Economic Benefit of an Educational Intervention to improve tPA Use as Treatment for Acute Ischemic Stroke in Community Hospitals

Secondary Analysis of the INSTINCT Trial

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StrokeNet Trainee

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Disclosures

• Funding NIH NINDS
  – R01 NS050372 (PI: Scott)

• Financial conflicts of interest: none
Background

• INSTINCT
  – INcreasing Stroke Treatment through Interventional Change Tactics

• Trial Design
  – Prospective, cluster randomized controlled trial
  – Involves 24 acute care community hospitals in lower Michigan
Study Hospitals
Background

• Trial Design
  – Hospitals were matched in pairs based on ED volume and stroke admissions
  – Randomly assigned to receive intervention vs. control:
    • Standardized barrier assessment
    • Interactive educational intervention
  – Goal
    • Improve appropriate tPA use in community EDs without dedicated stroke teams in lower Michigan
Objectives

1. Cost effectiveness of INSTINCT knowledge translation research program due to increased tPA treatments.

2. Would deploying the interactive educational intervention outside of the research realm be cost effective.
Methods

- Per-protocol analysis

<table>
<thead>
<tr>
<th></th>
<th>Intervention Sites</th>
<th>Control Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Total Stroke Patients</td>
<td>10,627</td>
<td>10,071</td>
</tr>
<tr>
<td>tPA Treated Patients</td>
<td>244</td>
<td>160</td>
</tr>
<tr>
<td>Fraction tPA Treated</td>
<td>2.30%</td>
<td>1.59%</td>
</tr>
</tbody>
</table>

- Net increase of tPA use – 0.71%
Methods

- Demographics

<table>
<thead>
<tr>
<th></th>
<th>Intervention Sites</th>
<th>Control Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>43%</td>
<td>52%</td>
</tr>
<tr>
<td>Prior Stroke</td>
<td>18%</td>
<td>19%</td>
</tr>
<tr>
<td>Age (years)</td>
<td>68.7</td>
<td>71</td>
</tr>
<tr>
<td>NIHSS</td>
<td>12.1</td>
<td>11.9</td>
</tr>
</tbody>
</table>
Methods

• Analytical Model
  – Long-term health and economic outcomes were predicted using a decision-analytic Markov model of progression of stroke patients.
    • Decision tree at hospital presentation
    • Mortality and mRS assigned based on tPA use
    • Patients enter Markov model that tracks mRS and mortality.
Methods

• Decision tree and model
Methods

• Outcomes data
  – Long-term outcomes data gathered from medical literature

• Cost-effectiveness data
  – Gathered from several pertinent studies on cost-effectiveness of tPA use.

• Costs of stroke care
  – Obtained from several databases (HCUPnet), market surveys, and studies of long-term care
Methods

• Rankin scores converted to QALYs using previously published studies.

• Used a societal perspective
  – Aggregated all health effects and costs regardless of payer

• Tracked health outcomes in terms of QALYs.
Methods

• Costs of intervention

<table>
<thead>
<tr>
<th></th>
<th>Research-based</th>
<th>Generalized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant Award</td>
<td>$3.158M</td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td></td>
<td>$567,801</td>
</tr>
<tr>
<td>Opportunity Costs (CME)</td>
<td>$126,502</td>
<td>$114,622</td>
</tr>
<tr>
<td>Total</td>
<td>$3.285M</td>
<td>$682,423</td>
</tr>
</tbody>
</table>

• Opportunity costs - lost productivity for medical providers (MD, RN, PA, Pharmacists).
Results

- Research-based Intervention

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Direct Cost Saving</td>
<td>$545,000</td>
</tr>
<tr>
<td>Additional QALY</td>
<td>82.75</td>
</tr>
<tr>
<td>Net Cost</td>
<td>$2.74M</td>
</tr>
<tr>
<td>ICER ($/QALY)</td>
<td>33,105</td>
</tr>
<tr>
<td>Net Monetary Benefit</td>
<td>$1.4M</td>
</tr>
</tbody>
</table>
Results

- Generalized Intervention

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<td>Net Cost</td>
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</tr>
<tr>
<td>ICER ($/QALY)</td>
<td>1,655</td>
</tr>
<tr>
<td>Net Monetary Benefit</td>
<td>$3.9M</td>
</tr>
</tbody>
</table>

- Assumes similar intervention effectiveness and outcomes
Results

- One-way sensitivity analysis
  - Significant variables
    - Annual cost of nursing home
    - Age of patient at time of stroke
    - Fraction of patients receiving tPA
## Results

### Variables

<table>
<thead>
<tr>
<th>Annual inpatient rehab cost</th>
<th>Annual NH cost</th>
<th>Annual outpatient rehab cost</th>
<th>Annual stroke services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalization cost</td>
<td>ICH hospital costs</td>
<td>Subsequent stroke</td>
<td>Cost of tPA</td>
</tr>
<tr>
<td>Months in inpt rehab</td>
<td>Fraction d/c to NH</td>
<td>ICH without tPA</td>
<td>ICH with tPA</td>
</tr>
<tr>
<td>Age at time of stroke</td>
<td>Fraction receiving tPA with the intervention</td>
<td>Fraction receiving tPA without the intervention</td>
<td>Distribution of pts in 1st year by mRS without tPA</td>
</tr>
<tr>
<td>Distribution of pts in 1st year by mRS with tPA</td>
<td>Distribution of pts in 2nd year by mRS without tPA</td>
<td>Distribution of pts in 2nd year by mRS with tPA</td>
<td>Annual rate of stroke</td>
</tr>
<tr>
<td>RR to other cause mortality b/c of prior stroke</td>
<td>Discount rate</td>
<td>Time horizon</td>
<td>Distribution of health-related quality of life</td>
</tr>
</tbody>
</table>
Results

• Sensitivity Analysis – NH Cost
Results

- Sensitivity Analysis - Age
Results

• Sensitivity Analysis – Fraction Receiving tPA
Limitations

• Long-term health outcomes and costs projected using mathematical model
  – Consistent with other similar models

• Did not account for lost productivity
  – Leads to conservative outcomes
Conclusions

• Appropriate tPA administration in patients with AIS is highly cost effective

• Funds spent on the INSTINCT Trial are cost-effective and achieve good value

• Future deployment of similar interventions would cost less and achieve similar economic benefit.
Acknowledgements

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Statistician
• Jack Kalbfleisch
Questions/Discussion