Electonic Health Records Use from a Complexity Science Perspective

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Context: US Health Care System

"Between 44,000 to 98,000 people die each year in US hospitals as a result of preventable medical errors."

-- To Err is Human, Institute of Medicine Report, 1999

Thought Leaders in Health IT (2001-2009)

"The use of information technology is key to solving problems in health care."

- Institute of Medicine Report
  Crossing the Quality Chasm, 2001

"The time has come for an electronic medical record in every group medical practice in America. Period. End of story."

- Donald M. Berwick, MD, President & CEO
  Institute for Healthcare Improvement
  October 6, 2004

Learning Objectives

At the end of this presentation participants will be able to:

1. Discuss the national health IT dissemination and implementation efforts underway as a result of the ARRA 2009 legislation.
2. Understand how their individual views of uncertainty influence their use of health IT.
3. Understand how practice level factors shape practice level EHR use patterns.

Disclosure

Holly Lanham, PhD, MBA, has no relationships with commercial companies to disclose.
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“We’ve got 21st century medical practices, but 19th century paperwork systems...electronic medical records are one of the great innovations in medicine.”
- President George W. Bush
  Remarks at National Institutes of Health
  January 26, 2005

"Our recovery plan will invest in electronic health records and new technology that will reduce errors, bring down costs, ensure privacy, and save lives."
- President Barack Obama
  Address to Joint Session of Congress
  February 24th, 2009

American Recovery & Reinvestment Act 2009

$27B intended to stimulate the economy through investments in infrastructure, unemployment benefits, transportation, education and healthcare
  • specifically directs almost $36B to healthcare information technology and electronic health record adoption
  • $27B incentive program to encourage greater use of electronic health records
  • Physicians eligible to earn a up to $44,000 from Medicare and $63,750 Medicaid beginning Oct 1, 2011

Is health IT making a difference?

Continued challenges in health care today…

“Medical errors kill enough people to fill four jumbo jets a week.”
- Wall Street Journal, Sept. 21, 2012
Thought Leaders in Health IT (2009-present)

“The widespread use of electronic health records in the United States is inevitable. EHRs will improve caregivers’ decisions and patients’ outcomes. Once patients experience the benefits of this technology, they will demand nothing less from their providers.”
- David Blumenthal, Director of the Office of the National Coordinator for Health IT
New England Journal of Medicine, 2010

“Dissatisfaction with electronic health records among some providers remains a problem and a barrier to achieving the potential of health information technology.”
- Melinda Buntin, Office of the National Coordinator for Health IT, Health Affairs, 2011

“The very low levels of adoption of electronic health records in U.S. hospitals suggest that policymakers face substantial obstacles to the achievement of health care performance goals that depend on health information technology.”
- Ashish Jha, Harvard School of Public Health, New England Journal of Medicine, 2009

Research question

Why do physicians working in the same organization use the same electronic health record (EHR) system differently from each other?

Research design

- Comparative case study
  - 28 physicians; 8 practices; 1 organization
  - All using the same EHR system
  - Prior to ARRA (HITECH Act & Meaningful Use legislation)
- Data collection
  - Direct observation
  - Semi-structured interviews
- Exploratory & focused on studying differences in EHR use patterns
- Field site
  - 120+ physician for-profit multispecialty outpatient group
  - 21 practices in 17 locations
  - 6 years after purchasing EHR system
- Analysis: Constant comparison (Strauss & Corbin, 1998)
  - Field notes and interviews coded for themes (open coding; NVivo)
  - Similar themes grouped into categories
  - Categories used to make comparisons between physician and practices
Overview of eight practices

<table>
<thead>
<tr>
<th>Practice</th>
<th>Physicians</th>
<th>Clinical Staff</th>
<th>Non-clinical staff</th>
<th>Total Practice Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Practice 1</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Family Practice 2</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Family Practice 3</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>13</td>
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<tr>
<td>Specialty Practice 1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Specialty Practice 2</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Specialty Practice 3</td>
<td>6</td>
<td>9</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Specialty Practice 4</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>16</td>
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<tr>
<td>Specialty Practice 5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>11</td>
</tr>
</tbody>
</table>

Findings

- **Study 1: Practice level**
  - Relationships and communication associated with *practice-level* EHR use

- **Study 2: Individual level**
  - Individual views of uncertainty in health care delivery associated with *individual-level* EHR use

Study 1: Practice-level EHR use

Lanham et al., *Joint Commission Journal on Quality and Patient Safety*, 2009

**Findings: Relationships and EHR use**

- Relationships associated with *practice level* EHR use
  - Fragmented communication patterns associated with heterogeneous EHR use
  - Cohesive communication patterns associated with homogeneous EHR use

Model of EHR use

Lanham et al., *Journal of the American Medical Informatics Association*, 2012
Table 4  Linking within-practice communication patterns and electronic health record (EHR) use patterns

<table>
<thead>
<tr>
<th>Practice</th>
<th>Within-practice communication patterns</th>
<th>Physician–nurse team EHR use</th>
<th>Primary/level EHR use patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family medicine A</td>
<td>Fragmented</td>
<td>Team 1–High</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>Family medicine B</td>
<td>Fragmented</td>
<td>Team 2–Low</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>Family medicine C</td>
<td>Cohesive</td>
<td>Team 3–Medium</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>Specialty practice A</td>
<td>Cohesive</td>
<td>Team 4–High</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>Specialty practice B</td>
<td>Cohesive</td>
<td>Team 5–Low</td>
<td>Homogeneous</td>
</tr>
</tbody>
</table>

Lanham et al., Journal of the American Medical Informatics Association, 2012

Findings: Perspectives of uncertainty (Type 1)

“‘And you know you wanna have the information you need, when you need it. I guess at some point we put all the information into electronic medical records and we do away with the charts and if we get records elsewhere, we’ll maybe they can just download all in that information in there you know.’”

—Brian

“‘I’m just maybe a little more complainy than other people and it satisfies that need in me to know exactly what medicines my patients are on; know exactly what interactions they may have; you know and so for someone with those needs this is a great system.’”

—John

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“I take pride in the fact that if a patient gets dumped in our hospital for an admission, I want them to go to my stats first; rather than the internal medicine doctor’s history and physical because they get better and more information out because I did write down that they had an append–appendectomy. That they had three pregnancies but only two kids, and one spontaneous abortion. That kind of information. That’s a personal note of pride that actually drove me more to be an excellent record keeper in that way, that’s my information that can be used.”

—Norman
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-- John

"I’m just maybe a little more compulsive than other people and it is satisfies what need in me to know exactly what medicines my patients are on, know exactly what interactions they may have, you know, and so for someone with those needs this is a great system."

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"I take pride in the fact that if a patient gets dumped in our hospital for an admission, I want them to go to my note first, rather than the internal medicine doctor's history and physical because they get better and more information out because I did what done that they had a appendiceal appendectomy. They had these pregnancies but only two licks, and one spontaneous abortion. That kind of information. That’s a personal note of pride that actually drives me more to be an excellent record keeper in that way; that’s, my information that can be used.

-- Norman

"I think it’s; it made things a lot safer in many respects. And as doctors we need that. You know we need we need the, immediate availability of information."

-- Ted

Findings: Perspectives of uncertainty (Type 2)

"I’m not sure what the purpose of having a medication list in there if we pretty much don’t know if it’s correct or not. For example, any medication list in the system assumes that every doctor the patient sees is within the clinic which is not true, most of the time; and it also assumes that somebody updated the list every time that medication has changed, which is not true most of the time. But still the fact is that you don’t know what someone’s taking unless you ask them that day, because that could have changed the day before you wouldn’t know. We never actually have all the medications that someone is taking. We never have a complete list."

-- Charlie

"And, I mean the notes are important, but I really don’t know if they’re going to help anyone."

-- Mike

"I don’t know if the information I need is really in there [EHR]."

-- Morgan

"Information has no value unless it is quickly retrievable and in the right/reusable form. When I read other people’s notes I don’t get any much information; I’m interested in practitioner’s assessment of putting it all together."

-- Tye

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"Life is like a box of chocolates... you never know what you’re gonna get when you open that door."

-- Mike
Findings: Perspectives of uncertainty

- **Traditional View of Uncertainty**
  - Uncertainty is reduced with more information or better information processing capacity

- **Irreducible Uncertainty**
  - Uncertainty that is not a result of ignorance or the partiality of human knowledge but is a characteristic of the world itself
  - Outcomes often described as probabilistic, not predictable
  - Nonlinearity in complex systems contributes to this type of uncertainty
  - Idea originates in chaos theory and complexity theory

- **Hybrid View of Uncertainty**
  - Some uncertainty is reducible with more information or better information processing
  - Some uncertainty is irreducible

Uncertainty Reduction vs. Uncertainty Absorption

- Table 2: Definitions of physicians’ perceptions of uncertainty codes
  - | Code | Definition |
  - | --- | --- |
  - | Uncertainty reduction | Observations or statements associated with or indicating strategies for managing uncertainty by reducing it with information or information processing: diminishing irreducible risk and striving for certainty |
  - | Uncertainty absorption | Observations or statements associated with or indicating strategies for managing uncertainty by assimilating it or incorporating it into local circumstances; includes high use of relationships or interdependencies with others including physicians, nursing staff, patients, etc. to manage uncertainty |

Physicians and Uncertainty

Uncertainty is inherent in health care delivery systems.

“Uncertainty creeps into medical practice through every pore. Whether a physician is defining a disease, making a diagnosis, selecting a procedure, observing outcomes, assessing probabilities, assigning preferences, or putting it all together, he is walking on very slippery terrain. It is difficult for nonphysicians, and for many physicians, to appreciate how complex these tasks are, how poorly we understand them, and how easy it is for honest people to come to different conclusions.”

-- David Eddy, 1984

Implications

- Consider relationships among practice members as lever for improving health IT use
  - Consider physicians’ perspectives of uncertainty in EHR implementation and management
    - Clinicians who acknowledge irreducible uncertainty may present greater challenges for health IT designers, developers, & managers
    - Selection of clinician champions
    - IT as an artifact for learning
Questions, Comments, Thoughts?

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