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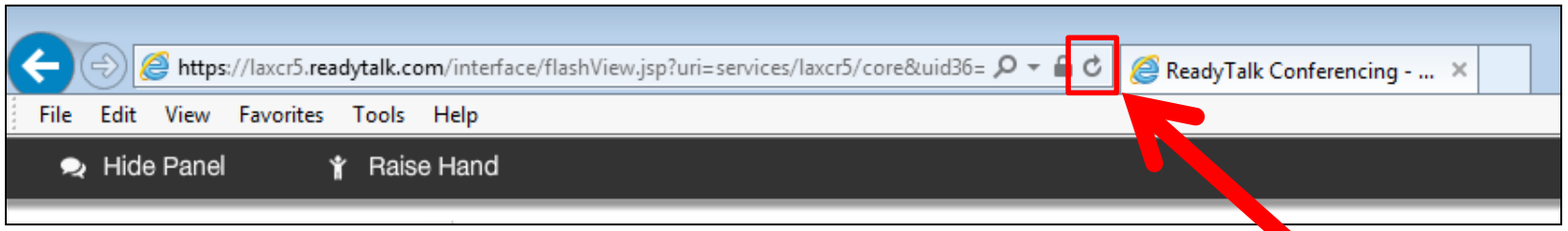
Troubleshooting Audio

Audio from computer speakers breaking up?
Audio suddenly stop?

Click Refresh
– or –
Click F5

F5 Key
Top Row of Keyboard



Location of Buttons

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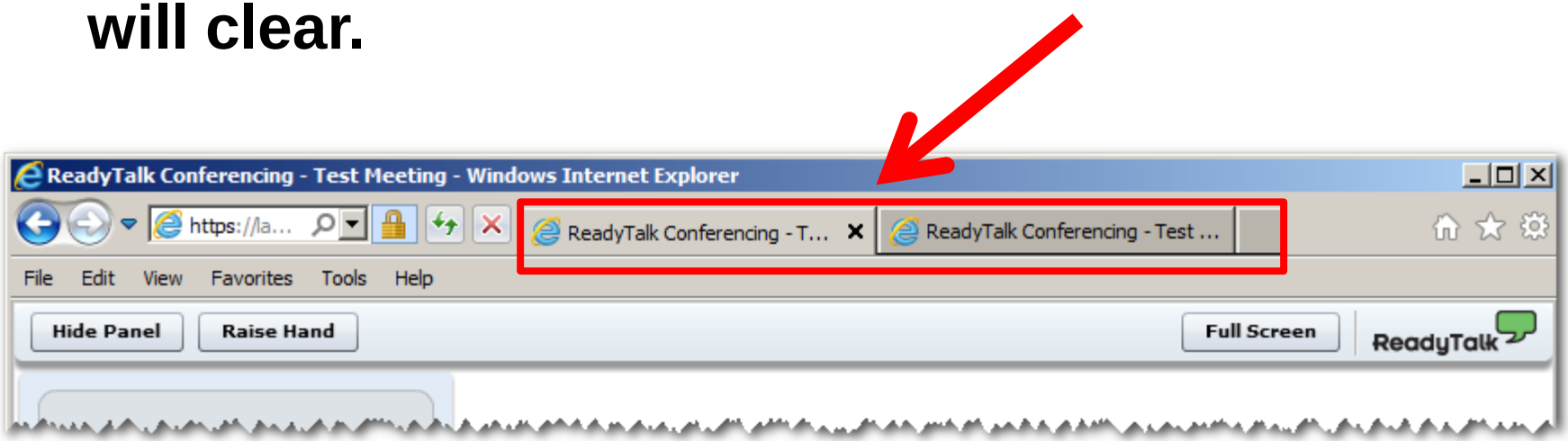
Troubleshooting Echo

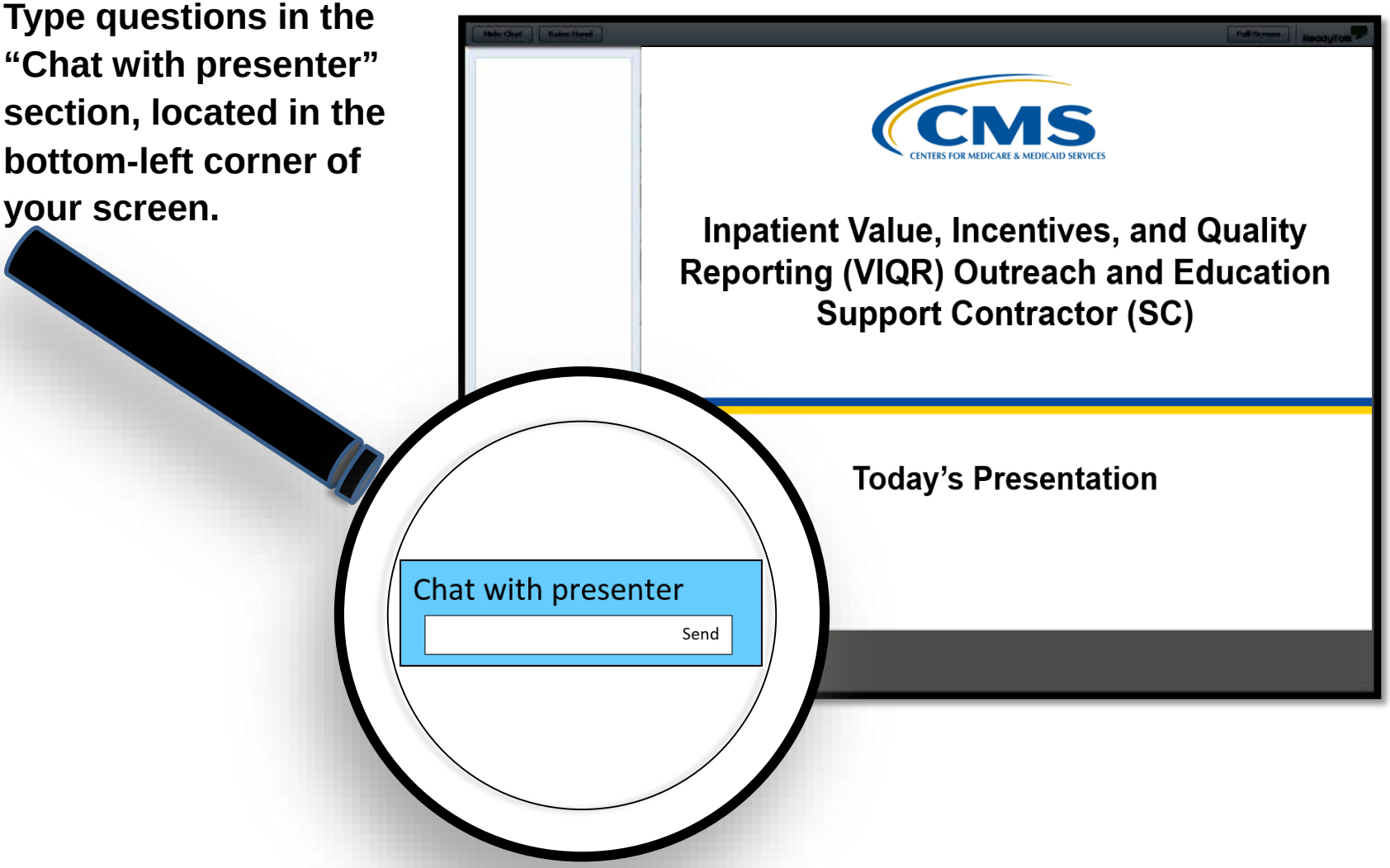
- **Hear a bad echo on the call?**
- **Echo is caused by multiple browsers/tabs open to a single event (multiple audio feeds).**
- **Close all but one browser/tab and the echo will clear.**



Example of Two Browsers/Tabs open in Same Event

Submitting Questions

Type questions in the "Chat with presenter" section, located in the bottom-left corner of your screen.



SSM Health's Sepsis Core Measure Journey

October 23, 2019

Speakers

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System Director – Clinical Analytics, SSM Health

Disclosures

- The presenters are employees of SSM Health.
- The presenters have no conflicts of interest.

Purpose

This presentation will share SSM Health's processes and tools to implement the sepsis core measure and continuously improve results.

Note: CMS' sepsis measure support contractor will be on the webinar to answer technical measure questions and will not be able to answer questions about SSM Health's experience. Any question and answer follow-up from this webinar will only address technical measure questions where CMS is providing a response.

Learning Objectives

At the conclusion of the program, participants will be able to understand SSM Health's experience:

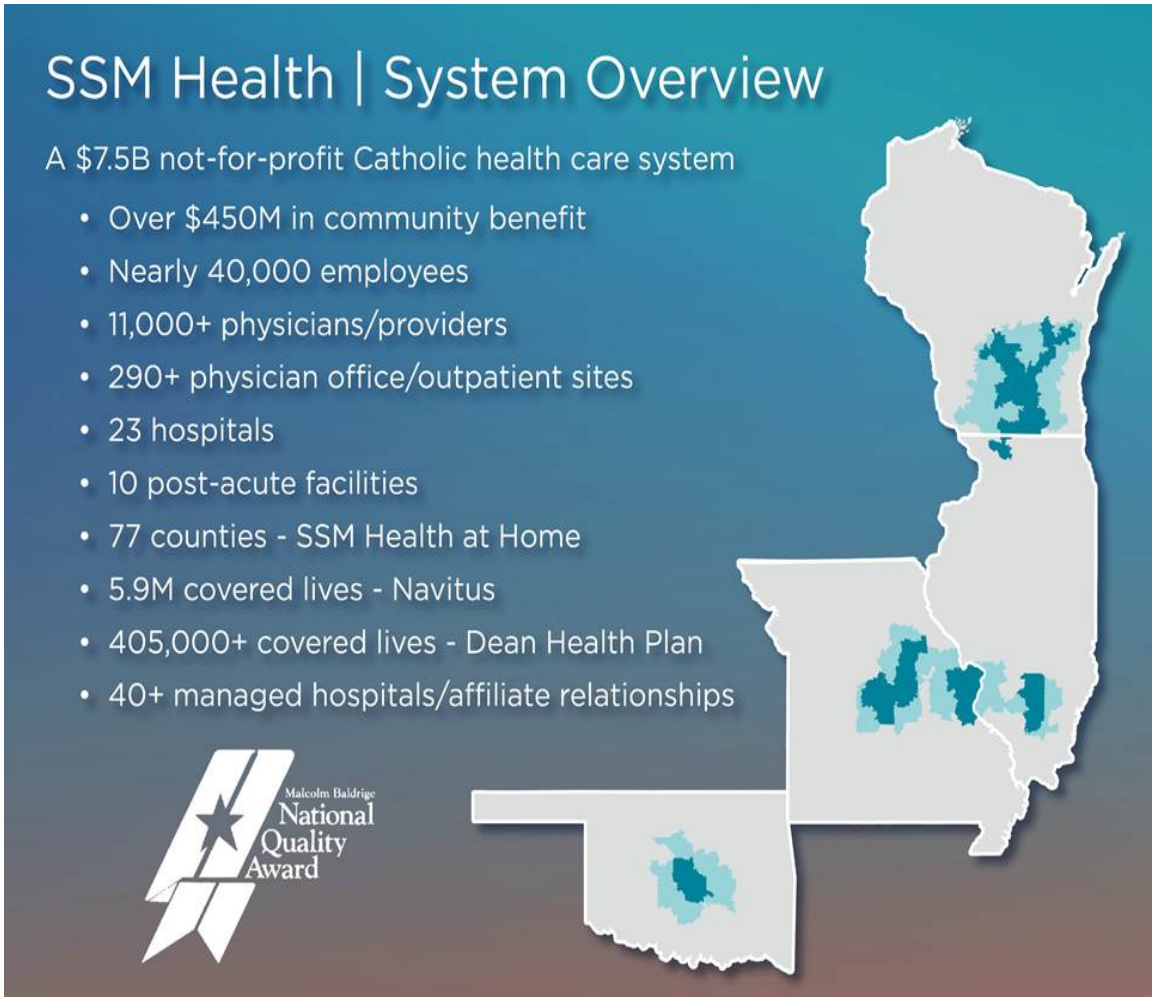
- Building a comprehensive sepsis improvement plan using a multimodal team approach.
- Creating and utilizing daily and monthly reports to monitor compliance with indicators of sepsis care.
- Using advanced analytics (machine learning) to identify opportunities for program improvement.

Acronyms and Abbreviations

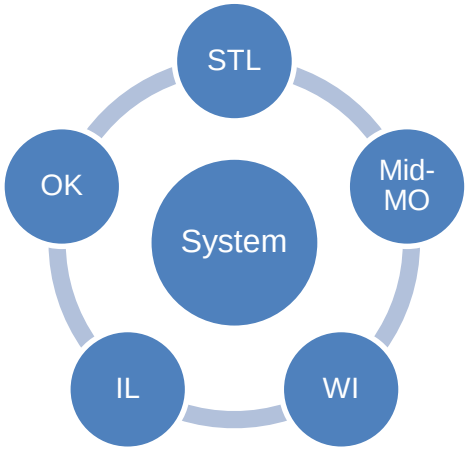
ABX	antibiotic	M	million
ARISE	Australasian Resuscitation in Sepsis Evaluation	MINS	minutes
B	billion	MO	Missouri
CE	continuous education	MRN	Medical Record Number
CI	confidence interval	NEJM	New England Journal of Medicine
CMS	Centers for Medicare & Medicaid Services	O/E	observed to expected
Dx	diagnosis	OK	Oklahoma
ED	emergency department	PATS	patients
EHR	electronic health record	PRISM	Protocolized Resuscitation in Sepsis Meta-Analysis
ESICM	European Society of Intensive Care Medicine	Q	quarter
HAR	Hospital Account Record	SCCM	Society of Critical Care Medicine
HR	hour	SEP	Sepsis
ICC	intraclass correlation coefficient	SSC	Surviving Sepsis Campaign
ICU	intensive care unit	SSSP	Simplified Severe Sepsis Protocol
IL	Illinois	Std	standard
IM	internal medicine	STL	St. Louis
IP	inpatient	WI	Wisconsin
IV	intravenous	Y/N	Yes/No
KPI	Key Performance Indicator	YTD	year to date
LOS	length of Stay		

SSM Health and Our Sepsis Work

SSM Health – Who are We?



Geographic regions support the System structure.



SSM Health's Sepsis Program Development

ED and ICU clinician collaboration incorporated evidence-based guidelines into clinical workflows, electronic health records (EHRs).

- Multi-disciplinary team
- Standardized practices, education for clinical criteria
- Data monitoring

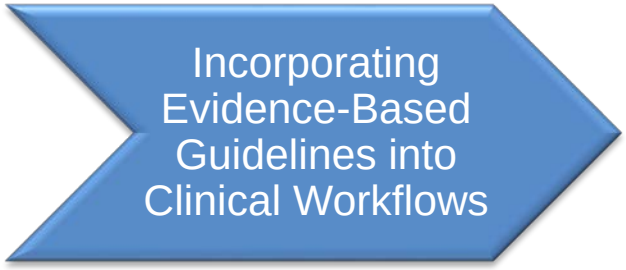
- SEP-1 core measure bundle
- System Sepsis Team Education
- Continued EHR support for clinical workflows and SEP-1 compliance
- Data monitoring

- Standard work: Code Sepsis, TIME*, medical emergency
- Daily reporting, leading metrics
- Monthly reports
- Advanced data analytics
- Predictive tool

*Temperature, Infection, Mental Decline, Extremely Ill

Sepsis Overview and Program Development

Overview and History of Sepsis Treatment

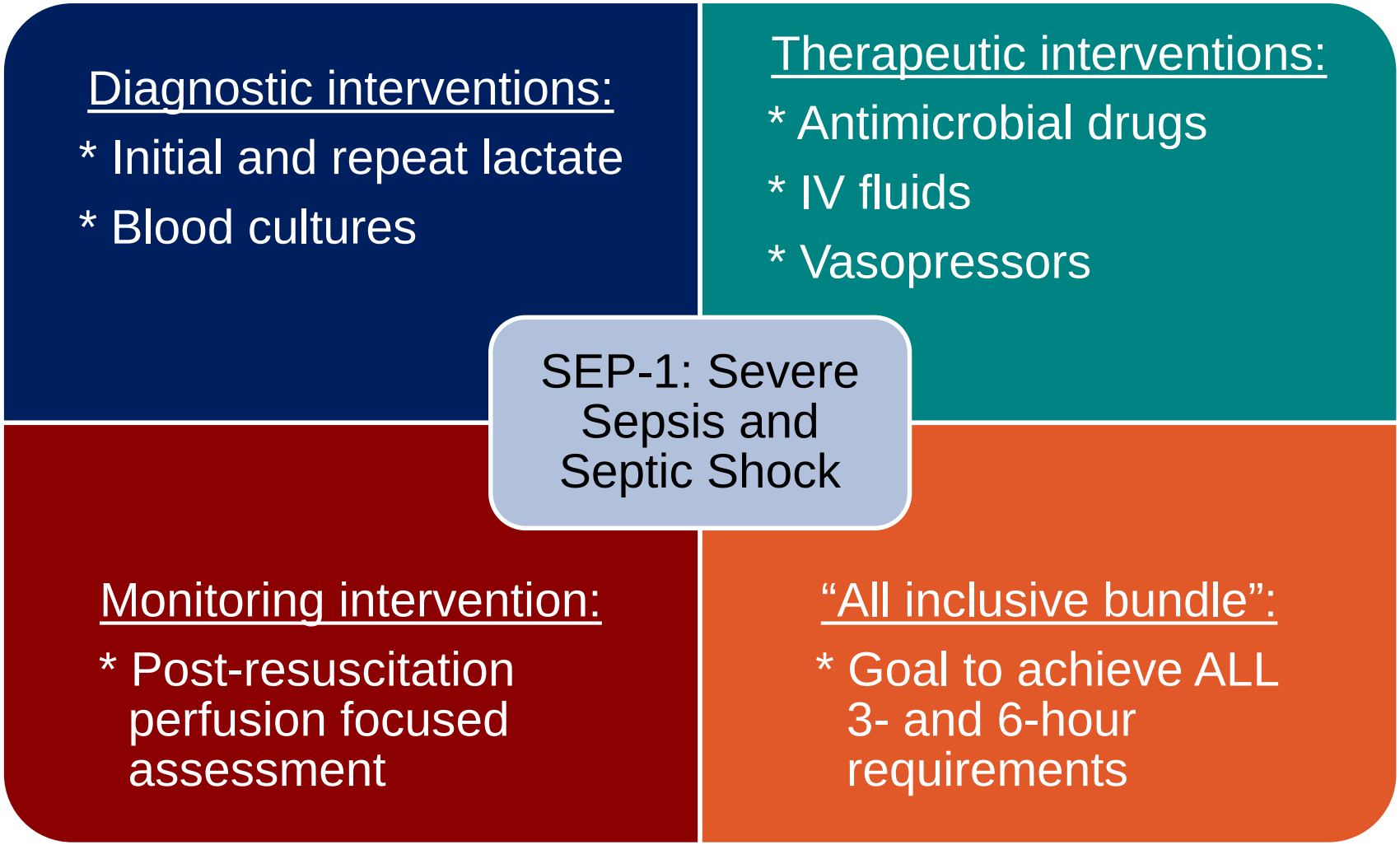


- 1992: First definition of sepsis implemented
- 2001: Concept of early, goal-directed therapy, Surviving Sepsis Campaign (SSC) formed
  - Time zero defined. Sepsis better defined and established as a systemic event.
  - Guidelines updated every four years (2004, 2008, 2012, 2016).

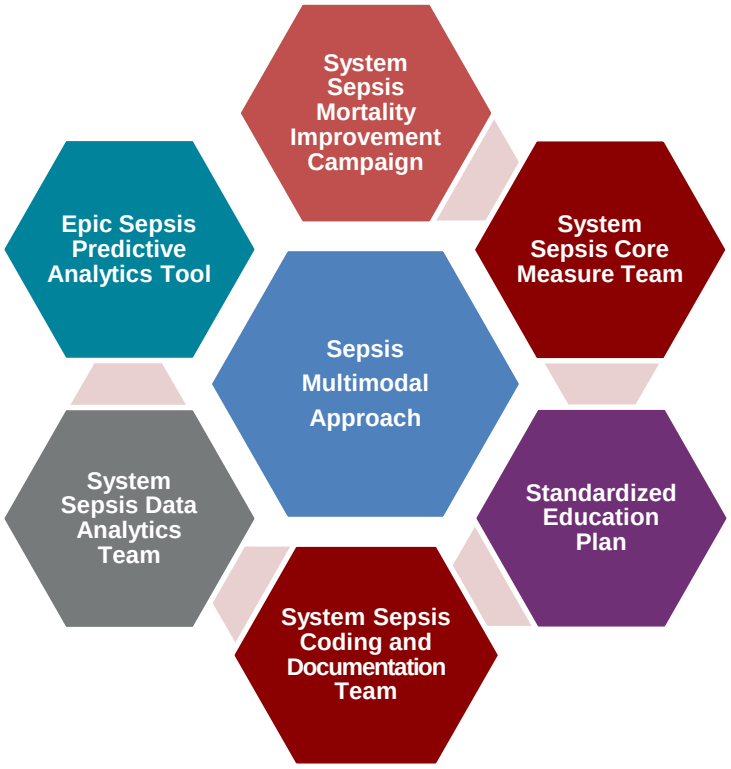
Overview and History of Sepsis Treatment

- 2014: Concept of bundles
  - ProCESS and ARISE, Ferrer et al. Critical Care Medicine
- 2015: Concepts of bundles
  - ProMISe and early goal-directed resuscitation
  - Surviving Sepsis Campaign update
  - CMS SEP-1 implementation
- 2016: SCCM/ESICM Sepsis-3
- 2017: Meta-analysis PRISM
  - Seymour et al. NEJM
  - SSSP2
- 2018: Concept of bundles
  - 1-hour bundle
  - Surviving Sepsis Campaign update
  - Results of the SEP-1 implementation

Overview and History of Sepsis Treatment



Comprehensive Sepsis Improvement Program



System Sepsis Mortality Improvement Campaign

- Clinical leader champions, hospital teams, collaboration
- Gap analysis, standard work, data results

System Sepsis Core Measure Team

- Workflows and Epic (EHR) optimization
- Outlier review, develop abstraction guidelines, templates
- Code Sepsis process, handoff tool

Standardized Education Plan

- Tip sheets, online learning module
- Sepsis video for employee and patient education (YouTube)
- September Sepsis Awareness Month activities
- Screen savers and badge cards

Comprehensive Sepsis Improvement Program (continued)

System Sepsis Coding and Documentation Team

- Standardize coding and documentation, education
- Review of sepsis coding and documentation data for opportunities

System Sepsis Data Analytics Team

- Analyze data with various methodologies
- Meaningful reports to drive improvement

Sepsis Predictive Analytics Tool

- Epic (electronic health record) tool; assist in predicting when patient has a high probability of developing sepsis
- Phased go-live approach
- Analyze the tool's effectiveness

Data Reporting

Monthly Reporting of Measures

SSM Health

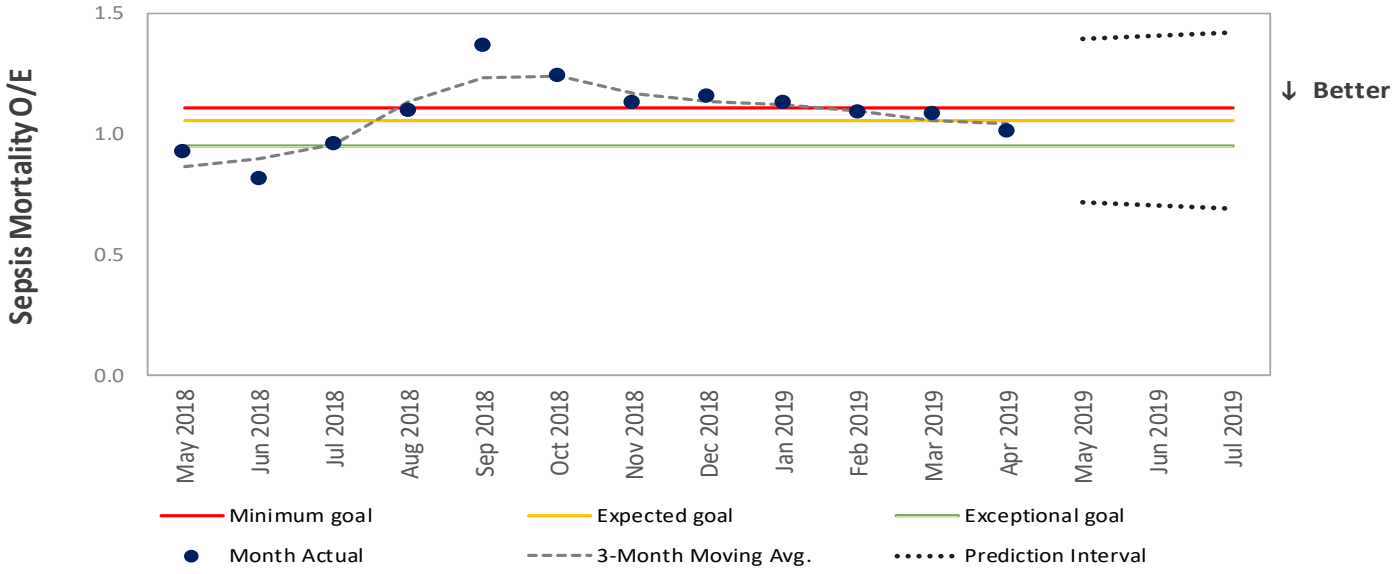
Acute Care — **Apr, 2019**

Sepsis Mortality O/E

YTD **1.07**

- Exceptional goal exceeded
- Expected goal met
- Minimum goal met
- Minimum goal not met

Goal	
Minimum	1.11
Expected	1.06
Exceptional	0.95



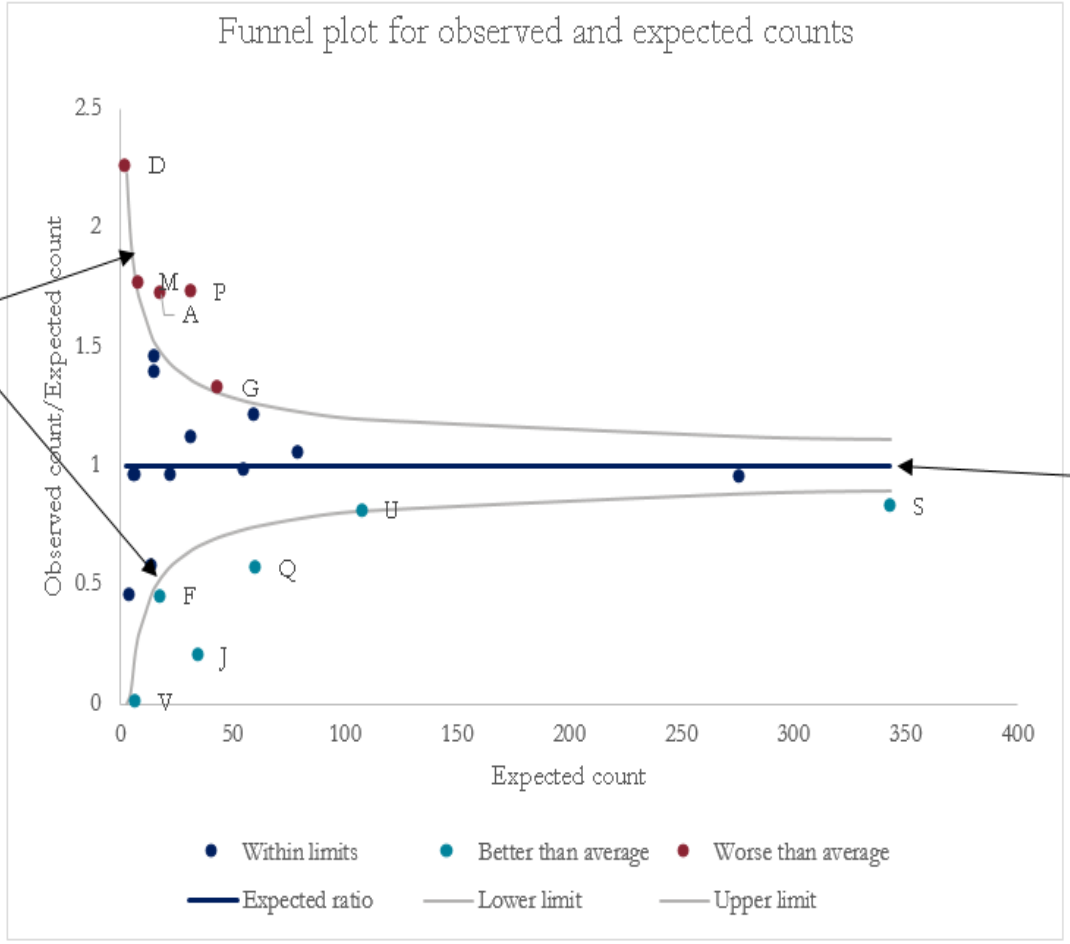
Date sources: Premier

Sepsis Mortality O/E: Denominator-Expected Mortality (Risk Adjusted using Care Sciences Methodology from Premier); Numerator-Observed Mortality using Care Science Methodology Risk Adjustment

Prediction Interval: An estimated interval in which future observations will fall, with 95% confidence, given what has already been observed.

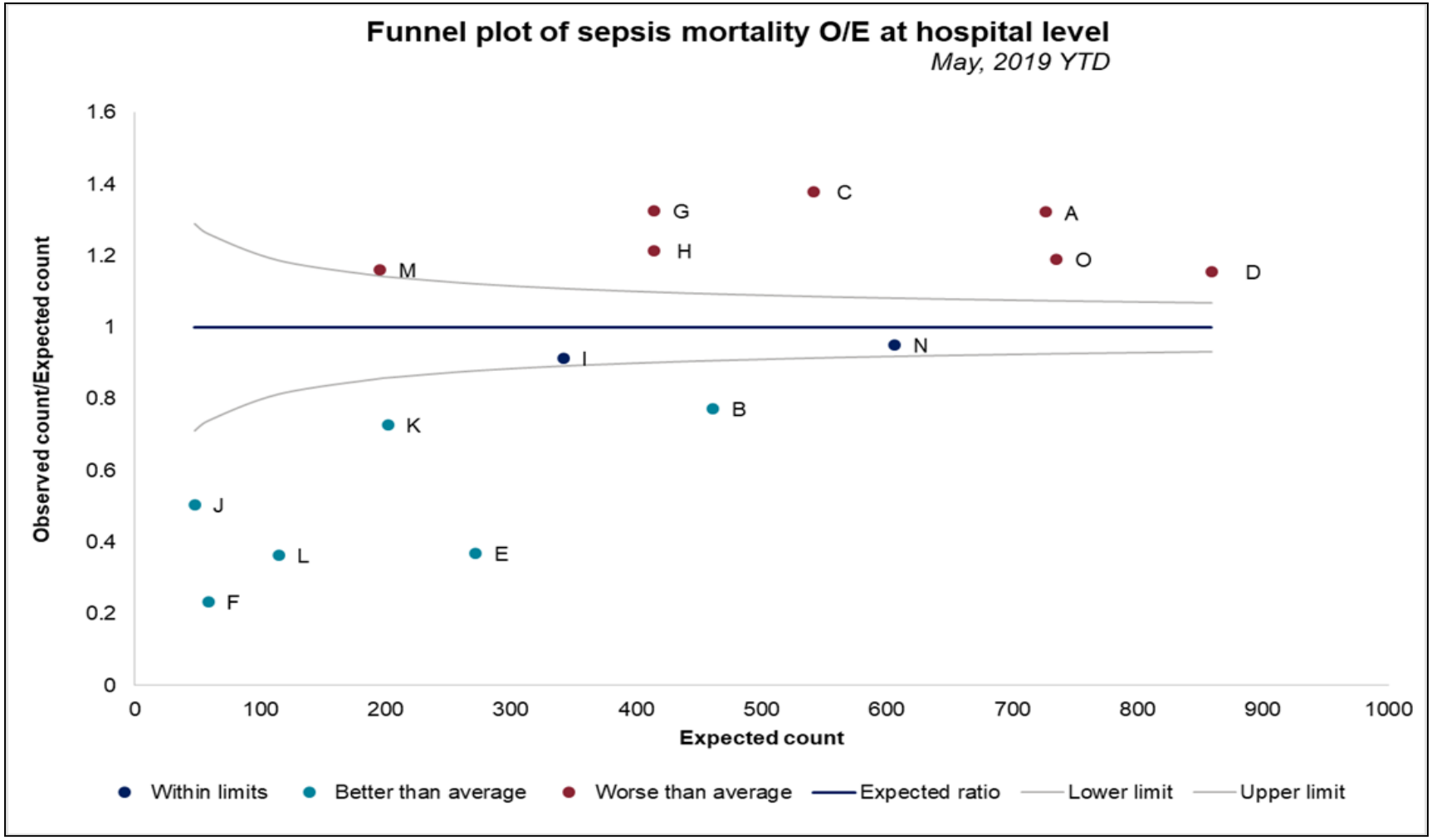
Using Funnel Plots

Gray funnel limits indicate ± 2 standard deviation limits

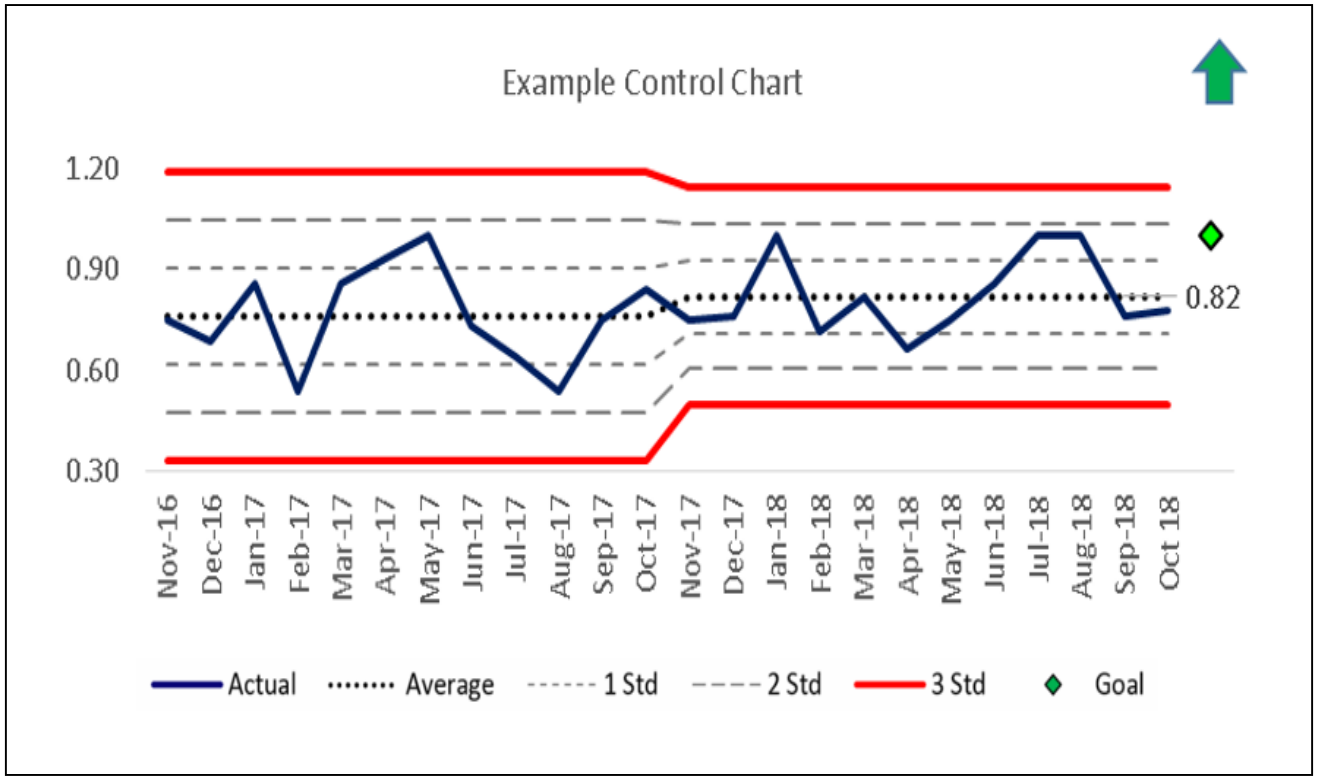


Navy blue horizontal center line indicates expected values for all sample sizes

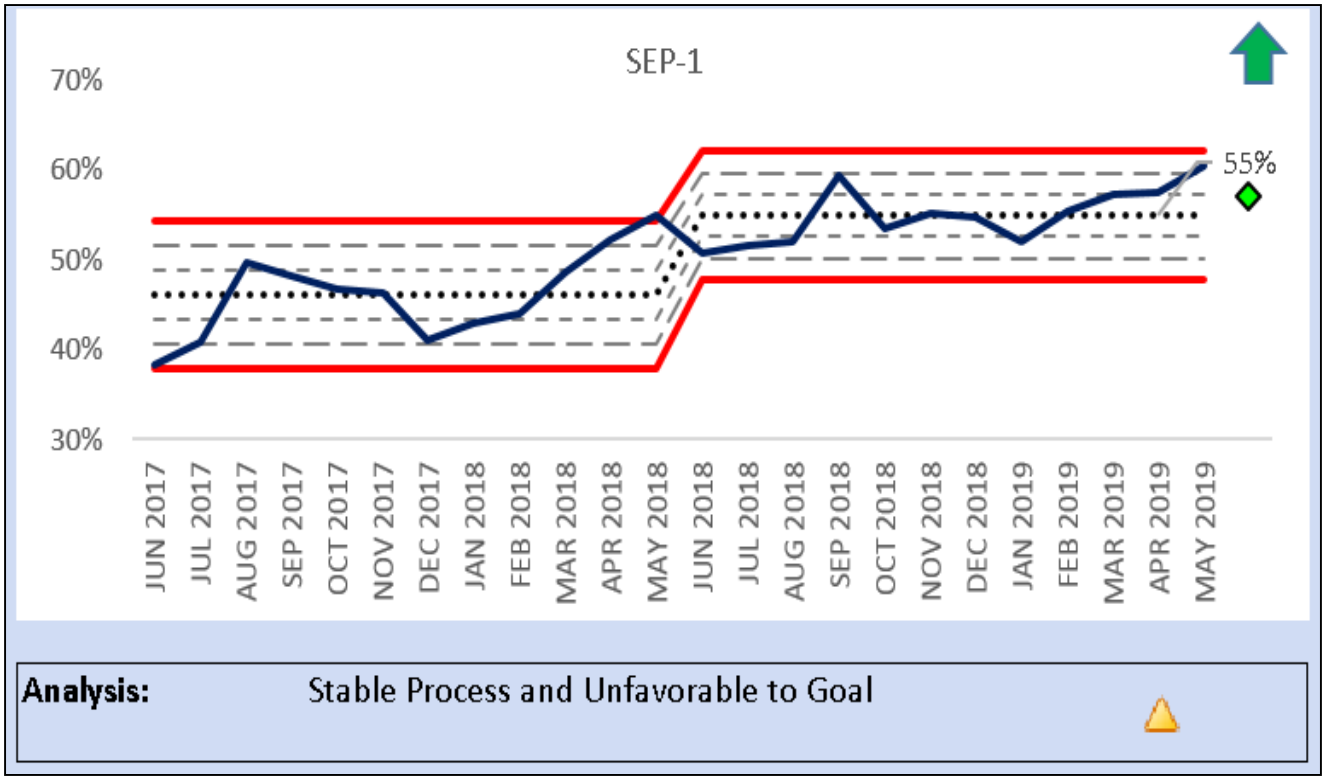
Using Funnel Plots: Monthly Reporting



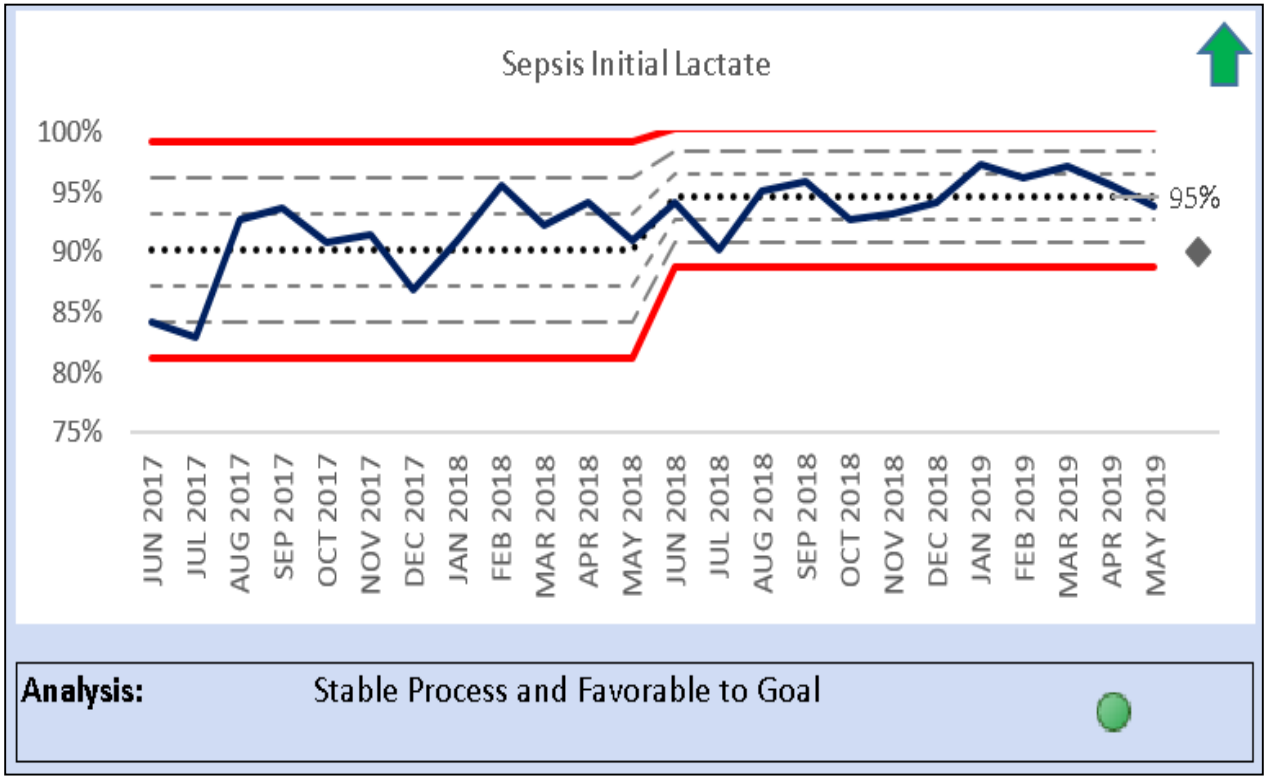
Using Control Charts



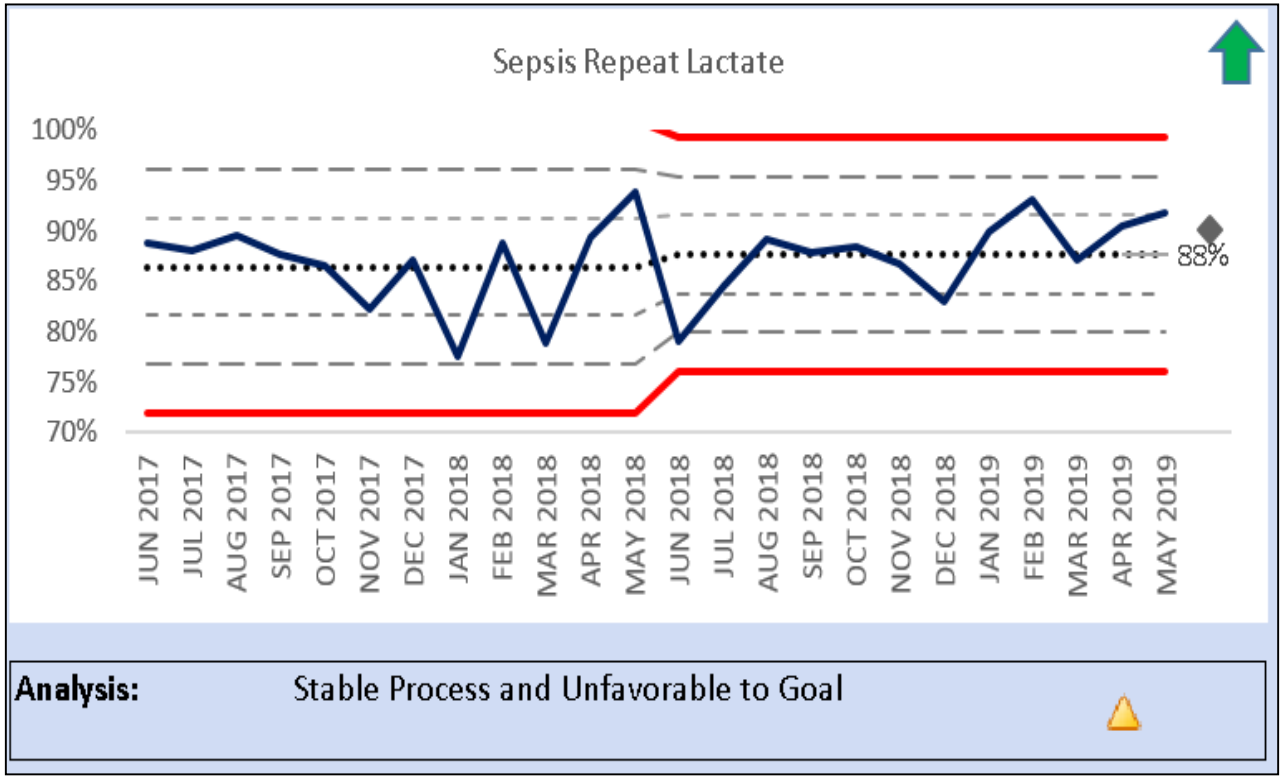
Using Control Charts: Monthly Reporting



Using Control Charts: Monthly Reporting



Using Control Charts: Monthly Reporting



Emergency Department Use of Sepsis Order Set: Daily Reporting

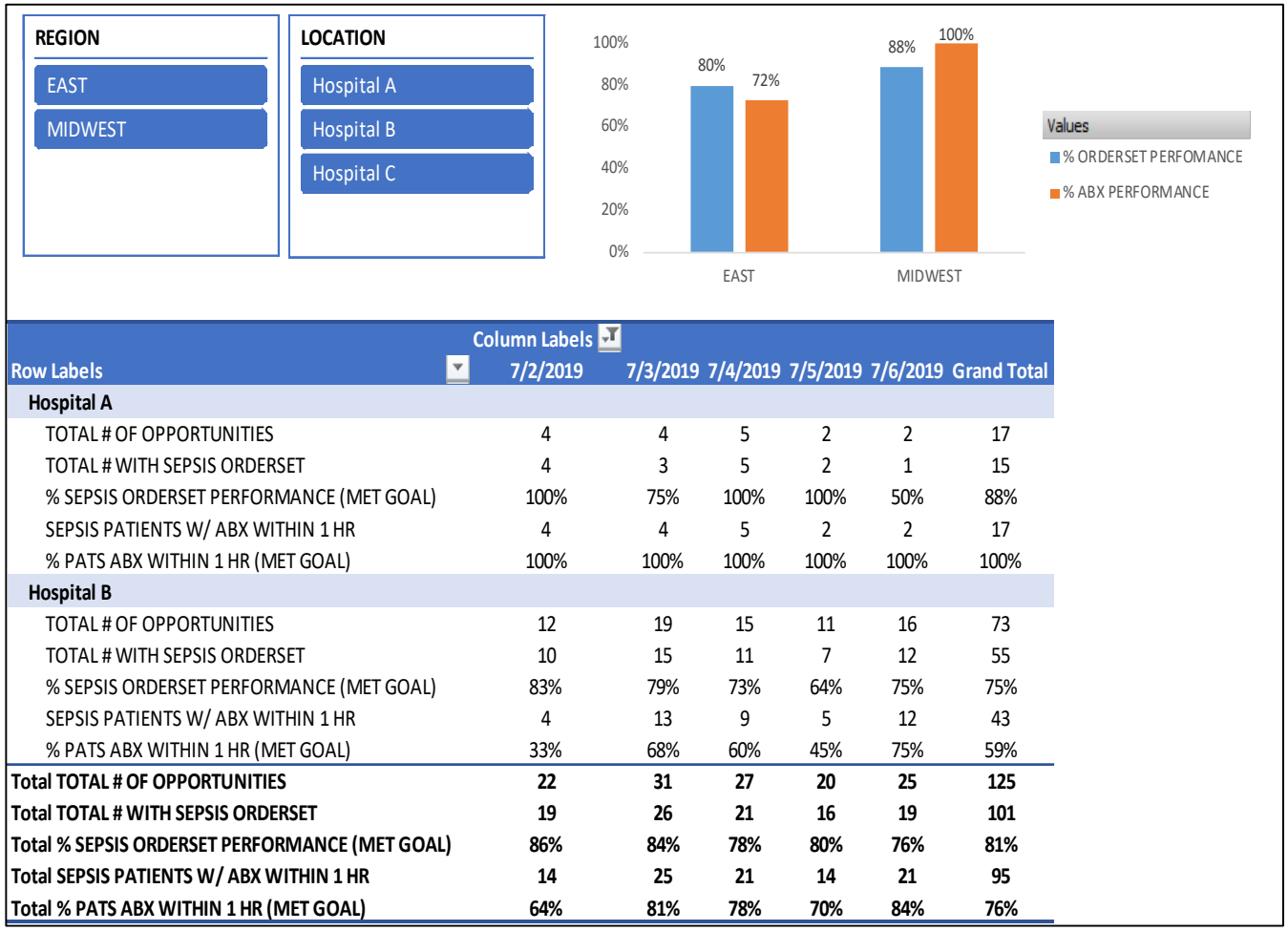
- In April, 2017, SSM Health began generating daily reports of whether providers used the sepsis order set in the emergency department (ED) for patients admitted with a sepsis diagnosis to one region's hospitals. Goal set at 90% order set usage.
- If providers did not use the order set, providers were asked, "Why not?"
- SSM health posted results, including provider name, on the ED performance board, and shared results in sepsis team and leadership meetings.
- Chief Medical Officer followed up with phone calls to ED Medical Directors regarding providers who had a consistent record of not using the order set.

Admit Date	Name	Hospital /Unit	Age	Sex	Admit Dx	HAR	MRN	Sepsis Order Set Used? (Y/N)	Who Initiated Sepsis Order Set? (RN/MD)	Comments

Ministry and Regional Results: Daily Reporting

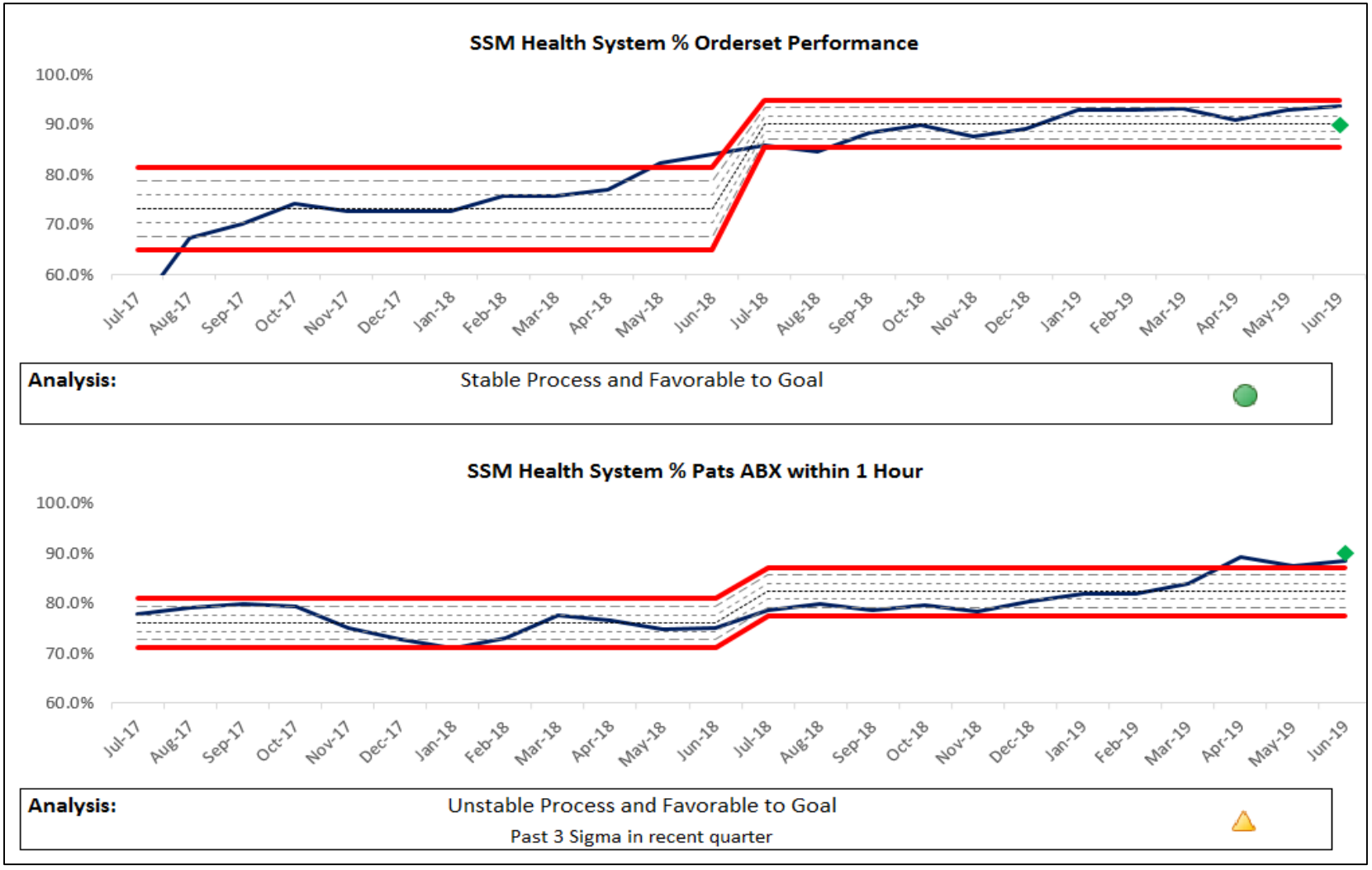
- We added daily reporting of antibiotic administration **within one hour of order*** in December 2018. (Data shown as "back dated" for baseline prior to December 2018.)
- Report has been rolled out system-wide with approximately 200 recipients across five regions.
- We recently added the "percent of Best Practice Alerts responded to in 30 minutes or less" (in pilot phase).

***SSM Health's *internal* goal**



Row Labels	7/2/2019	7/3/2019	7/4/2019	7/5/2019	7/6/2019	Grand Total
Hospital A						
TOTAL # OF OPPORTUNITIES	4	4	5	2	2	17
TOTAL # WITH SEPSIS ORDERSET	4	3	5	2	1	15
% SEPSIS ORDERSET PERFORMANCE (MET GOAL)	100%	75%	100%	100%	50%	88%
SEPSIS PATIENTS W/ ABX WITHIN 1 HR	4	4	5	2	2	17
% PATS ABX WITHIN 1 HR (MET GOAL)	100%	100%	100%	100%	100%	100%
Hospital B						
TOTAL # OF OPPORTUNITIES	12	19	15	11	16	73
TOTAL # WITH SEPSIS ORDERSET	10	15	11	7	12	55
% SEPSIS ORDERSET PERFORMANCE (MET GOAL)	83%	79%	73%	64%	75%	75%
SEPSIS PATIENTS W/ ABX WITHIN 1 HR	4	13	9	5	12	43
% PATS ABX WITHIN 1 HR (MET GOAL)	33%	68%	60%	45%	75%	59%
Total TOTAL # OF OPPORTUNITIES	**22**	**31**	**27**	**20**	**25**	**125**
Total TOTAL # WITH SEPSIS ORDERSET	**19**	**26**	**21**	**16**	**19**	**101**
Total % SEPSIS ORDERSET PERFORMANCE (MET GOAL)	**86%**	**84%**	**78%**	**80%**	**76%**	**81%**
Total SEPSIS PATIENTS W/ ABX WITHIN 1 HR	**14**	**25**	**21**	**14**	**21**	**95**
Total % PATS ABX WITHIN 1 HR (MET GOAL)	**64%**	**81%**	**78%**	**70%**	**84%**	**76%**

Using Control Charts: Monthly Reporting of *Internal* Measures



Advanced Data Analytics

Use Case 1: Hospital Differences in Sepsis Mortality

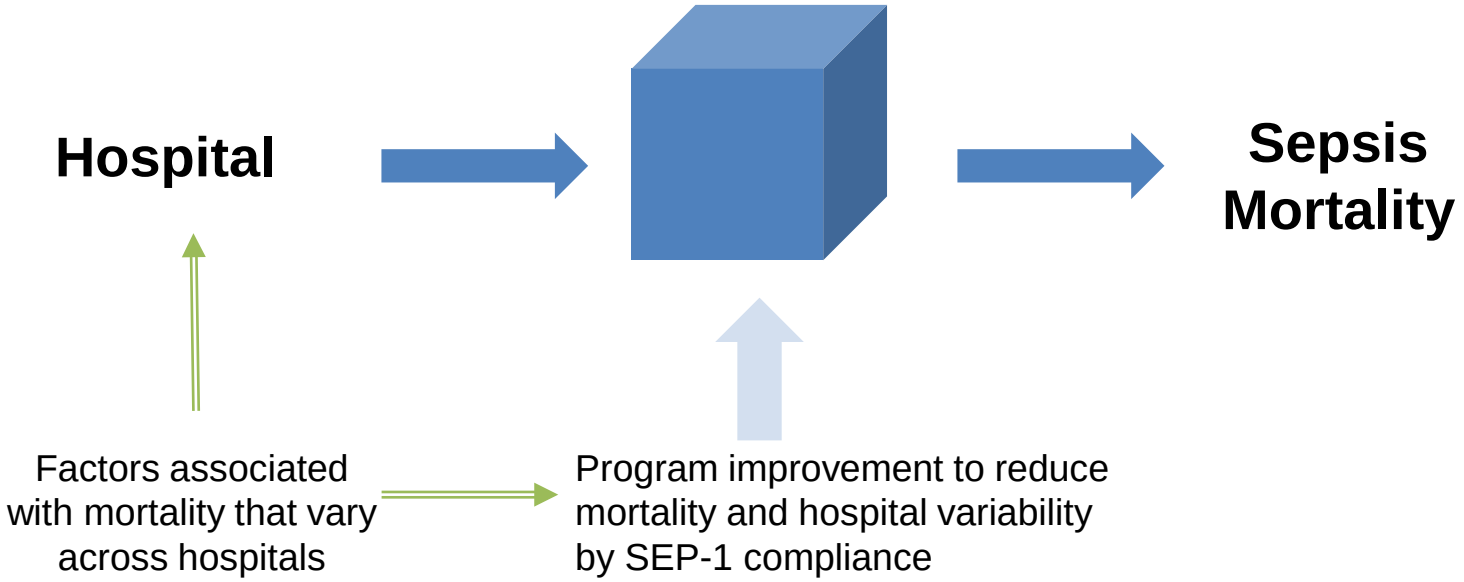
Question: How much of the variability in risk of death across ministries is due to differences in SEP-1 compliance?

Why is this important: How much room for further improvement?

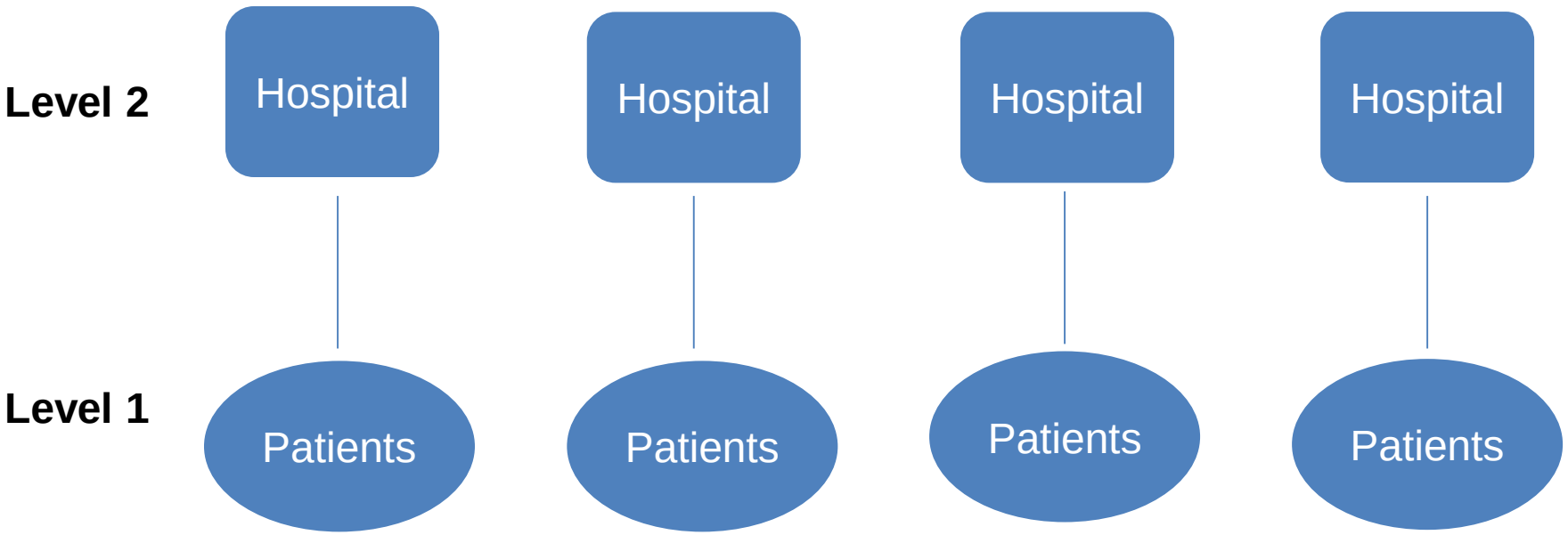
Methods

- Use of core measure data managed by Press Ganey vendor
- Severe sepsis and septic shock patients admitted Jan 2017–Dec 2018
- Number of observations = 4265
- Multilevel logistic regression model predicting death

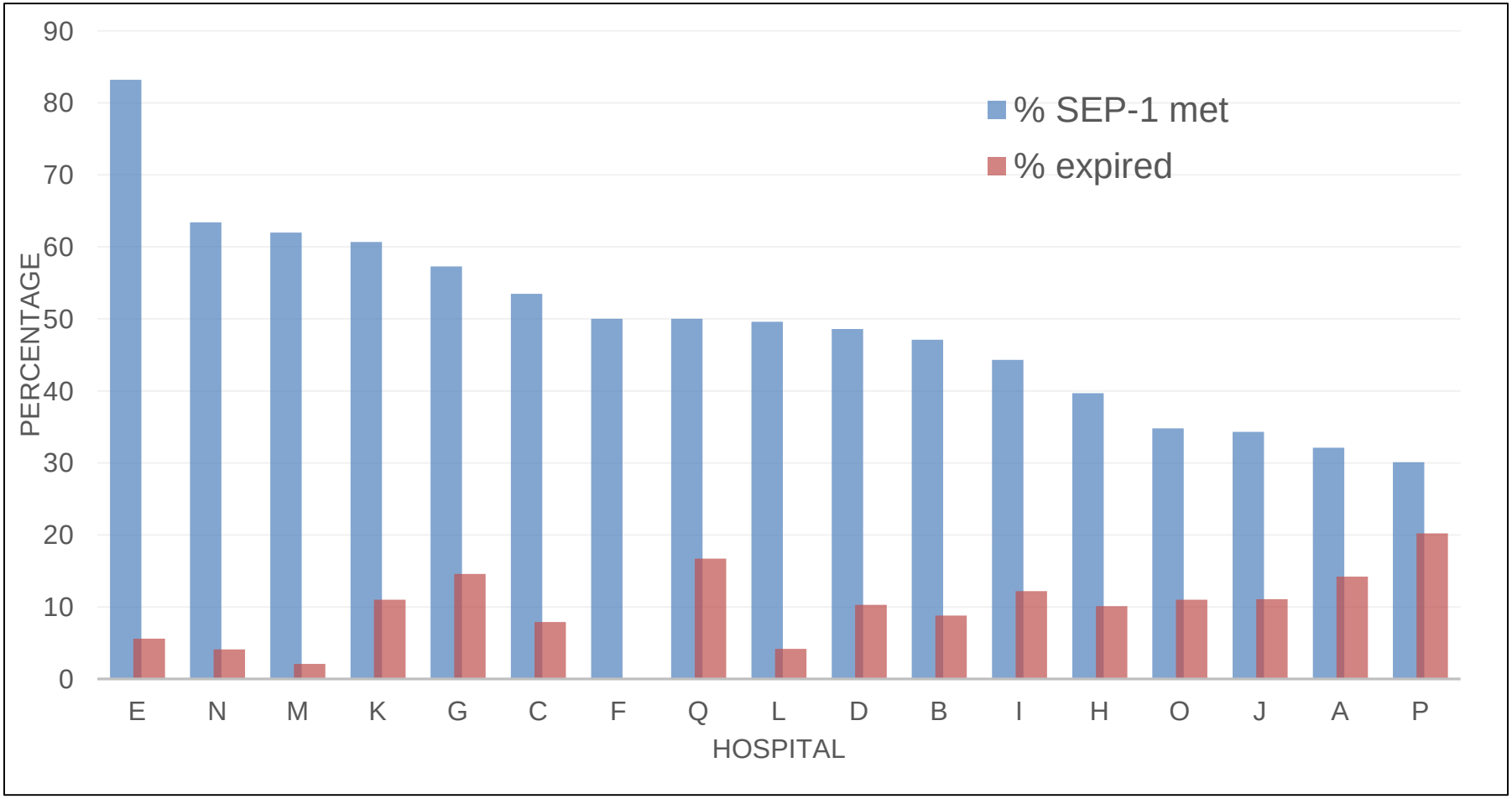
Use Case 1: Hospital Differences in Sepsis Mortality?



Multi-Level Structure of Patients Nested Within Hospitals



Variability in % SEP-1 and Patients Who Expired Across Hospitals



Results and Implications

- **Model A**: Intra-class correlation coefficient (measure of variability in risk of death across ministries) while adjusting for sex, race, age, comorbidity, primary payer, present on admission, sepsis shock/severe sepsis, ICU stay, day of the week: **0.128**
- **Model B**: Model A + SEP-1 compliance. ICC: **0.117**
- **Results:** 100% * (0.128 – 0.117) / 0.128 = 8.6% of the variance in risk of death across ministries explained by differences in SEP-1 compliance after adjusting for patient-level differences
- **Implications:** SEP-1 compliance important, but lots of room for implementation of additional program improvements.

Use Case 2: Learning from Our Data

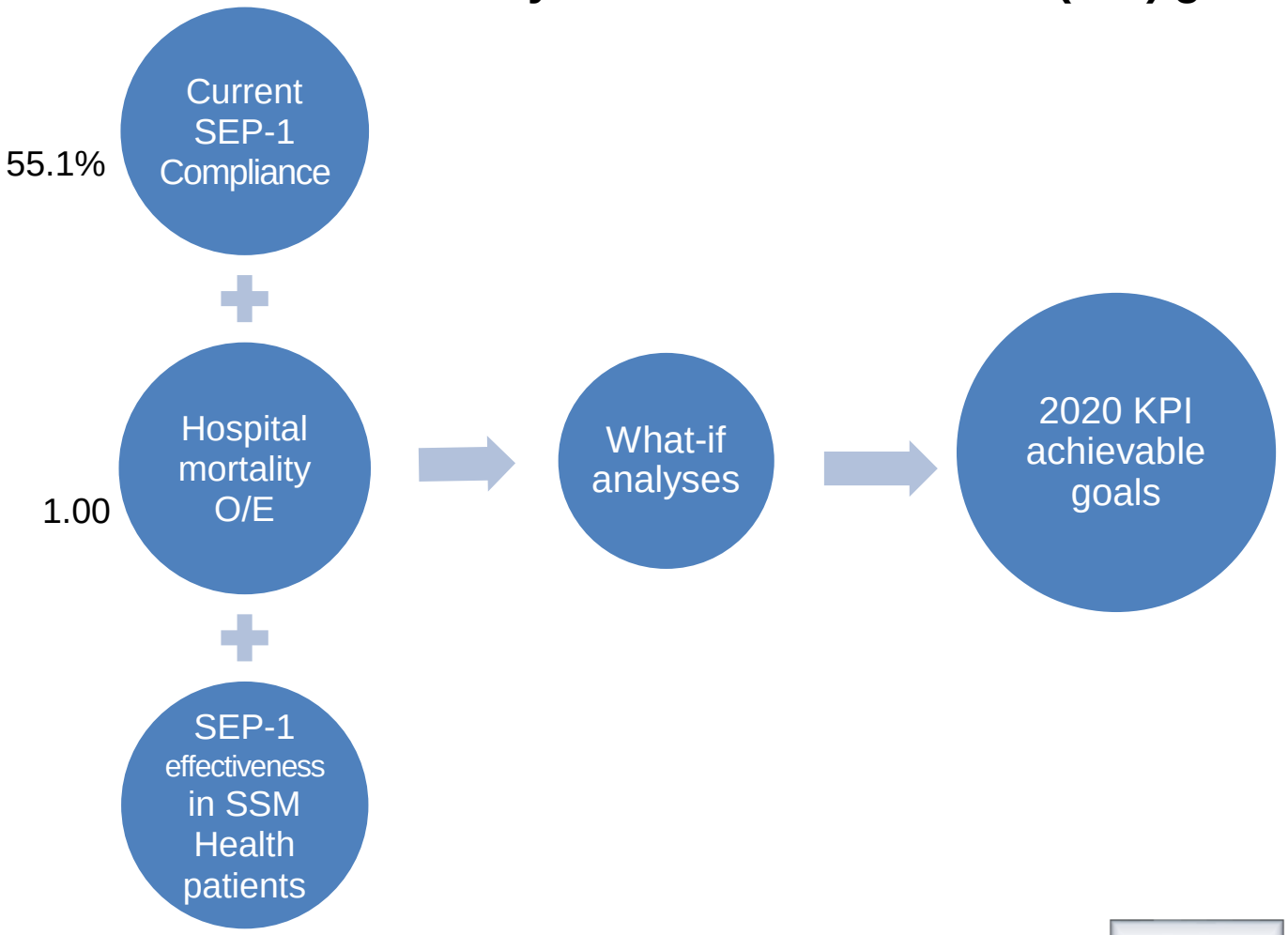
- **What we know**:
  - The SEP-1 bundle reduces the risk of death of SSM Health patients.
  - The SEP-1 bundle reduces length of stay of SSM Health patients.
- **What we don't know:**
  - What is the effect of increasing SEP-1 compliance on hospital-specific mortality?

Learning from Our Data

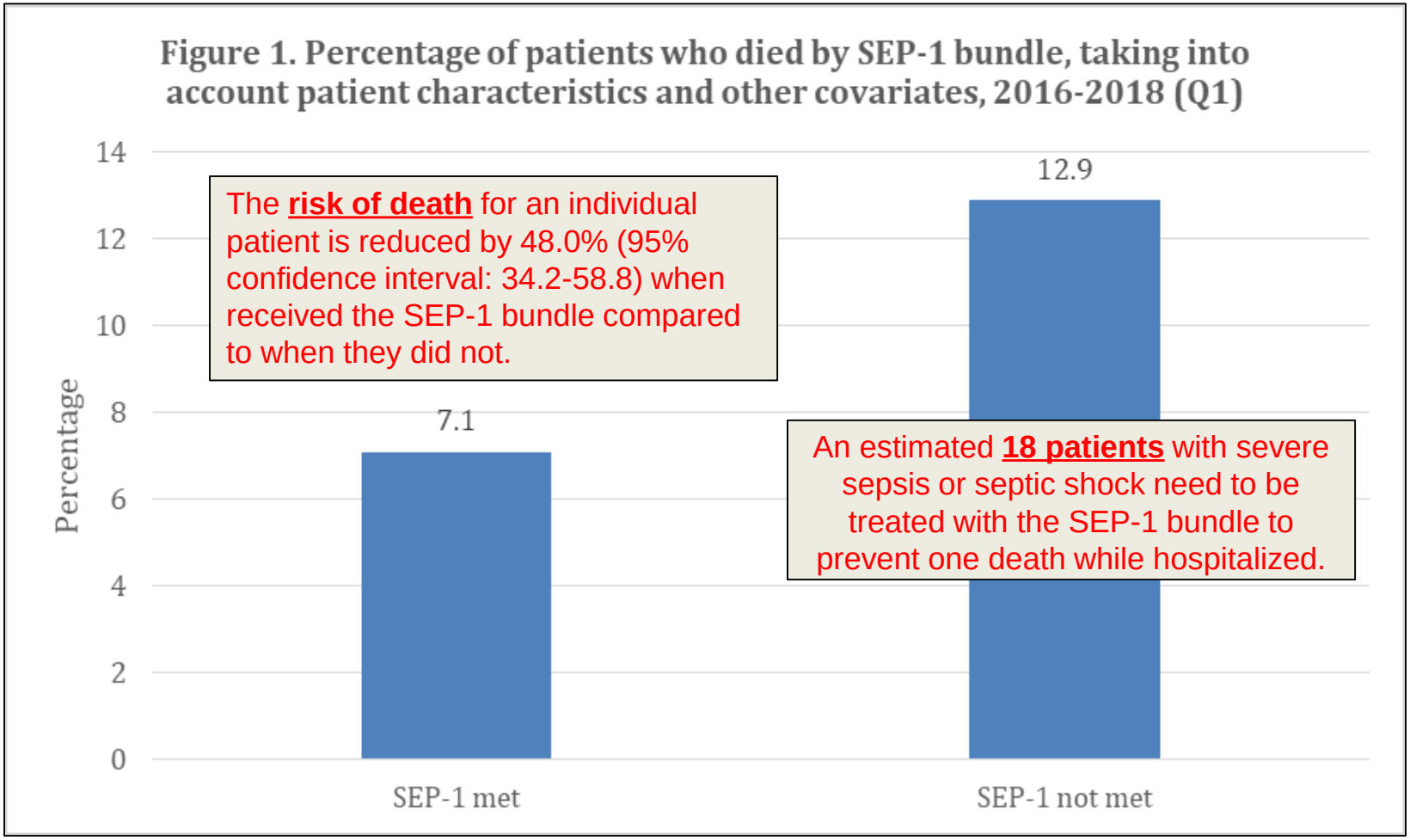
Use of Core Measure data to set 2020 Key Performance Indicator (KPI) goals

Example:

An estimated 18 patients with severe sepsis or septic shock need to be treated with the SEP-1 bundle to prevent one death while hospitalized.



Effectiveness of SEP-1 on Risk of Death Sepsis and Septic Shock Among Severe Patients



What-if Scenarios for Estimating 2020 KPI for a Specific Hospital

Scenario	if % SEP-1 increased during May-Dec 2019 to*	Estimated # severe sepsis & septic shock patients during May-Dec 2019**	# additional patients prevented from dying during May-Dec	Observed: Expected during May-Dec 2019
1	**65.1%**	**410**	**2**	**0.96**
2	**75.1%**	**410**	**5**	**0.91**
3	**85.1%**	**410**	**7**	**0.88**

* Increases in SEP-1 Core Measure data
** Estimated based on historical data from Premier Inc.

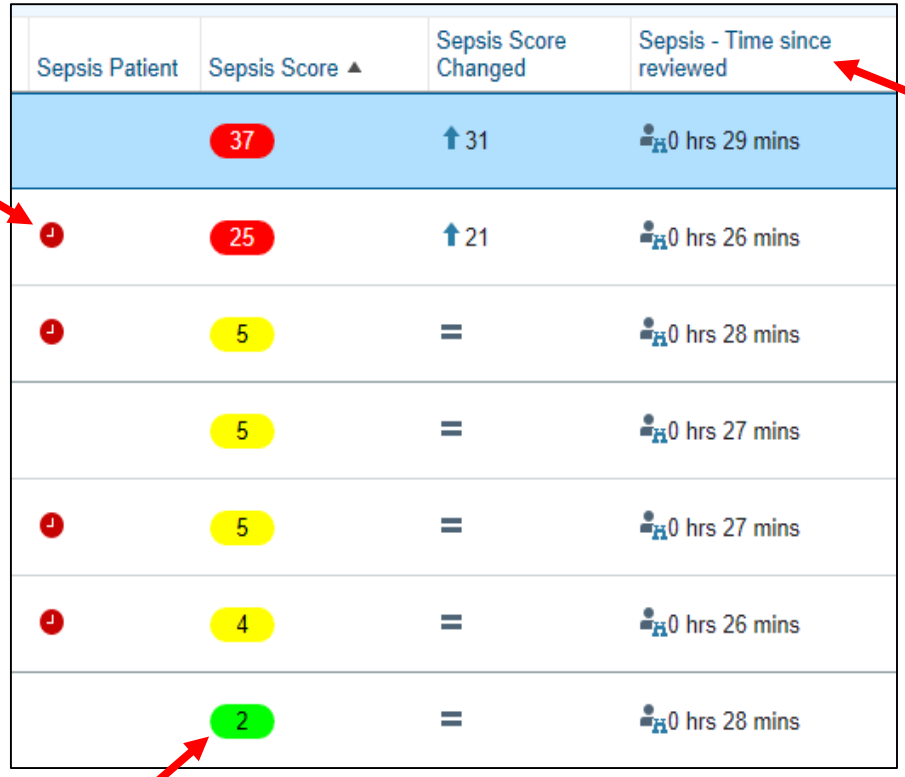
Use Case 3: The Impact of the Sepsis Predictive Tool

- Epic Cognitive Computing Model is for early detection of sepsis.
- In late 2017, SSM Health began implementation of a Predictive Model to aid in early detection of sepsis.
  - The model considers data elements in the electronic health record to predict the probability of a patient becoming septic. Data elements used include: demographics, vital signs, recent lab results, counts of medication orders, comorbidities, and invasive lines or drains.
  - The model output provides a probability score of the patient developing sepsis. This score is made visible to the clinicians.
  - The probability score is also used to alert clinicians when it reaches the alert threshold (6% in ED, 8% inpatient). The alert prompts clinicians to defined actions.

Sepsis Predictive Tool in Epic

The red clock icon displays if a patient has been started on a Sepsis Treatment Protocol.

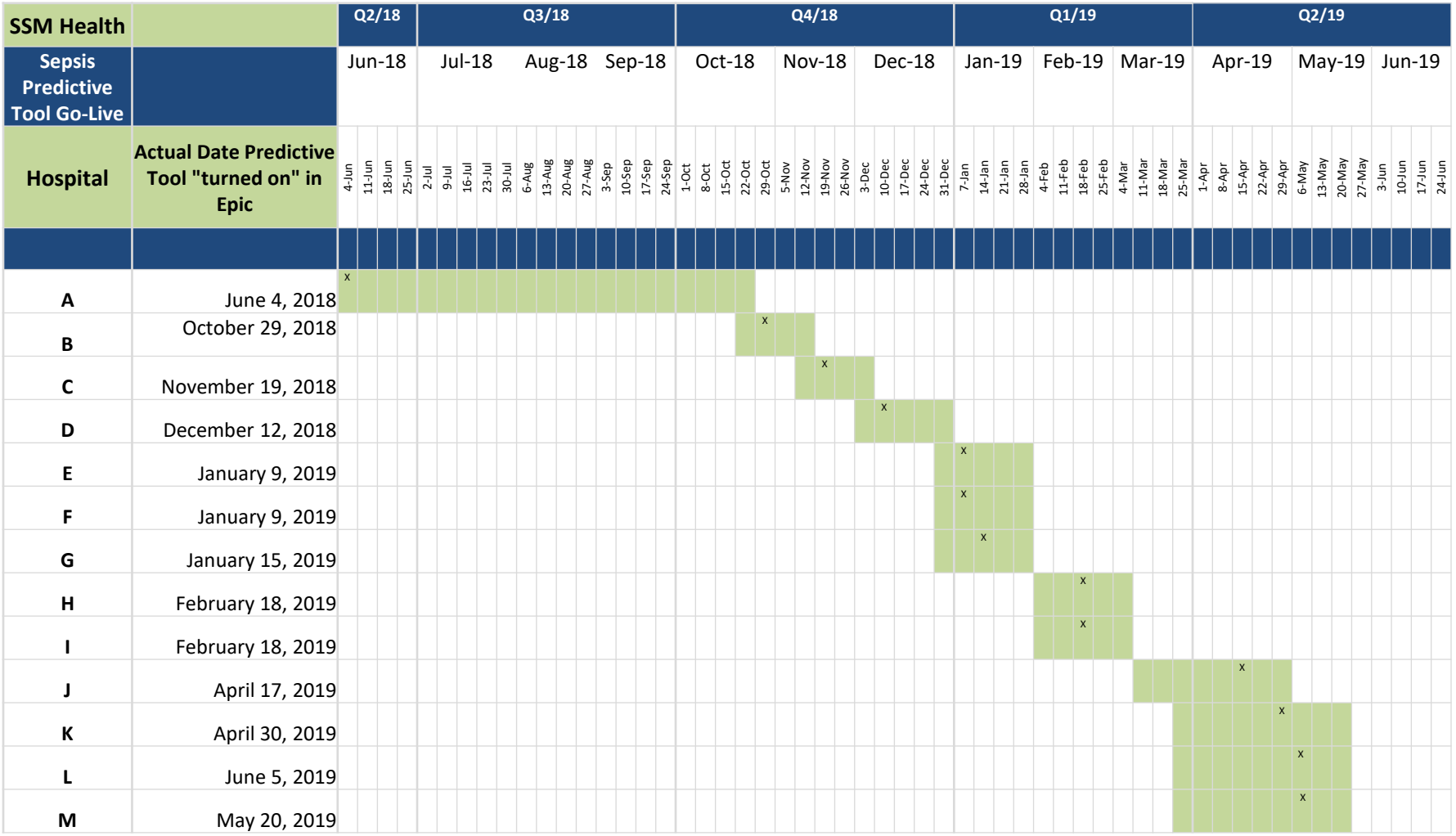
The Early Detection of Sepsis Predictive model generates the score. A rising score indicates a strong possibility the patient is developing sepsis. Alerts are generated if the score reaches 6 in the ED or 8 on the inpatient units. The colored bubble indicates factors contributing to the score and what the recent score trend had been.



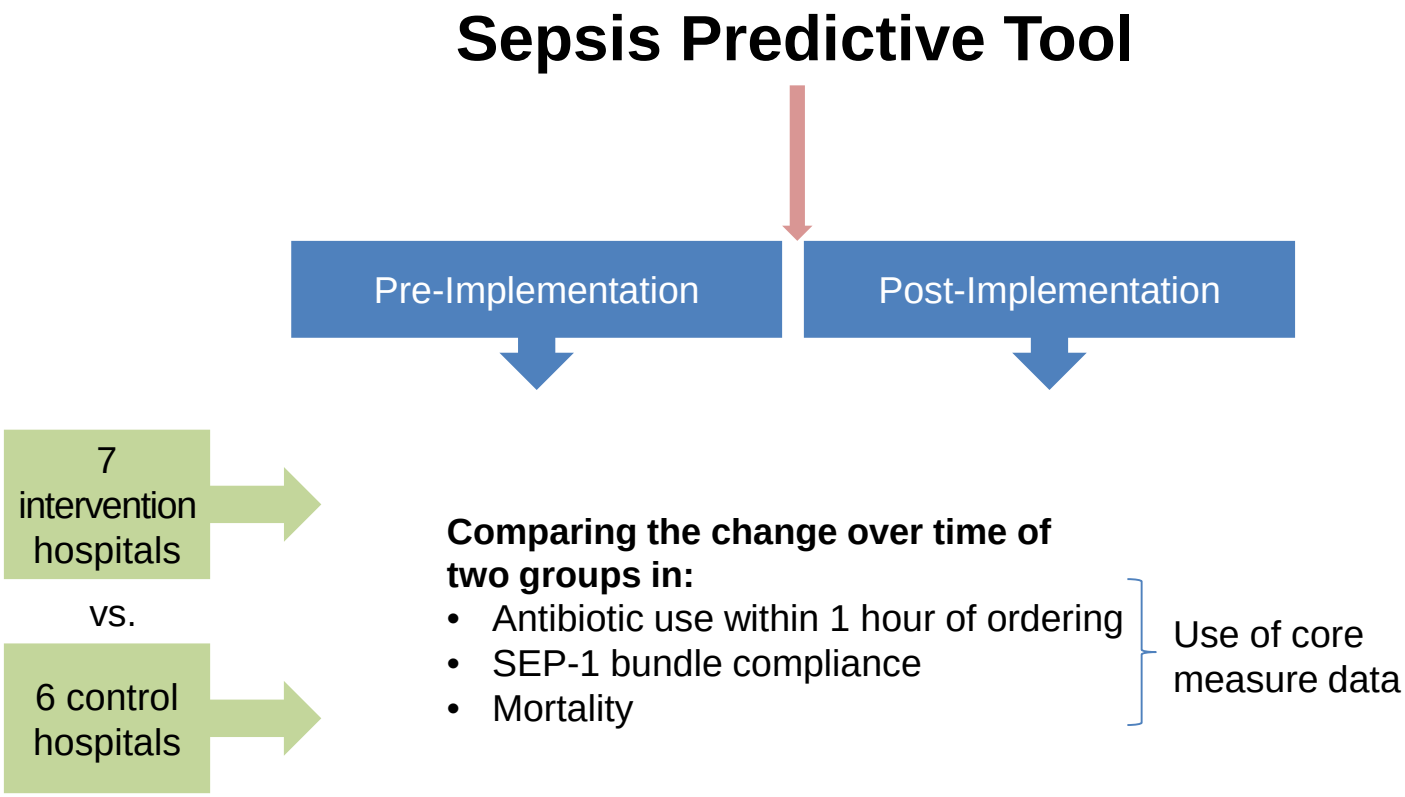
This column works with the “reviewed” column to show the amount of change up or down since the time of last review.

Clinicians can use this column for patients with a score of concern that has not reached the alert threshold. The column marks the time they assessed the patient and tracks the time since the assessment.

Predictive Tool Implementation Across SSM Health Hospitals

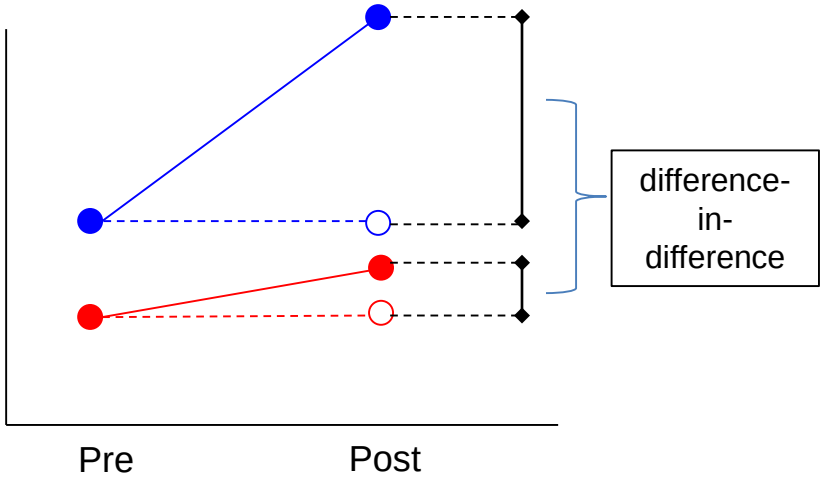


Evaluation of the Implementation of Sepsis Predictive Tool



Evaluation: Difference-in-Difference Study Design

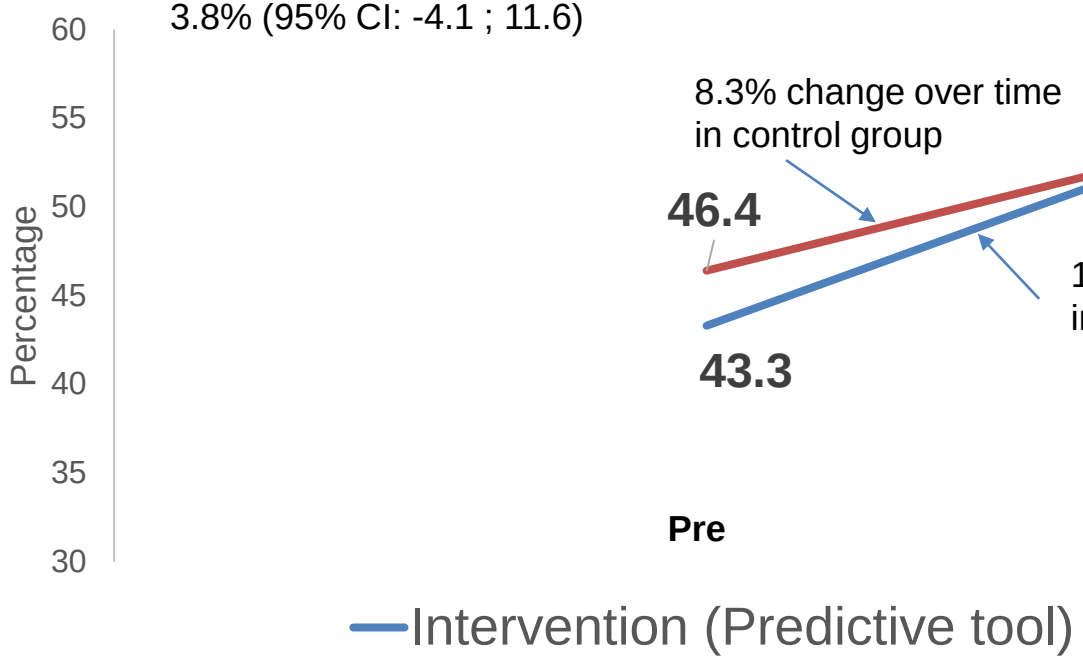
What happened to the **control group** (without predictive tool) over time is what would have happened to the **intervention group** (with predictive tool) in the absence of the program (predictive tool).



Effect of intervention using difference-in-difference approach (taking into account pre-existing differences between Intervention & Control groups and general time trend).

Adjusted SEP-1 Compliance Among Intervention and Control Groups*

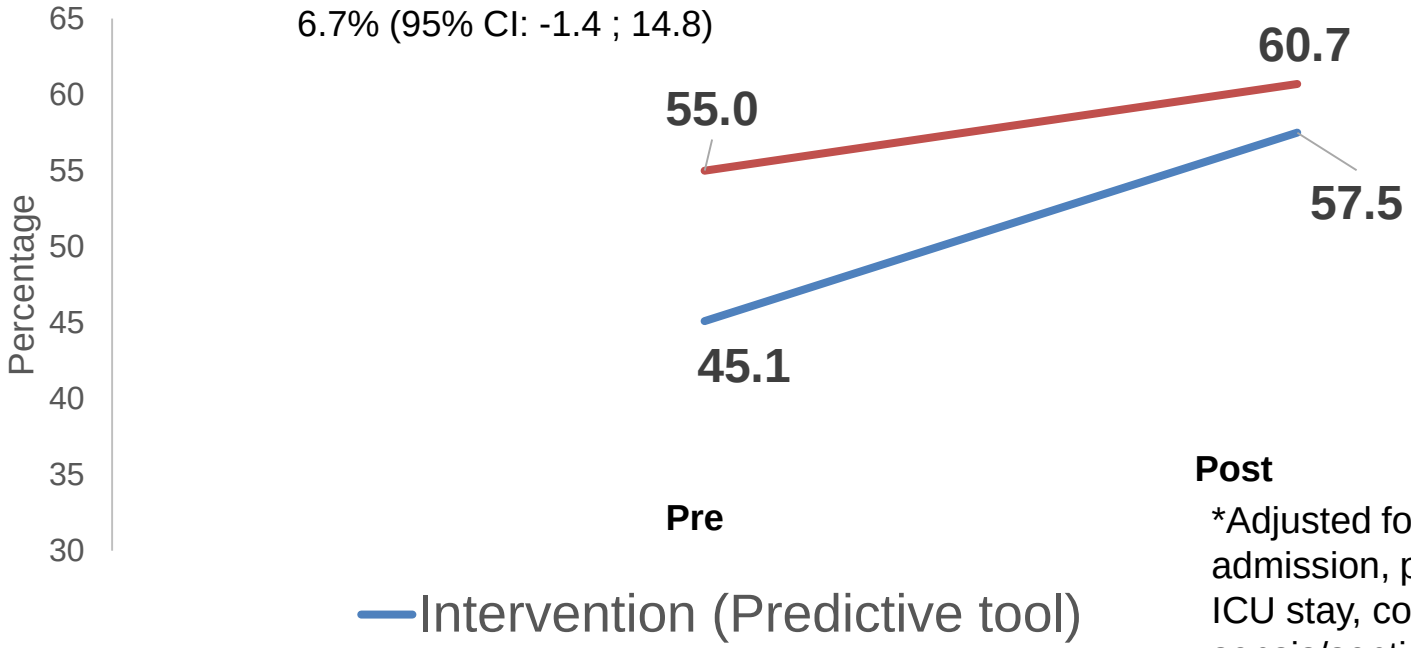
Difference in difference:
3.8% (95% CI: -4.1 ; 11.6)



*Adjusted for: sepsis upon admission, primary payer, ICU stay, comorbidity, severe sepsis/septic shock, day of week, age, sex, race, LOS, and type of admission.

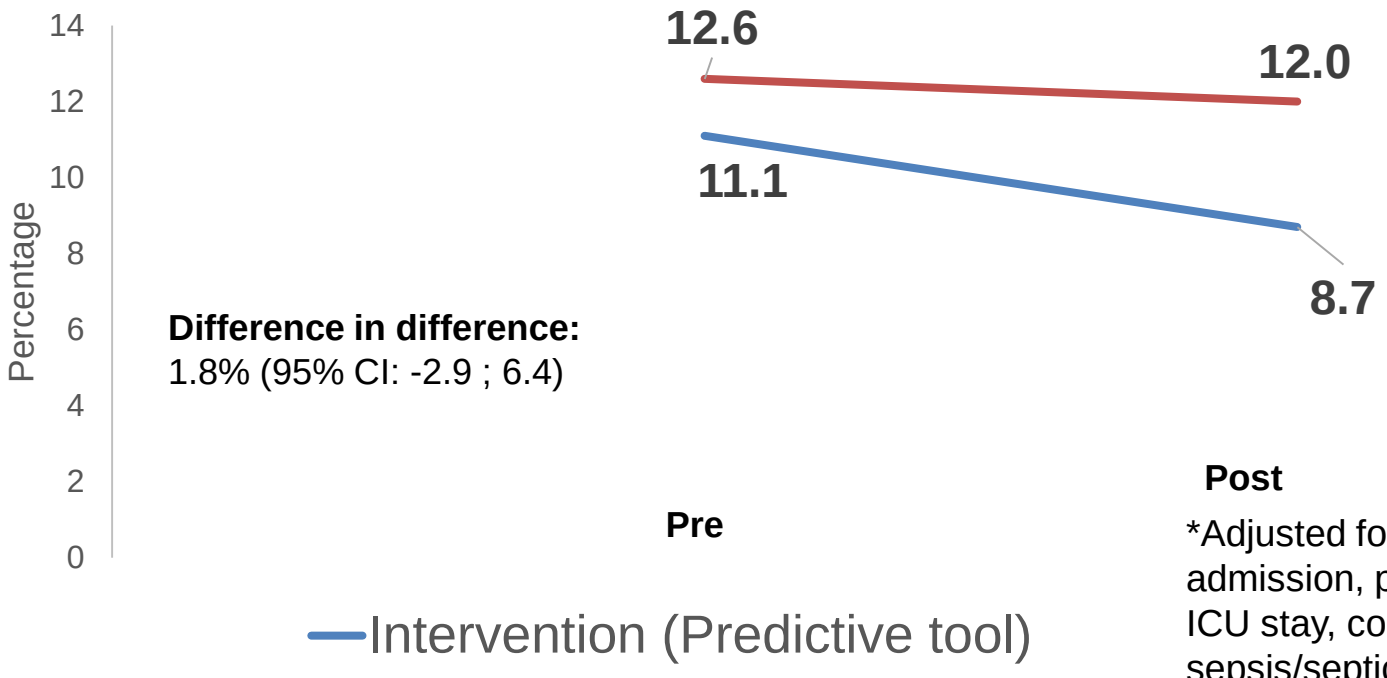
Adjusted Antibiotic Use Within 1 Hour Among Intervention and Control Groups*

Difference in difference:
6.7% (95% CI: -1.4 ; 14.8)



*Adjusted for: sepsis upon admission, primary payer, ICU stay, comorbidity, severe sepsis/septic shock, day of week, age, sex, race, LOS, and type of admission.

Adjusted Mortality Among Intervention and Control Groups*



Difference in difference:
1.8% (95% CI: -2.9 ; 6.4)

*Adjusted for: sepsis upon admission, primary payer, ICU stay, comorbidity, severe sepsis/septic shock, day of week, age, sex, race, LOS, and type of admission.

Limitations

- Limited time following implementation of sepsis predictive tool resulting in limited power to detect differences (preliminary results)
- Use of severe sepsis and septic shock patients only
- Possibly incomplete control of confounding
- Only one aspect of the evaluation of the predictive tool
- Observational study, not randomized design

Conclusions

- Implementing the sepsis core measure and an improvement initiative requires the following:
  - Education
  - Multi-disciplinary team approach
  - Standardized processes
  - Continuous improvement
- Sepsis data reporting and useful reporting tools should drive improvement.
- Advanced data analytics enables progressive decision-making and improvement efforts .

Acknowledgments

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Questions

Continuing Education

Continuing Education (CE) Approval

This program has been approved for CE credit for the following boards:

- **National credit**
  - Board of Registered Nursing (Provider #16578)
- **Florida-only credit**
  - Board of Clinical Social Work, Marriage & Family Therapy and Mental Health Counseling
  - Board of Registered Nursing
  - Board of Nursing Home Administrators
  - Board of Dietetics and Nutrition Practice Council
  - Board of Pharmacy

Note: To verify CE approval for any other state, license, or certification, please check with your licensing or certification board.

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