

# Early Identification and Management of Sepsis: Real-World Solutions for Improving Patient Outcomes

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#### Today's Presenters





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#### Agenda

- Focus on hospital-acquired sepsis to align with initiatives for improved inpatient sepsis screening
- Discuss how early identification of deterioration can drive improvements in sepsis mortality
- Examine the Rothman Index framework for sepsis
- Review a real-world case study showing reduction in overall mortality as well as sepsis mortality and a reduction in cost for hospital-acquired sepsis cases



### Increases in Hospital Acquired Infections

Figure 1. Quarterly National SIRs for Select HAI Types, 2019-Q1 - 2021-Q3



CDC reported significant increases CLABSI, CAUTI, VAE, and MRSA bacteremia in 2020 and 2021.

Weiner-Lastinger, L., Pattabiraman, V., Konnor, R., Patel, P., Wong, E., Xu, S., . . . Dudeck, M. (2022). The impact of coronavirus disease 2019 (COVID-19) on healthcare-associated infections in 2020: A summary of data reported to the National Healthcare Safety Network. *Infection Control & Hospital Epidemiology*, 43(1), 12-25. doi:10.1017/ice.2021.362



### Some Evidence of Increases in Hospital-Acquired Sepsis

- Recent data published by the California Department of Health Care Access and Information showed an increase in hospitalacquired sepsis cases in 2020 and 2021.
- There was a 24.2 percent rise for in hospital-acquired cases and 6.0 percent increase for non-hospital acquired cases from 2020 to 2021. From 2014 to 2021, non-hospital acquired severe sepsis cases outnumbered hospital-acquired cases.



California Department of Health Care Access and Information Hospitalizations for Severe Sepsis in California – HCAI



# Hospital-Acquired Sepsis Associated with Poorer Outcomes

Sepsis cases not present on admission (hospital-acquired) have longer LOS, higher mortality and readmission rates, and are more expensive compared to present on admission cases.

	Average Length of Stay		Mortality Rate		30-Day Readmission Rate		Average Cost of Hospitalization	
	Not Present on Admission	Present on Admission	Not Present on Admission	Present on Admission	Not Present on Admission	Present on Admission	Not Present on Admission	Present on Admission
Sepsis w/o organ	15.8	6.7	13.8%	4.5%	14.8%	10.7%	\$39,336	\$13,384
Severe sepsis	20.7	8.6	30.7%	12.9%	14.9%	12.1%	\$60,672	\$19,851
Septic shock	20.8	10.9	48.5%	31.2%	15.6%	13.2%	\$68,671	\$31,704

Paoli CJ, Reynolds MA, Sinha M, Gitlin M, Crouser E. Epidemiology and Costs of Sepsis in the United States-An Analysis Based on Timing of Diagnosis and Severity Level. Crit Care Med. 2018 Dec;46(12):1889-1897. doi: 10.1097/CCM.00000000003342. PMID: 30048332; PMCID: PMC6250243.



# Sepsis Diagnosis is Challenging for Many Reasons

#### **Clinical Signs Often Subtle**

- Can resemble flu, gastroenteritis, or chest infection
- Early symptoms include fever, chills and shivering, increased heart rate, and rapid breathing

#### No Gold Standard for Diagnosis

- No lab or biomarkers to confirm diagnosis
- SIRS criteria defining sepsis are part of early response to infection, not sufficient to predict complicated course

#### Symptoms Often Masked

- Pain, elevated temperature, or changes in blood results in post-op and post-childbirth patients can mask sepsis
- Clinical findings could be expected in these circumstances

#### Caused by any infection, some pathogens cannot be cultured

Up to 50% of septic patients have no pathogen identified<sup>1</sup>

Rhee C, et al. Prevalence of Antibiotic-Resistant Pathogens in Culture-Proven Sepsis and Outcomes Associated With Inadequate and Broad-Spectrum Empiric Antibiotic Use. JAMA Network Open. 2020;3(4):e202899.



### A Hyper-Focus on Sepsis Misses Patients of Concern





# Reframing the Approach to Sepsis

Separating the intellectually interesting from the operationally meaningful



#### SCREENING VS PREDICTION

Predicting a definition not a disease is a self-fulfilling prophecy with no new information to clinicians



#### PROVIDING INFORMATION AHEAD OF "TIME ZERO"

Lagging and/or known indicators (lactate, antibiotics)



#### **DENOMINATOR/CODING EFFECTS**

Wider recognition is not the same as improved outcomes

#### **Reframing the Approach**

Sepsis is associated with deterioration

➤Identify deterioration earlier

Focus on the patient not the definition



# Rothman Index Leverages Existing Data to Identify Deterioration





# Physiologic Deterioration Associated with Septic Patient



![](_page_10_Picture_2.jpeg)

#### Focusing on Sepsis Associated Deterioration

- Sepsis is associated with deterioration
- Severe sepsis and septic shock characterized by the development of organ dysfunction
- RI captures changes in physiological status associated with deterioration

![](_page_11_Figure_4.jpeg)

![](_page_11_Picture_5.jpeg)

## Real-time Alerting to Patient Deterioration

- The Rothman Index draws attention to patients who are deteriorating
- Reduces perceived false positive rate of warnings compared to tools with a narrower, sepsis-specific focus

SIRS: Systemic Inflammatory Response Syndrome qSOFA: Quick Sequential Organ Failure Assessment MEWS: Modified Early Warning System

	# Inputs	Frequency of Calculation	Med-Surg & ICU	Alerts on Score Value & Trend
Rothman Index	26	continuous	Yes	Yes
SIRS	4	per-shift*	Yes	No
qSOFA	3	per-shift*	No	No
Cerner St John	5-9	varies	Yes	No
MEWS	5	3-5x daily*	No	No

\* Some facilities have built the scoring criteria into their EMR for automated calculation.

![](_page_12_Picture_6.jpeg)

#### Improvements in Sepsis Survivability and More

500 Bed Academic Medical Center in Northeast

![](_page_13_Picture_2.jpeg)

Reduction in sepsis mortality Customer Analysis, 2016

**13%** Reduction in sepsis cost per case *HFMA*, 2016 >900 Bed Academic Medical Center in South

32%

**Risk-adjusted mortality reduction** BMJ Quality & Safety, 2016 Customer Analysis

11%

Reduction in sepsis mortality HIMSS, 2016 500 Bed Community Hospital in Mid Atlantic Region

**37%** Reduction in sepsis mortality 2018 Maryland Health Quality Innovator of the Year, 2019

**35%** Reduction in emergent transfers Customer Analysis, 2020

![](_page_13_Picture_13.jpeg)

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# Success Requires People, Process and Technology

SPACELABS

HEALTHCARE

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15

![](_page_14_Picture_3.jpeg)

# RI Supports Detection and Monitoring for Sepsis Patients

- Rapid intervention through the Sepsis Care Bundles has been shown to reduce mortality
- The RI can support detection and monitoring, allowing clinicians to focus on providing patient care

![](_page_15_Figure_3.jpeg)

![](_page_15_Picture_4.jpeg)

## Real-World Success: Surveillance Based Case Study

#### **Reducing sepsis mortality in a 500 bed academic facility**

![](_page_16_Picture_2.jpeg)

#### **PROTOCOL IMPLEMENTATION**

Implementation of "Right Patient, Right Bed, Right Time" program using surveillance-based protocols

![](_page_16_Picture_5.jpeg)

#### **PRE-IMPLEMENTATION MEASUREMENT**

Evaluation of mortality, sepsis mortality and sepsis cost data for 12 months prior to implementation

![](_page_16_Picture_8.jpeg)

#### **POST-IMPLEMENTATION MEASUREMENT**

Evaluation of annualized mortality, sepsis mortality and sepsis cost data for 9 months post implementation

![](_page_16_Picture_11.jpeg)

### Right Patient, Right Time, Right Bed Protocol

![](_page_17_Figure_1.jpeg)

Patient receives a Palliative Care Services consult

**RRT/Code Team is called and determines patient's disposition** 

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# Reduction in Both Overall and Sepsis Mortality

Clinical redesign process results:

![](_page_18_Picture_2.jpeg)

**20%** Reduction in *non-sepsis* mortality

![](_page_18_Picture_4.jpeg)

**29%** Reduction in sepsis mortality

#### Impact of RI-Surveillance on Mortality

![](_page_18_Figure_7.jpeg)

![](_page_18_Picture_8.jpeg)

Associated Improvements in Cost – Hospital Acquired Sepsis

13% cost decrease in average direct cost per sepsis case37% decrease in sepsis cases developed while in hospital

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#### Post-Implementation Avg Direct Cost Per Case

![](_page_19_Figure_4.jpeg)

![](_page_19_Picture_5.jpeg)

## Thank you!

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Please reach out to Kathy or Colleen with questions or for additional information

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