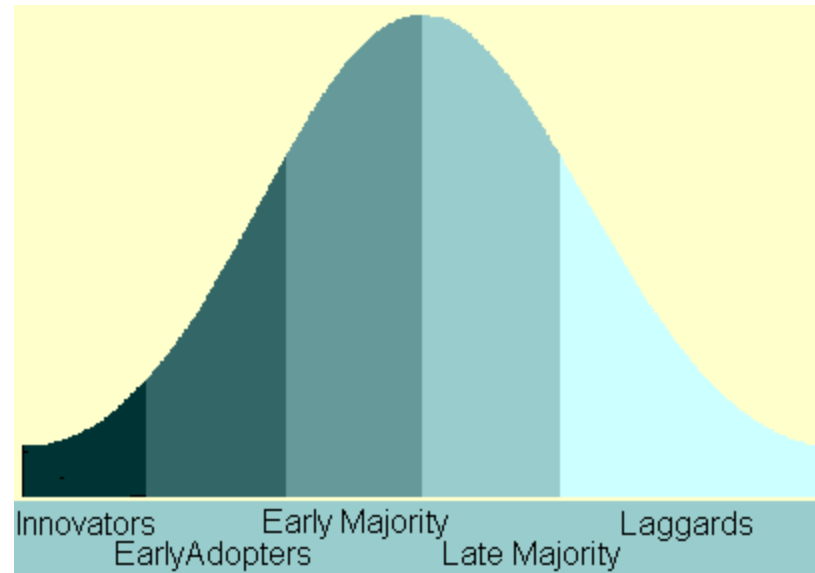
# Process

1. Knowledge
2. Persuasion
3. Decision
4. Implementation
5. Confirmation

# Adopters

- Innovators (2.5%)
- Early adopters (13.5%)
- Early majority (34%)
- Late majority (34%)
- Laggards (16%)
- Kulier, Gee and Khan (2008) distinguished between opinion leaders (informal influence) and decision-makers (wield power to implement a decision)

# Distribution of Adopters



# Stages of Adoption

- The process of adoption has 5 stages:
  - knowledge or awareness
  - persuasion
  - decision
  - implementation
  - confirmation (or maintenance)

# The Innovation

- The innovation itself has an effect on the decision to adopt or reject an innovation.
  - Relative advantage over current practice (this could be in terms of cost, convenience, efficacy, ease etc.)
  - Compatibility with workflow
  - Complexity (difficulty of use negatively affects adoption)
  - Observability (innovations that are visible to others are more likely to be adopted and spread to others)

# Channels

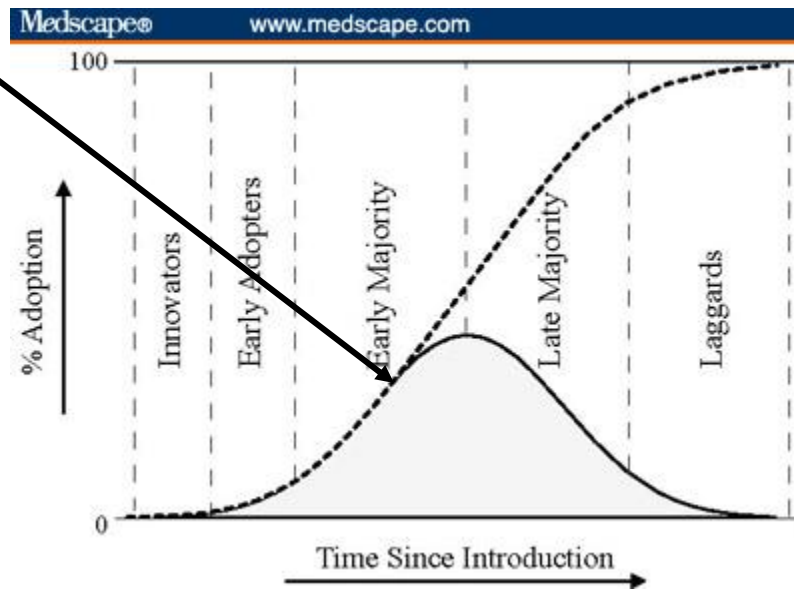
- Personal communication
  - Social networks
- Mediated communication
  - Print, broadcast
- Computerized decision support
- The literature
  - Guidelines, evidence bases

# Diffusion and EBM

- Widely accepted explanation of behavioral change; over 10,000 hits in PubMed
- Seminal article by Berwick (JAMA, 2003) collapsed factors into three clusters—clinician perceptions of the innovation, individual characteristics, and managerial/organizational factors
- Systematic review (> 1000 studies) by Greenhalgh and colleagues in 2005 stressed looking at diffusion “ecologically” using multiple methods, including qualitative approaches
- Each has been cited over 400 times.

# Diffusion Theory (Gladwell version)

## The Tipping Point



# Implementation Science

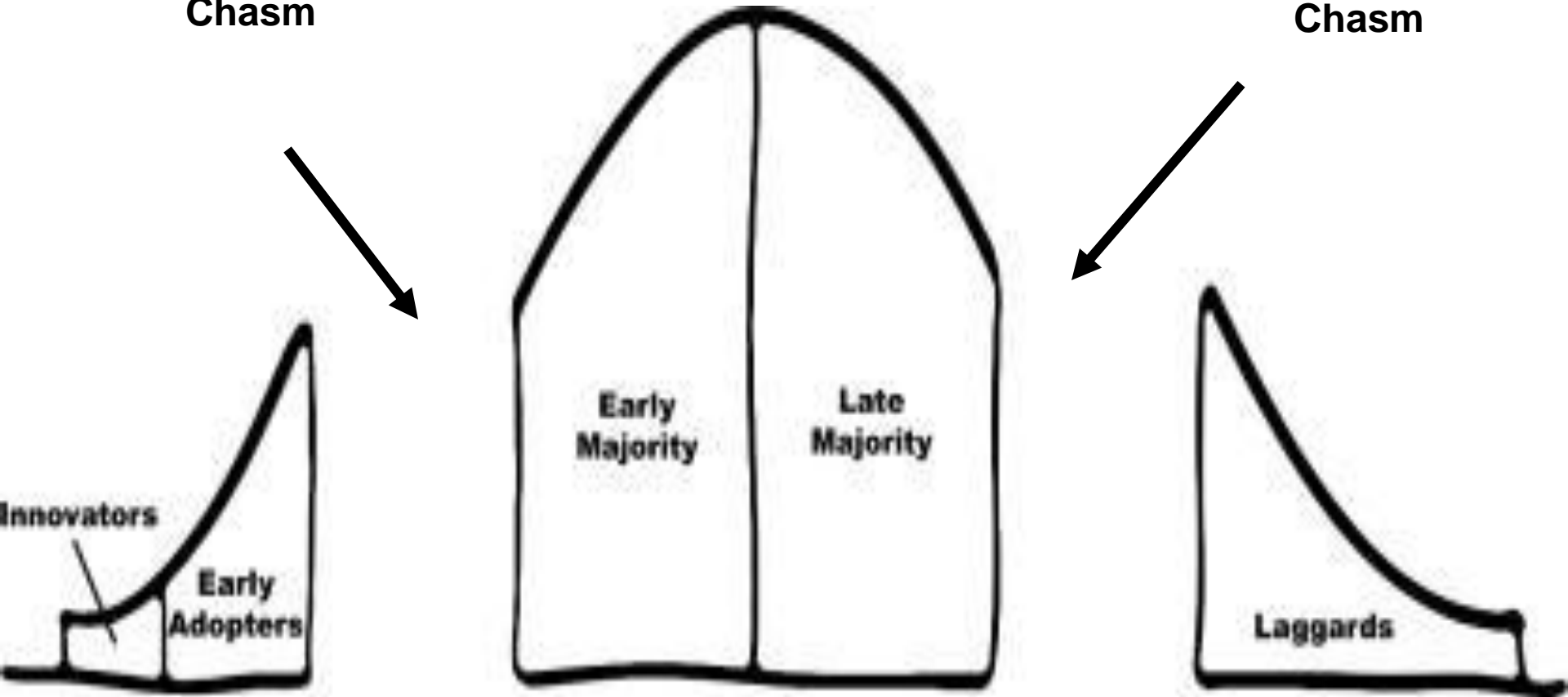
- a new discipline draws from social science theory on the individual and the organizational levels
- focuses on “identifying and understanding variations in practice, the barriers to changing existing clinical behavior, and effective methods for changing medical practice. (Sladek, 2006)
- Journal entitled **Implementation Science** (v. 1, 2006)

# Team Science

- Similar to implementation science, but uses social and organizational context
- new multidisciplinary field emerged from ACMI's winter symposium (2007) "Research issues in the implementation of Information systems"
- Diffusion sees adoption of innovation as an individual decision; team science recognizes the influence of the social and organizational context.
  - two "chasms"—between the early adopters and the early majority group

Chasm

Chasm

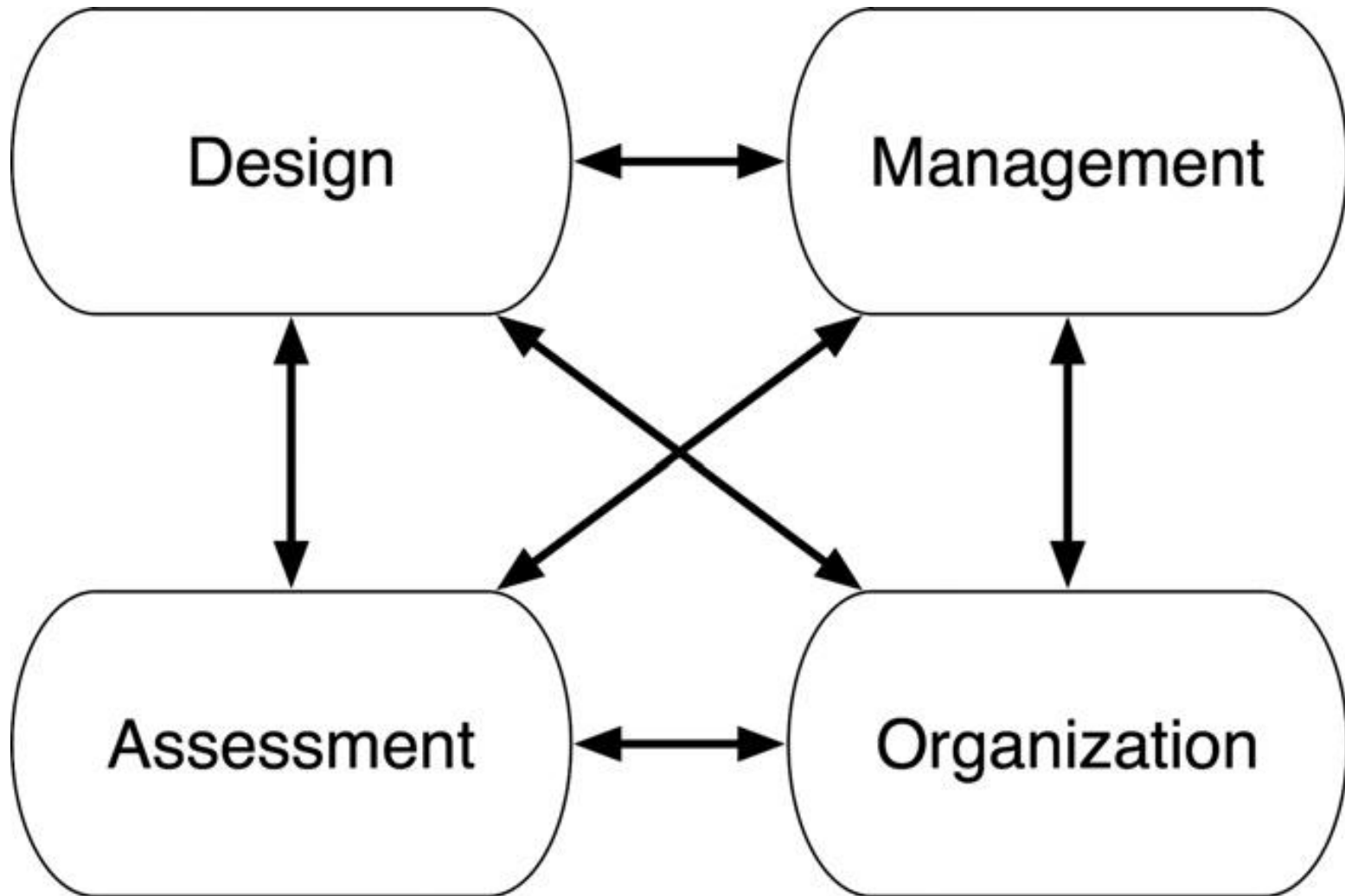


Lorenzi, et al, JAMIA, 2008

# Components of Team Science

4 components:

- Design: the properties and information models of IT products
- Management: planning and rollout of a specific information system
- Organization: issues of structure, leadership and workflow
- Evaluation: system use, outcomes, impact on work and structure of care



# Greenhalgh: A Systems Approach to Diffusion

- Greenhalgh called for multi-method, multi-dimensional examination of diffusion, with greater attention to social and contextual factors
- Reflects a more complex model of diffusion in health systems

## SYSTEM ANTECEDENTS FOR INNOVATION

<b>Structure</b>	<b>Learning capacity</b>	<b>Receptivity to change</b>
<b>De-centralized</b>	<b>Internal information flow</b>	<b>Leadership, vision</b>
<b>Resourced</b>	<b>Skilled workforce</b>	<b>Abundant data</b>

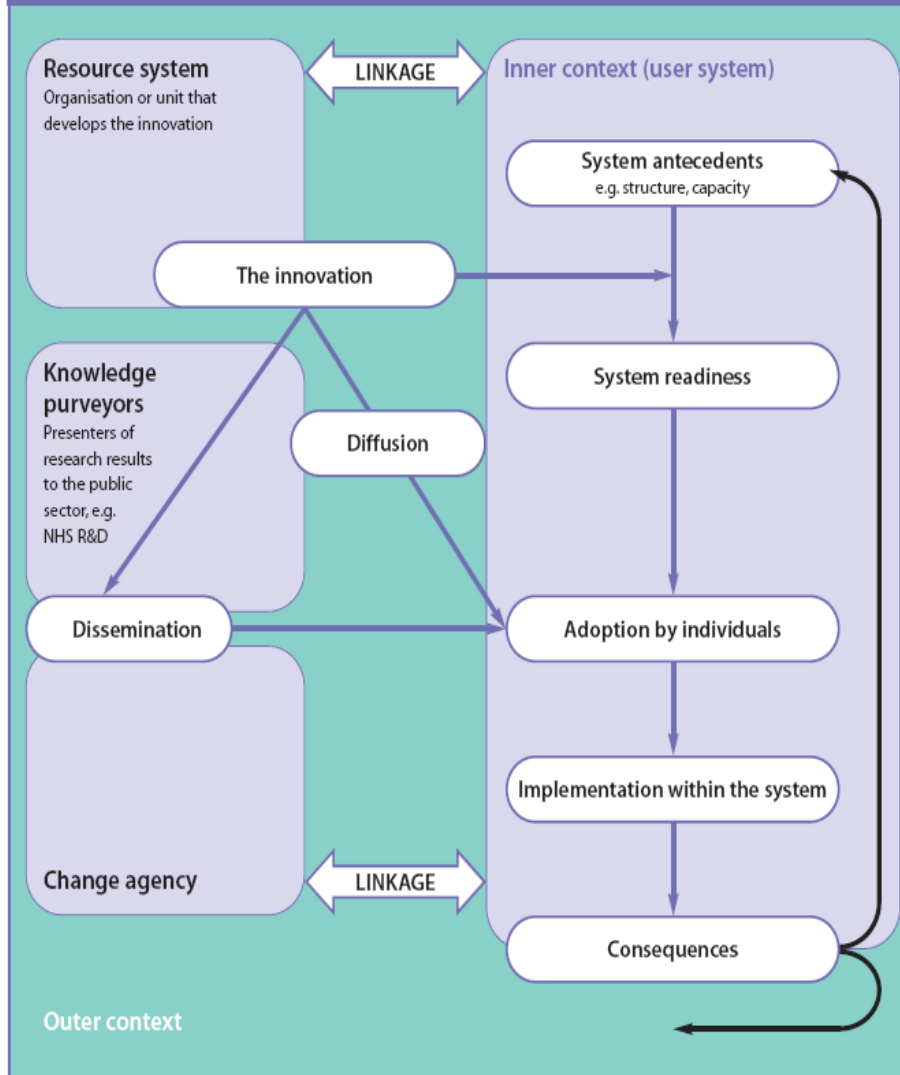
**INNOVATION**  
**Relative advantage**  
**Compatibility**  
 Low complexity  
**Trialability**  
 Observability  
**Adaptability**  
**Risk**  
 Task  
 Training  
 Technical support

**DIFFUSION (informal)**  
**Social networks**  
**Homophily**  
**Peer opinion**

Marketing  
 Expert opinion  
 Champions  
 Boundary spanners  
 Change agents  
**DISSEMINATION (formal)**

Outer Context  
 JCAHO  
 Insurance  
 Norms

Figure 1: A framework for the spread and sustainability of innovation in service delivery and organisation



**SYSTEM READINESS**  
 Tension for change  
 Innovation-system fit  
 Power balances  
 (supporters vs. opponents)  
 Assessment of implications  
 Dedicated time/resources  
 Monitoring & feedback

**THE ADOPTER**  
**Motivation**  
 Values & goals  
 Skills, learning style  
**Social networks**

**ASSIMILATION**  
 Complex, non-linear  
 Soft periphery

**IMPLEMENTATION**  
 Front line teams decide  
 Training, HT support  
 Dedicated resources  
 Internal communication

# Systems Thinking & Change Management

- Systems thinking is a framework that is based on the belief that the individual parts of a system can best be understood in the context of their relationships with one other rather than in isolation.
- Utilizes feedback to understand change
- Increased interest in systems thinking related to Change Management
- NHS program **Managing Change in the NHS**

# Systems Approach to Applying Research to Practice

- Systems approach to implementing evidence is accomplished through 4 stages:
  - Summarize evidence
  - Identify local barriers to implementation
  - Measure performance
  - Ensure implementation **ACTUALLY** occurs on a sustained basis

Pronovost, BMJ, 2008

# Johns Hopkins Center for Innovation in Quality Patient Care

- Organization of work, rather than care of individual patients
- Interdisciplinary teams “own” a Quality Improvement project
- Centralized support for the technical, detailed support
- Local customization of intervention or innovation
- Collaborative culture at both the local unit level and the larger system level

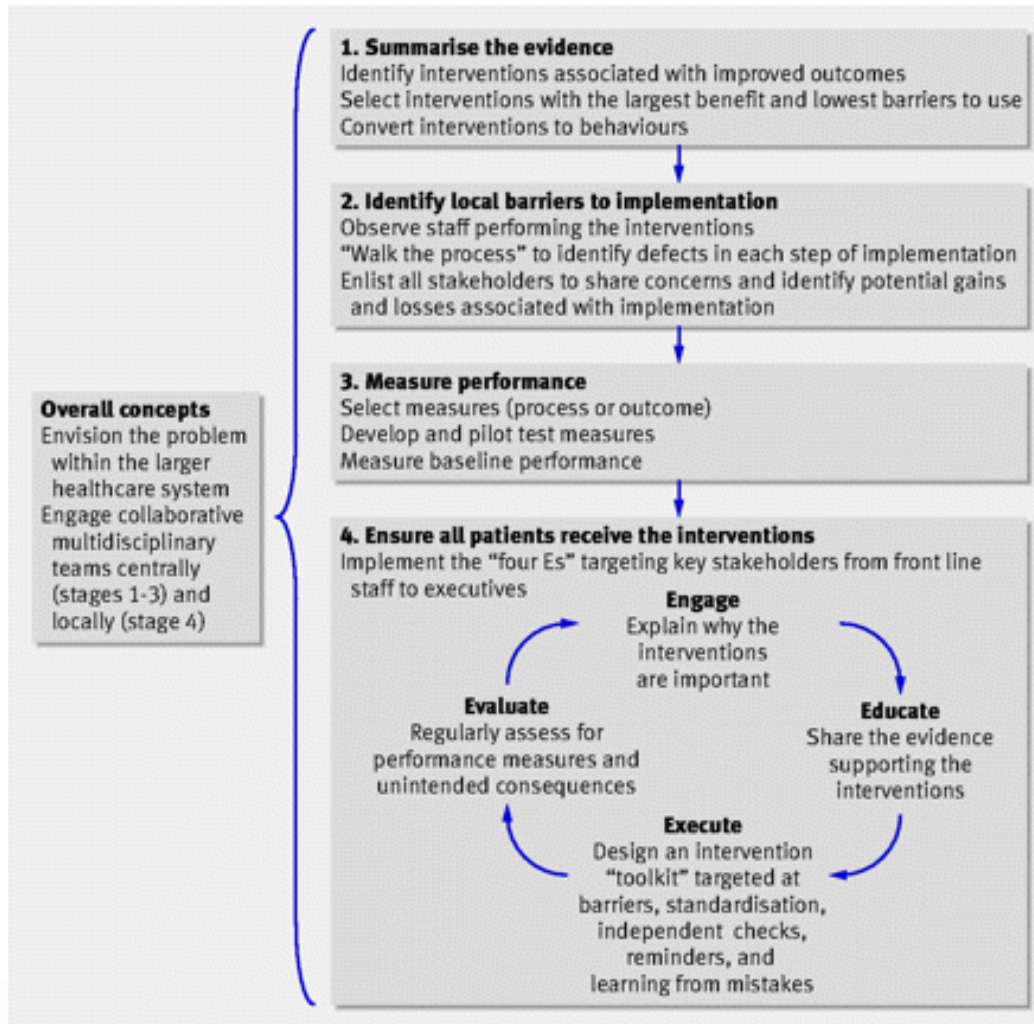
# 4 + 2 E's to Implement Evidence

- Engage---through stories
- Educate—through literature and evidence
- Execute—a toolkit to standardize the implementation
- Evaluate—“before and after”—making sure to collect baseline data against which successive iterations could be measured

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- Endure—that resources were available to continue to work in the improved way
- Extend—move the intervention into other units

# Strategy for translating evidence into practice



# 3. Evidence to Practice: A Case Study

# A Case Study

- Too many “panic values” stemming from heparin dosing by residents--Why?
- Previous attempts to change practice had not worked:
  - Automated alert
  - Nurses managed heparin
- Diffusion of innovation as theoretical framework (guideline as innovation)

# Research Design

- Semi-structured interviews with residents in a “firm” (n=17) to elicit experience with heparin dosing, sources of information and influence
- Observation & examination of documents
- Interviews with key informants: nurses, pharmacists & other staff
- Analysis of out of range lab tests (n =  $\pm$  22/month)

# Limitations & Strengths

- No direct observation of order entry
- Interviews were short ( ~15 mins)
- Small sample, researcher conducted interviews & did most data analysis
- Residents' responses suggested candor
- Residents did not know my identity or background
- Access to full cohort of residents + additional sources of data

# Results

- Residents consulted the guideline they were given, but modified it to fit their experience and patients:
- “A lot of the interns use a kind of standard approach. When you use this though, and you do a bolus, and if you do exactly what they say to do here, I think at least half of time, it’s over shot and the levels are usually super therapeutic... I usually down play it a little bit. So whatever this came out to be, say, it came out to be a 5000 unit bolus, I would tend to do like a 3000 unit bolus. And then if it said to start the drip at 1000, I would usually start the drip at 800.... if they needed to be therapeutic quickly with a PE or something, I’d bolus... to do the trick. But I usually underplay it a little bit based on the gold standard calculation. [R308]”

# Results

Heparin requires blood tests every 6 hours, but the residents found it difficult to time the blood draws with the phlebotomy schedule:

“...you kind of have to time it...But I’ve learned a little trick, to order it STAT, and then they’ll get it within a reasonable time. Sometimes it’s hard to time it perfectly. “[R104]

“...It can be really hard to get it every, even eight hours, it can be a challenge. It’s possible, but it can be very hard to get it...Too, we’re not as good as the phlebotomists and so we often need to stick people multiple times, and it’s very unpleasant for the patient.”  
[R107]

# Results

- Residents were open to nurses managing heparin
- “...for a million reasons we wish that the nurses on all floors could draw labs and then put in IVs and I think if the nurses could draw labs, they could easily follow a heparin protocol and titrate rates.” [R101]
- “...the best system is the [one in which] the nurses are drawing the blood, and then you can just call and ask them and they can do it and if you’re reasonable and give them a decent timeframe, then by far, that works the best.”[R108]

# Unexpected Result

- Late in the study, one resident cited an new ACP guideline published two months earlier that supported the use of low molecular weight heparin (enoxaparin Lovenox® sanofi-aventis) delivered subcutaneously and not requiring blood draws and titration Following this “discovery,” the resident abandoned the guideline in favor of LMWH. As he talked about its advantages, several other residents began to use it because of its perceived relative advantage.

“I would try to find a reason to use Lovenox because we don’t have to titrate that. “[R113]

“I would much rather use Lovenox over heparin any day so I try to use Lovenox as much as possible. “[R112]

# Application of Results

- All heparin protocols in the institution were reviewed with a goal of reducing the number from 11 to 3.
- Medicine service adopted the new ACP guideline as appropriate
- Insights gained enabled a more inclusive conversation involving nursing and pharmacy.

# Personal Reflection

- Experienced physicians argued that “of course, residents will seek to reduce inconvenience and will choose expedience.”
- Can you compare the use of an evidence-based guideline to searching the literature for evidence?
- What does the growing use of the use of evidence-based “info-buttons” or CDSS portend for EBLIP?

# 4. Implications for EBLIP

# Applying Evidence in Libraries

- So, you might ask, what has this to do with libraries? And to EBLIP?
- Basic tension between evidence in the service of medicine and evidence in the service of libraries. How is the professional community similar? And how is it different?
- Andrew Booth's recent work offers direction in this area
- Some additional reflections from my own experience

# Generating LIS Evidence

- Library research estimated to cost 30% of time and salaries of librarian faculty members
- Library faculty focused on areas of “personal interest” but research on library issues is needed
- Incentives from leadership are essential to generating LIS research
- What gets rewarded, gets done.

# What EBLIP Has Accomplished

- An approach
- A community
- A small—but growing--research base due to through statements from MLA, from SLA, and CILIP, among others

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But is it used?

# Implementation of EBLIP

- Not a trivial undertaking
- As information professionals, we believe it is our job to make information available.
- We “quality filter” information to make available the best possible evidence to others
- Do we filter out our “cognitive biases” in our own literature?

# Implementing EBLIP in a Large Academic Library

- Time and cost data generated to improve technical services management in large university library
- Intent was to re-classify staff to shift responsibilities upward and to do new things
- But staff resisted, due to misunderstanding and fear
- “I needed to take more time to explain things better.” (Associate University Librarian)

# Implementing EBLIP in Special Academic Library

- The “New Books List” is popular with users, but the ILS makes it awkward to produce in current workflow
- User satisfaction data alone did not motivate the staff to change
- Plan-do-test-change—but no one changes!

# Why Is Implementation So Hard?

# Information vs. Communication

- LIS values suggests that our responsibility ends at the provision of information.
- For a communications professional, the information (message) must not only be sent, it must also be received.
- The confluence of communications research and information research examines whether and how information is actually used.
- The use of information is one indication that it has been communicated.

# Communication vs. Behavior

- Behavioral research examines whether communication results in actual behavior change.
- That is, health educators, for example, not only need information, and communication information, they are seeking to determine whether the provision of information results in behavior change. This is one of the “grand challenges” of the information/communication/education fields. Does information make a difference? Does it result in behavior al change?

# Effect and Insight

- Medicine aims to demonstrate outcomes resulting from an intervention.
- As Booth as pointed out, the evidence base for effectiveness in LIS is equivocal at best.
- Demonstrating that information--on its own—results in behavioral change is challenging.
- We can perhaps demonstrate correlation, and also “add insight”
- Exploratory research, to add insight, is appropriate in periods of rapid change.

# Individual vs. Organization

- In libraries, rarely are we talking about the application of evidence by a single individual or to a single individual.
- Team science & systems thinking more relevant than individual, autonomous decisions
- Additional approaches:
  - Organizational development (OD)
  - Systems thinking
  - Data-driven decision-making
  - Data repositories & collaboratives
  - LIBQUAL

# LIBQUAL

- LIBQUAL is a “suite of services that libraries can use to solicit, track, understand and act upon users’ opinions of service quality.”
- “It helps libraries assess and improve library services, change organizational culture and market the library.”
- Used in >1000 libraries worldwide of all types
- <http://www.libqual.org>

# LIBQUAL Data Repositories

- LIBQUAL provides a consistent pool of data collected by libraries. This can be used to generate comparative studies about how a library is performing.
- Can lead to “best practices” and “comparative effectiveness research,” just as in healthcare

# LIBQUAL Example

- Lund University's use of LIBQUAL process revealed some fascinating insights regarding the "new user" (Kryllidou & Persson, 2006)
- These were generated through qualitative methods that can be augmented with data generated through transaction logs, gate counts and circulation data.
- Excerpts from the report are revealing:
  - "We have been unable to see the users' information needs..." [because we were looking through the lens of the library]
  - "Librarians "construct" the user they ask" (Kruse, 2004)
- These observations suggest that the same call for meticulous, detailed and multi-method studies of innovation and change that Greenhalgh made for healthcare also exist in libraries.

# Factors Necessary for Effective Library Assessment

- \*Library leadership
- \*Organizational culture
- Identifying responsibility for assessment
- Library priorities
- Sufficiency of resources
- Data infrastructure
- Assessment skills and expertise
- Sustainability
- Analyzing and presenting results
- Using results to improve libraries.
- --Making Library Assessment Work (ARL)
- \*Most important factors; without these, will fail

# Insight + Data

- “If you listen carefully to the patient they will tell you the diagnosis”
- But you would not ignore the lab results or physical exam.

# 5. The Way Forward

# Health Research & LIS Research

- Health research is conducted in universities and other centers; most clinicians are not researchers
- Health data may be collected through government or association agencies
- Libraries have mechanisms through which to share data; for example, shared cataloging, standards, benchmarking, and resource sharing
- LIS exemplifies high quality data sharing because it 1) follows standards 2) includes complete information 3) is accurate and reliable.

# The Information Professions and Healthcare

- Libraries have complex workflow and organizational issues just as healthcare does
- Library standards enable data sharing that illustrate benefits yet to be realized through EHRs
- Greater inter-disciplinary sharing of expertise, evidence and experience between information professionals and health professionals
- Pooling data enables data-driven decisions.
- Doing an RCT may be less important than implementing available assessment activities.

# Formative Evaluation & Data Repositories

- 1) formative or process evaluation to inform decision makers
- 2) an evidence repository for health IT implementations
- 3) Friedman's "small ball" evaluation.
- Small scale evaluations can yield valuable information regarding the effectiveness, individual and organizational issues, and cost. The AHRQ Evaluation toolkit available at <http://healthit.ahrq.gov>
- By substituting evidence based guideline for technological innovation, the Toolkit is a good guide for formative evaluation of the process of implementing evidence in practice.

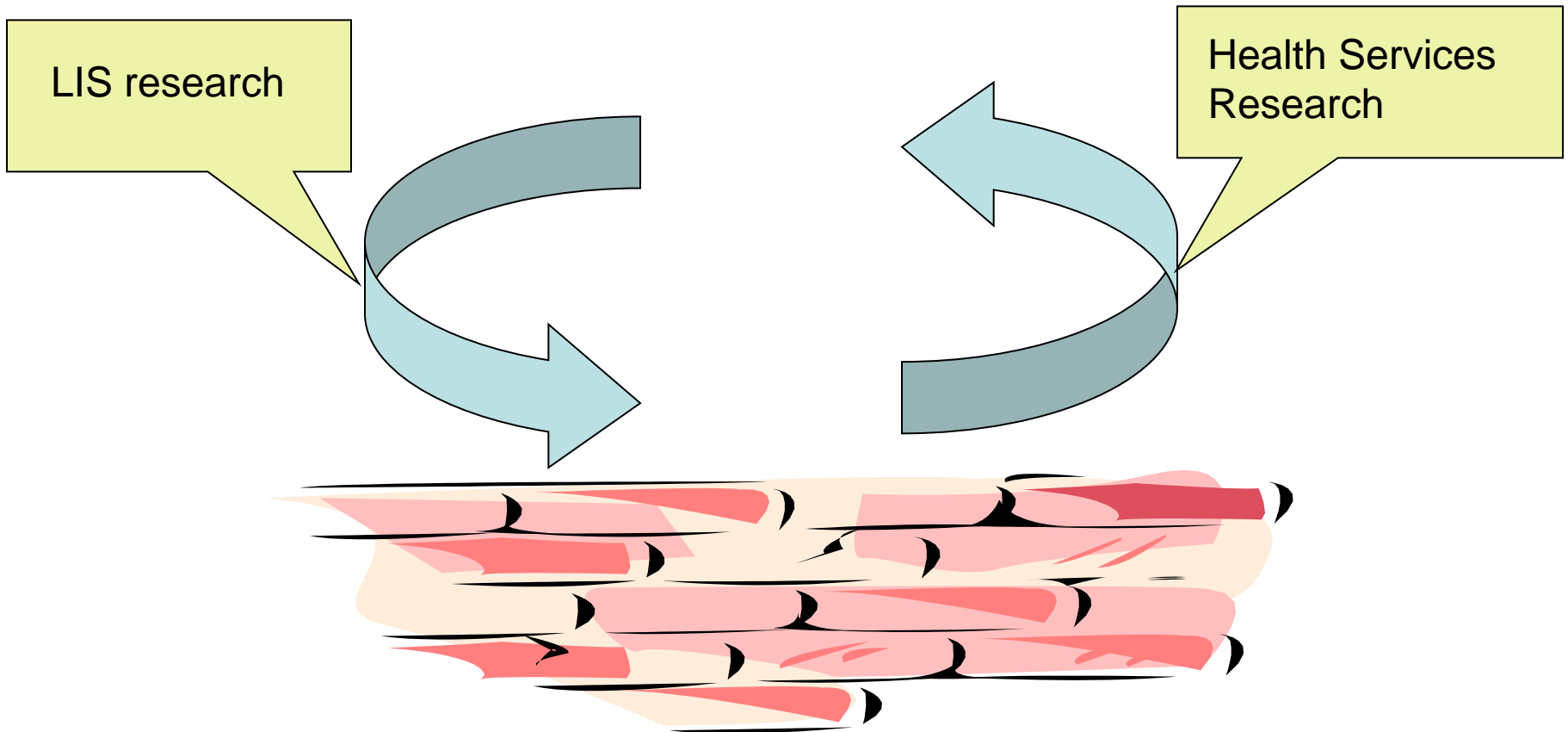
# What I Learned about EBM edicine

- Evidence isn't enough
  - Evidence alone cannot change practice
  - Context is key
  - Adapting evidence increases use
  - Systems thinking and incentives essential

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# An Ideal Future?



**Foundation of shared data & insights**

# Conclusion

- Evidence based practice is a foundation for professional practice.
- Data + insight creates a solid foundation for practice
- Evidence-based practice can facilitate interdisciplinary discourse and quality improvement.

*Thank you & Time for Questions*

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