Improving Survival from Sepsis-
Lessons from the NY State Sepsis Improvement Initiative

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Introduction
### New York State (NYS):

<table>
<thead>
<tr>
<th></th>
<th>NY State</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>19.7 Million</td>
<td>82.6 Million</td>
</tr>
<tr>
<td>Area</td>
<td>141,300 km²</td>
<td>357,170 km²</td>
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</tbody>
</table>
Sepsis in New York State

- Approximately 50,000 patients are diagnosed with severe sepsis or septic shock each year
- Almost 30% of adults, 9% of children, die in the hospital
- Early detection coupled with appropriate interventions can improve the chances of survival for patients with sepsis
- Around 2010, Sepsis was beginning to be recognized as an issue, fueled by:
  - National interest
  - Local interest (Stop Sepsis Campaign in New York City), IHI
  - Rory Staunton
NY State Sepsis Care Improvement Vision

Goal:
To reduce sepsis mortality in hospitals by 50%
NY State Sepsis Regulations

2013: New York State adoption of sepsis regulations (Rory’s Regulations)

• NYS DOH required to…
  ➢ Review and approve hospital protocols
  ➢ Facilitate the clinical data collection and reporting of sepsis measures

• NYS hospitals required to…
  ➢ Submit evidence-based protocols for the early recognition and treatment of patients with severe sepsis and septic shock
  ➢ Provide training for their medical staff on sepsis protocols
  ➢ Submit sepsis clinical data to the NYS Department of Health (DOH)
Statewide Sepsis Care Improvement Actions

- Created Sepsis Advisory Group
- Data Collection (Quarterly submissions)
  - Adult and Pediatric cases, severe sepsis and septic shock
  - Developed a data dictionary
  - 70 variables, including treatment, severity, comorbidities, and discharge
  - 3-hour and 6-hour bundles for adults (used NQF-500 as a guide)
  - 1-hour bundle for pediatrics
- Data audited and hospitals have the ability to correct data
- Data used to calculate hospital sepsis bundle performance and outcome data; publicly available
Transparency: Quarterly Data Reports between Hospitals and DOH

- Hospitals to DOH
  - Quarterly reported severe sepsis and septic shock cases, up to 2 months after closure of quarter
  - Including all transfer cases

- DOH to Hospitals
  - Quarterly performance report includes:
    - Demographics, protocol exclusions, treatment variables, treatment bundles (25\textsuperscript{th}/75\textsuperscript{th} percentile benchmark, all hospitals)
Data Validation

• Statewide Planning and Research Cooperative System (SPARCS) – allows verification of clinical data

• Audits (chart reviews) on 10% of cases

• Using risk adjustment to compare results across facilities
Identifying Sepsis Cases – Clinical vs. Administrative Data (ICD10)* (2015 – 2016 data)
NY State Sepsis Care Improvement Initiative Partners

- NY State DOH Office of Quality and Patient Safety
- New York State Hospitals and Clinicians
- Sepsis Advisory Work Group
- GNYHA
- HANYS

Working together to reduce barriers:
- Involvement of clinicians in advising and framing of decisions
- Transparency in data collection and reporting
- Collectively working together to improve quality of care
NY State Department of Health
Sepsis Care Initiative
NY State Department of Health’s Approach to Sepsis Care Improvement:

1) Public reporting

2) Research

3) Quality improvement
Sepsis Public Report and Publicly Available Sepsis Data Sets

• Describe the quality of care and outcomes for patients treated for severe sepsis/septic shock at NYS hospitals

• Vehicle for public reporting of current measure performance and trends calculated from sepsis clinical data submitted to the Department

• Helps to inform hospitals and general public of ongoing sepsis care improvement initiative activities

Sepsis Public Report Statewide Trends

• 3-hour management bundle: Blood cultures, broad spectrum antibiotics, lactate measurement

• Timely administration (3-hour) of broad-spectrum antibiotics

• 6-hour management bundle

• Pediatric 1-hour bundle

• Adult and pediatric in-hospital mortality

Sepsis Performance Data Example: Adult 3-Hour Bundle

Performance Change

<table>
<thead>
<tr>
<th>Performance Change</th>
<th>Hospitals (N)</th>
<th>Hospitals (%)</th>
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</thead>
<tbody>
<tr>
<td>Improved Performance</td>
<td>90</td>
<td>61.22</td>
</tr>
<tr>
<td>Same Performance</td>
<td>0</td>
<td>0.00</td>
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<tr>
<td>Declined Performance</td>
<td>57</td>
<td>38.78</td>
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<tr>
<td>Total</td>
<td>147</td>
<td>100.00</td>
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</table>
Outcome Measures in Report

- Adult (18 years and older) 30-day in-hospital raw mortality rate
- Pediatric (0 to 17 years) 30-day in-hospital mortality rate
- Adult risk-adjusted mortality rates (RAMR) based on yearly model
  - Accounts for patient demographic factors, sepsis severity, and chronic conditions
  - Adjustment is necessary to compare rates across hospitals
Adult Sepsis 30-day In-Hospital Raw Mortality
Quarter 2, 2014 – Quarter 2, 2019

As of Q2, 2019
Pediatric Sepsis 30-day In-Hospital Raw Mortality
Quarter 2, 2014 – Quarter 2, 2019

As of Q2, 2019
Comparison of Risk Adjusted Ratio of Observed to Expected Mortality Distribution per Hospital 2015 and 2017

Comparison was restricted to hospitals with ≥ 10 sepsis discharges.
Overall state ratio is 1.0 (red line)
3-Hour Bundle Relationship with Risk Adjusted Mortality Rate (RAMR) Performance in 2017
Health Data NY Open Data Platform

https://health.data.ny.gov/
Sepsis Clinical Data Available for Download:

Hospital-Specific Aggregate Data Set Example

<table>
<thead>
<tr>
<th>Facility PFI</th>
<th>Facility Name</th>
<th>Sepsis Cases</th>
<th>Deaths</th>
<th>RAMR</th>
<th>Performer</th>
<th>Disharged to Hospice</th>
<th>Protocol Eligible Cases</th>
<th>Protocol Initiated Percent</th>
<th>Protocol Initiated Quintile</th>
<th>3-Hour Bundle Eligible Cases</th>
<th>Met 3-Hour Bundle Quintile</th>
<th>3-Hour Bundle Eligible Cases</th>
<th>Met 6-Hour Bundle Quintile</th>
<th>6-Hour Bundle Eligible Cases</th>
<th>Met 6-Hour Bundle Quintile</th>
<th>6-Hour Bundle Eligible Cases</th>
<th>Met 6-Hour Bundle Quintile</th>
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<tr>
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<td>5</td>
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<td>0002</td>
<td>Hospital 2</td>
<td>488</td>
<td>143</td>
<td>23.24</td>
<td>10</td>
<td>825</td>
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<td>4</td>
<td>326</td>
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<td>325</td>
<td>22.50</td>
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<td>34.40</td>
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<tr>
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<tr>
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<td>323</td>
<td>69.30</td>
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<td>S.S.</td>
<td>12</td>
<td>91.70</td>
<td>3</td>
<td>S.S.</td>
<td>S.S.</td>
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<td>0010</td>
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<td>3</td>
<td>83</td>
<td>38.60</td>
<td>3</td>
<td></td>
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Research - Time to Sepsis Treatment

Crude in-hospital mortality (%) and predicted risk of in-hospital mortality adjusted for covariates across a range of time after protocol initiation for completing the 3-hour bundle (Panel A), receiving broad-spectrum antibiotics (Panel B), and completing the initial IV fluid bolus (Panel C) for a typical patient, Error bars represent 95% confidence intervals.

Research: Pediatric Sepsis

Research: Results of the NY State Initiative

Risk adjusted in-hospital mortality odds ratio by continuous compliance for those who had the sepsis protocol initiated:

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>OR</th>
<th>95% CI</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>10% increase in 3-hour bundle compliance</td>
<td>0.95</td>
<td>0.94 – 0.96</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>10% increase in 6-hour bundle compliance</td>
<td>0.94</td>
<td>0.93 – 0.95</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Research: Do Mandated Sepsis Protocols Improve Mortality?

Kahn, J, Billie, Davis, et. al. : Association Between State-Mandated Protocolized Sepsis Care and In-hospital Mortality Among Adults With Sepsis, JAMA,2019;322(3):240-250
Other Research Examples

- Analyzing and improving Maternal Mortality due to sepsis/ infection
- Racial and ethnic disparities in sepsis care
- Readmission in septic patients
Focus on Quality Improvement

- Variation in mortality rates = Opportunity to improve and save lives
- Identify key clinical practices & delivery systems to improve outcomes of populations at increased risk (long term care, transfers etc.)
- Analysis of process and outcome measures
- Development of relevant outcome measures for children
- Make additional data available for research
Assessment and Future Direction

• Government issued sepsis policy interventions might be able to significantly reduce mortality
• More research is necessary and could be the key to further improvements
• Collaboration with national and international partners might bring further gains
Thank you!