beaRTAME: Understanding and Adapting to Late and Missed Appointments in Pediatric Care (Pilot Report)

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ESRI HHS Users Conference
Progression of GIS Use and Adoption at CNHS

Discovery
- Obesity/Asthma
  - ESRI HHS 2013

Analytics and Process
- Sickle Cell Readmission
  - ESRI HHS 2014

Action
You'll never get to work on time, HAHAA!!
HCAHPS: Recommend the Hospital
(Represents patients discharged between July 2013 and June 2014)

<table>
<thead>
<tr>
<th>Region</th>
<th>Count</th>
<th>Total</th>
<th>Recommend</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>New England</td>
<td>172</td>
<td>141,231</td>
<td>4%</td>
<td>22%</td>
</tr>
<tr>
<td>Mid-Atlantic</td>
<td>386</td>
<td>334,475</td>
<td>6%</td>
<td>26%</td>
</tr>
<tr>
<td>South Atlantic</td>
<td>617</td>
<td>578,420</td>
<td>6%</td>
<td>25%</td>
</tr>
<tr>
<td>East North Central</td>
<td>673</td>
<td>512,249</td>
<td>4%</td>
<td>24%</td>
</tr>
<tr>
<td>East South Central</td>
<td>346</td>
<td>206,504</td>
<td>5%</td>
<td>25%</td>
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<tr>
<td>West North Central</td>
<td>535</td>
<td>241,455</td>
<td>5%</td>
<td>23%</td>
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<tr>
<td>West South Central</td>
<td>593</td>
<td>377,101</td>
<td>5%</td>
<td>22%</td>
</tr>
<tr>
<td>Mountain</td>
<td>334</td>
<td>242,623</td>
<td>5%</td>
<td>24%</td>
</tr>
<tr>
<td>Pacific</td>
<td>467</td>
<td>439,960</td>
<td>6%</td>
<td>24%</td>
</tr>
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</table>
Health care spending has grown much faster than the rest of the economy in recent decades.

THE HUFFINGTON POST
beaRTAME: Real Time Appointment Management and Execution System
Methods

• Retrospective Analysis
  • All outpatient surgery cases at CNHS Main Campus
  • 08/01/2014–07/31/2015
  • Potential Indicators (Pilot):
    Surgery Service
    Scheduled to Surgery Time
    Geographic Location (and associated variables)
## Surgery Study Sample

<table>
<thead>
<tr>
<th></th>
<th>Study Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On-Time</td>
</tr>
<tr>
<td>Sample Size (%)</td>
<td>8,088 (84.8)</td>
</tr>
<tr>
<td>Median Minutes Late (IQR)</td>
<td>–</td>
</tr>
<tr>
<td>Median Time from scheduling to appointment in days (IQR)</td>
<td>20.7 (8.9–39.6)</td>
</tr>
</tbody>
</table>
$12 Million
Originating Medical Service ($\chi^2=147, p<0.001$)
Impact Factor

• Public Transit Network
• Time of Day vs. Patient Location
• Surgery Type (Service)
• Socioeconomic Status
Move to Action
beaRTAME System of Improvement

Predictive Scheduling

Dynamic Reminders

Responsive Adjustment

Office Alerting
Real Time Office Alerting

Process Improving, Customer Satisfaction Increasing, Cost Reducing Dashboard

1 - Sonny Beech
Estimated 18 minute(s) early

- Heart rate: 53
- Variability: 486
- Resp rate: 23
- Skin temp: 97.8°

2 - Steve Mulberry
Estimated 10 minute(s) late

- Heart rate: 53
- Variability: 407
- Resp rate: 19
- Skin temp: 98.3°

3 - Daniel Bradshaw
Estimated 12 minute(s) late

- Heart rate: 54
- Variability: 480
- Resp rate: 19
- Skin temp: 98.8°

start simulation
Next Steps

• Model Expansion
• Prospective prediction model testing
• Scheduling Integration
• Responsive Adjustment and Office Alerting Pilot
• Use Case Evaluations (Other Appointment Types)
Questions?

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