Hospital Efficiency Changes from Health Information Exchange Participation

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Daniel M. Walker, PhD, MPH
Assistant Professor
CATALYST, The Center for the Advancement of Team Science, Analytics, and Systems Thinking
Department of Family Medicine
College of Medicine, The Ohio State University
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Does participation in an HIE improve hospital efficiency?
A HITECH Perspective of HIE

What is the Value Proposition of HIE?
A Logic Model Grounded in Organizational Value (Walker, 2017)

Environmental Inputs
- HITECH/MU
- Payment Reform

Initial Activities
- HIE Participation

Ongoing Activities
- Clinical Information Sharing
- Workflow Redesign

Immediate Outcomes
- Improved Service and Care Coordination

Secondary Outcomes
- Cost Savings
- Improved Quality
- Improved Efficiency

Policy

Hospital Care Process Transformation

Organizational Value

Which organizations achieve the value proposition?
Efficiency vs. Productivity

• Efficiency is the transformation of inputs to outputs
• Productivity as sustained Efficiency: Total Factor Productivity (TFP)

Do the same things better (more efficiently)
Technical Efficiency Change (TEC)

Do new things (innovation)
Technological Change (TC)
Does HIE matter?

1. Do Hospitals that participate in HIE at any time increase TEC, TC, and TFP more over time than those that never participate in HIE.

2. Does greater duration of hospital HIE participation yield greater increases in TEC, TC, and TFP over time.
Methods

- Key Independent Variables:
  - H1: Any HIE Participation
  - H2: Total Years of HIE Participation
- Analytical Approach: Ordinal logistic regression
- Data issues
  - Selection: Inverse Probability Weighting
  - Endogeneity: Propensity Score Adjustment
Methods

• Outcomes: TEC, TC, TFP
  • Malmquist Algorithm (DEA)
    • Type of Date Envelopment Analysis
    • Sets ‘frontier’ of efficiency
    • Compares each hospital to frontier
      • Rather than to ‘average’ hospital (regression)
      • Can shift along frontier and/ or frontier can shift
  • Uses a set of inputs and outputs to determine frontier of hospital efficiency
    • Inputs: Total Licensed Beds, Licenses Nursing Staff, Other FTEs
    • Outputs: Surgical Outpatient Visits; MCMII Adjusted Admissions; Average Daily Census; ED Visits; Outpatient Load
  • Market based analysis
    • Within each Census Region:
      • Combined Division/Metro & Suburban/Rural CBSA

\[ \text{TEC} = \frac{q}{m} \]
\[ \text{TC} = \frac{n}{f} \]
\[ \text{TFP} = f(\frac{q}{m} \times \frac{n}{f}) \]
Results
## Results: H1 – Any HIE Participation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Outcome</th>
<th>TEC OR (95% CI)</th>
<th>TC OR (95% CI)</th>
<th>TFP OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Any HIE Participation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEC</td>
<td>1.29 (1.03-1.64)</td>
<td>1.06 (0.84-1.33)</td>
<td>1.32 (1.05-1.67)*</td>
</tr>
<tr>
<td>EHR Status:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>TEC</td>
<td>Ref.</td>
<td>Ref.</td>
<td>Ref.</td>
</tr>
<tr>
<td>Basic</td>
<td>TEC</td>
<td>1.21 (0.92-1.35)</td>
<td>0.99 (0.74-1.34)</td>
<td>1.36 (1.04-1.77)**</td>
</tr>
<tr>
<td>Comprehensive</td>
<td>TEC</td>
<td>0.96 (0.68-1.35)</td>
<td>0.90 (0.60-1.35)</td>
<td>0.87 (0.59-1.28)</td>
</tr>
</tbody>
</table>

**Notes:** *p<.05; **p<.01;

**Additional Covariates:** Teaching; System Membership; Ownership Type; Bed Size; Herfindahl Index
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<tr>
<td><strong>Years of HIE:</strong></td>
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<tr>
<td>1 Year</td>
<td>1.25 (0.93-1.68)</td>
<td>1.10 (0.83-1.46)</td>
<td>1.33 (1.00-1.77)*</td>
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</tr>
<tr>
<td>2 Years</td>
<td>1.29 (0.91-1.84)</td>
<td>0.87 (0.62-1.23)</td>
<td>1.17 (0.82-1.67)</td>
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<tr>
<td>3 Years</td>
<td>1.46 (0.97-2.20)</td>
<td>1.53 (0.95-2.45)</td>
<td>1.73 (1.17-2.56)**</td>
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</tr>
<tr>
<td>4 Years</td>
<td>1.32 (0.78-2.23)</td>
<td>0.96 (0.55-1.67)</td>
<td>1.26 (0.58-2.71)</td>
<td></td>
</tr>
<tr>
<td><strong>EHR Status:</strong></td>
<td></td>
<td></td>
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Discussion
Discussion

• Any HIE improves TEC and TFP, but not TC

• Some evidence of learning effect at 1 and 3 years

• Greater benefits may come from innovation

• Basic EHR improves overall efficiency in both models

• HIE landscape has evolved since 2012

• Efficiency Measurement as a method has shortcomings

• Hospitals represent only one perspective
Future Directions

- Improve ability of HIE to support care coordination and population health
- Develop standard HIE meta-data reporting to promote research
- Questions remain about what information is most useful at the point of care
Contact ONC

Questions?
Daniel.walker@osumc.edu

Phone: 202-690-7151

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