INCREASING SEPSIS BUNDLE UTILIZATION IN THE INPATIENT SETTING

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DNP SCHOLARLY PROJECT TEAM

Advisor: Shelly Smith, PhD, DNP, APRN-BC, FAAN, FAAN, FNAP

- Professor, Associate Dean for Graduate Nursing, UVA School of Nursing

Second Reviewer: Terri L. Yost, PhD, RN, FNP-BC

- Associate Professor, UVA School of Nursing

BACKGROUND AND SIGNIFICANCE

- Sepsis is a “life-threatening organ dysfunction caused by a dysregulated host response to infection. Septic shock is a subset of sepsis with circulatory and cellular/metabolic dysfunction associated with a higher risk of mortality (Surviving Sepsis Campaign, 2021).

- 48.9 million cases of sepsis, and 11 million sepsis-related deaths globally in 2017 (Rudd et al., 2020).

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BACKGROUND AND SIGNIFICANCE

- #1 reason for hospital admission (Most Frequent Principal Diagnoses, 2018).
- Challenging to identify (Yealy et al., 2021).
- Sepsis bundle order set is a group of evidence-based interventions, when used together gives maximum outcome benefit.

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CLINICAL AND ECONOMIC SIGNIFICANCE

Compliance

- U.S spent 38 billion on sepsis related care annually
- Sepsis 5-day timely hospital stay $11,457.69
- Sepsis 7-day untimely hospital stay $15,709.31

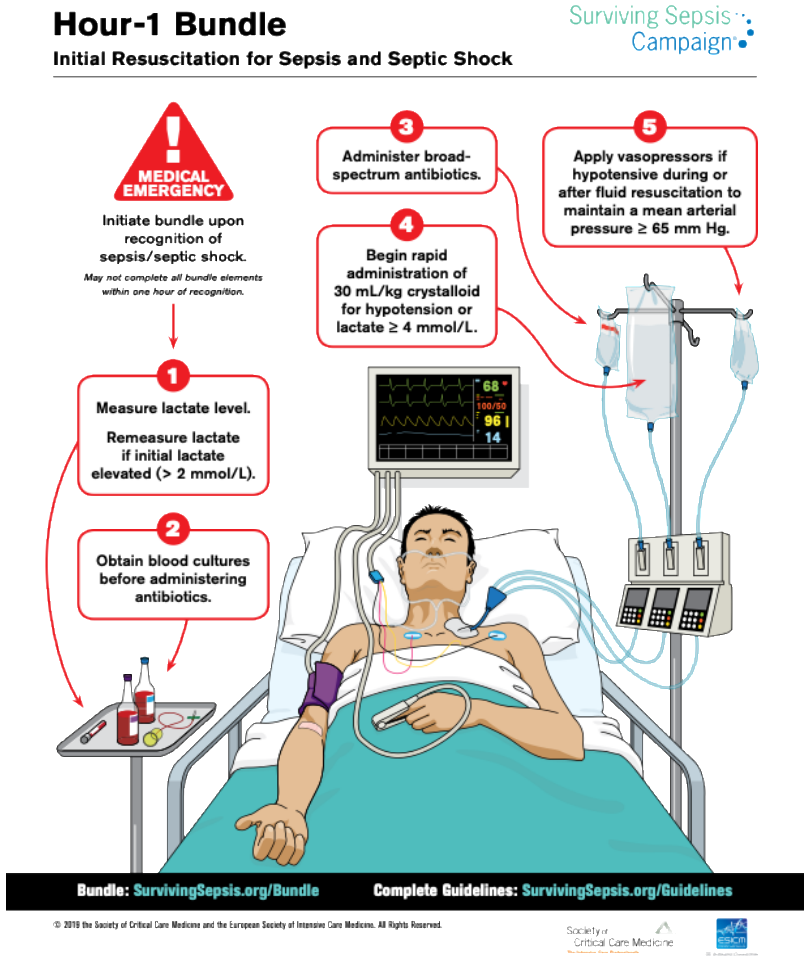
(Hollenbeak et al., 2023)

Financial Incentives under CMS (Centers for Medicare & Medicaid Services) Value Based Purchasing (VBP) Program

- VBP withholds 2% of participating hospitals' Medicare payments:
- Meeting quality metrics, bundle compliance, avoiding penalties

(Hospital Value-Based Purchasing Program | CMS, n.d.)

SEVERE SEPSIS AND SEPTIC SHOCK EARLY MANAGEMENT (SEP-1) BUNDLE



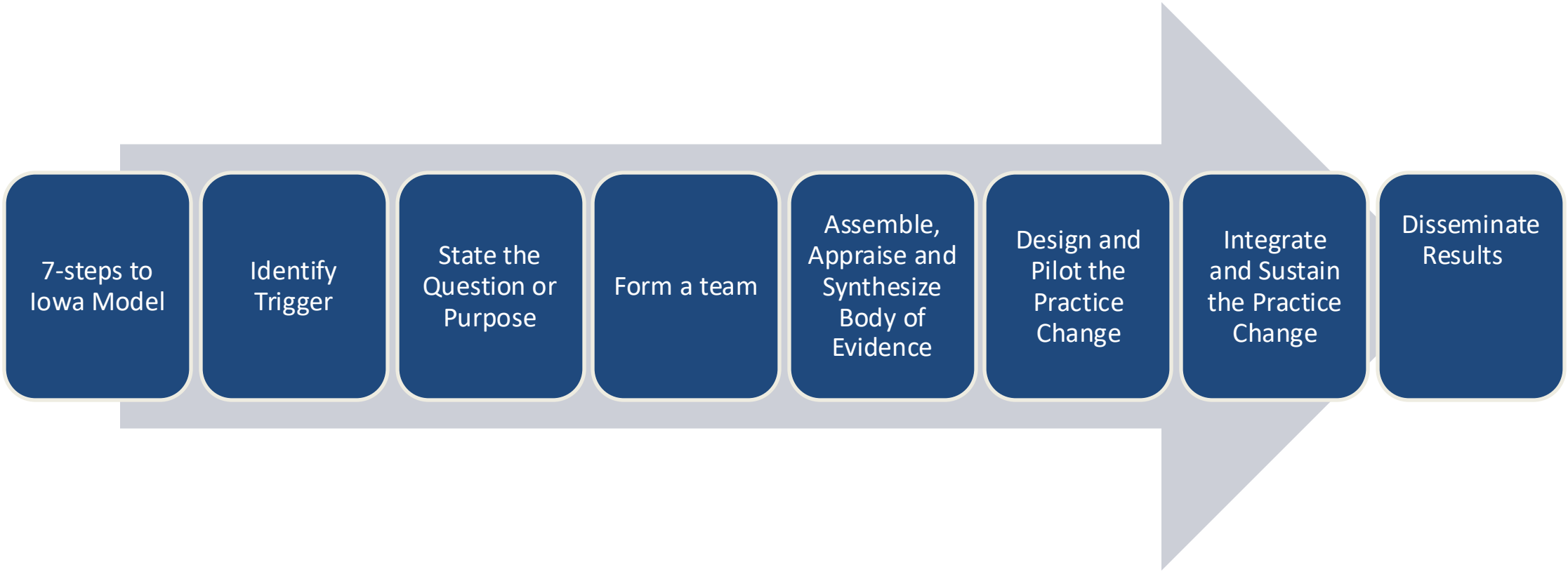
- Measuring serum lactate levels
- Obtaining blood cultures before administering broad-spectrum antibiotics
- Administering 30 ml/kg crystalloid for hypotension or lactate >4
- Vasopressor support

SEP-1 BUNDLE ORDER SET

- Standardized sepsis bundle ensures that hospitals follow best practice (Divatia et al., 2010).

Image: (*Sepsis-Navigator-Provider-Guide-Book.Pdf*,n.d.)

EVIDENCE BASED PRACTICE (EBP) FRAMEWORK: IOWA MODEL



(Iowa Model Collaborative, 2017)

IOWA MODEL STEP 1: IDENTIFY THE ISSUE

Setting:

- Large inpatient tertiary care center

Challenges In Sepsis Bundle Utilization:

- Delayed sepsis recognition, inconsistent provider adherence to sepsis bundles, evolving criteria and CMS billing requirements

Opportunities to Improve:

- Provider education & workflow integration, Epic Sepsis Model
- Aligning CMS documentation with EBP

STEP 2: CLINICAL QUESTION

In adult septic patients, does **sepsis bundle adherence** decrease mortality and improve patient outcomes?

STEP 3: FORM A TEAM

Advisor: Shelly Smith, PhD, DNP, APRN-BC, FAAN, FNAP

Second Reviewer: Terri L. Yost, PhD, RN, FNP-BC

Practice Mentor, Sepsis Navigator, Hospital Medicine Team, Sepsis Committee

STEP 4: ASSEMBLE, APPRAISE, AND SYNTHESIZE BODY OF EVIDENCE

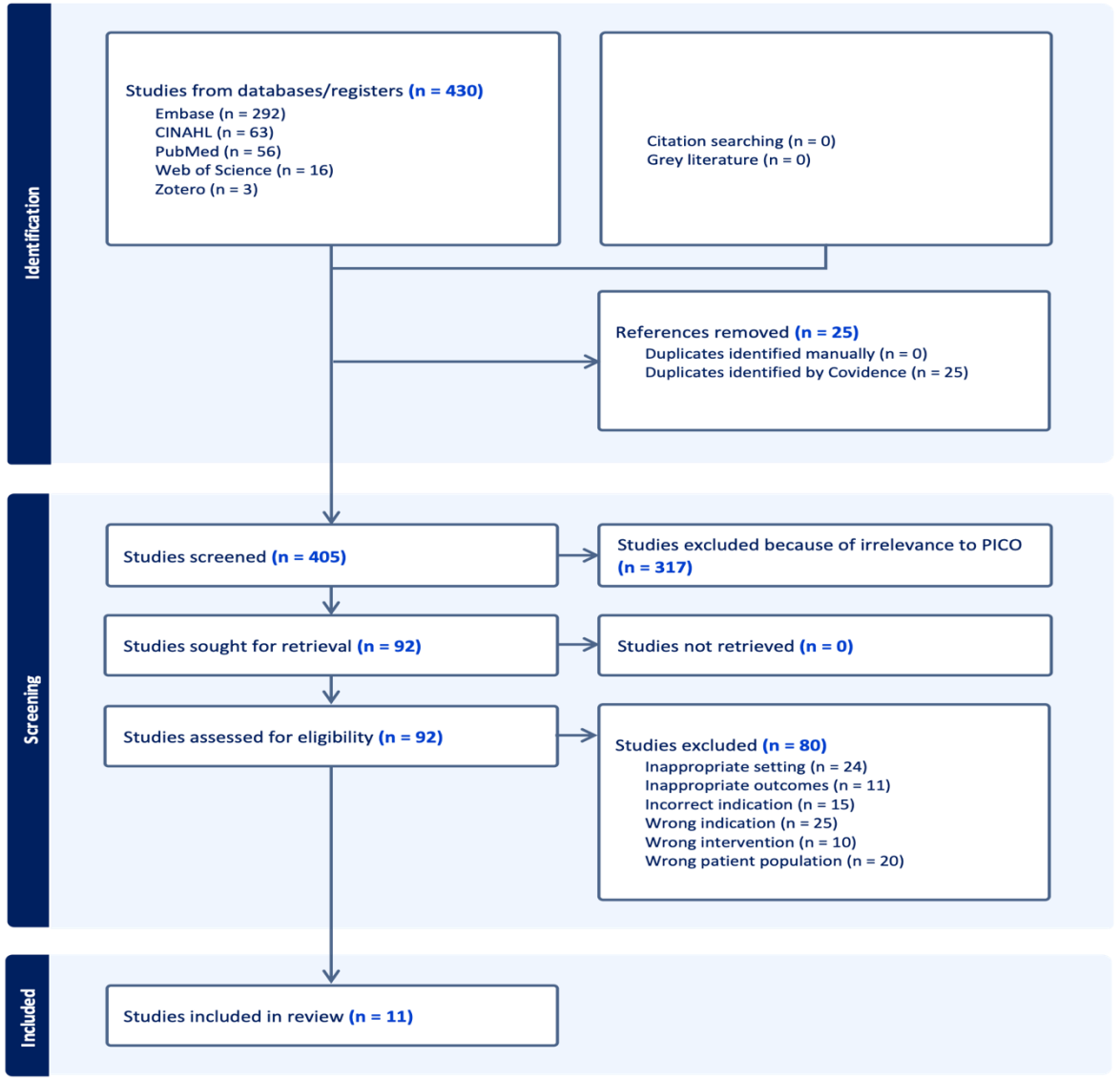
- Review of Literature

Primary Goal:

- Assess the impact of sepsis bundle compliance on mortality rates and patient outcomes, identify key barriers to adherence, and explore evidence-based strategies to improve bundle utilization in the inpatient setting

PRISMA DIAGRAM

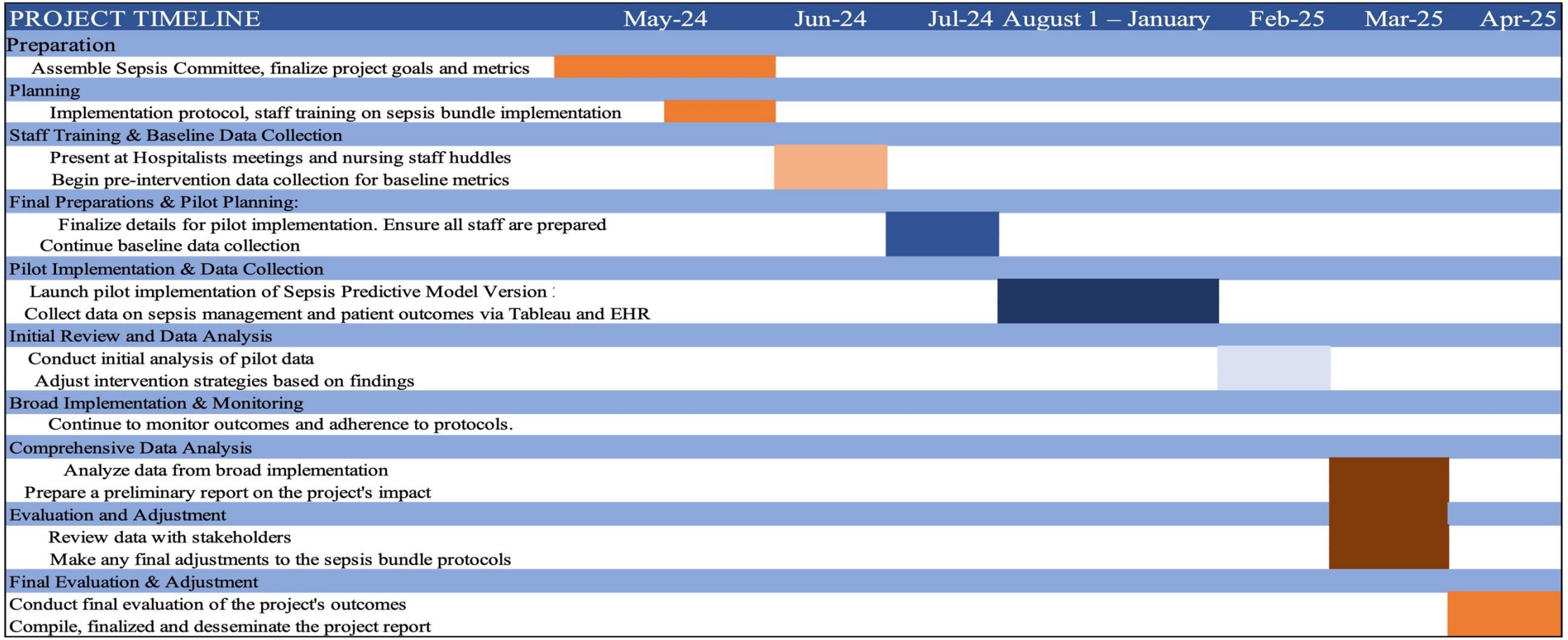
- Using the Johns Hopkins Nursing Evidence-Based Practice Evidence Appraisal Tool the overall quality of evidence ranged from level 1-A to level V-B
- 10-year limitation on publication
- English language



STEP 4: SYNTHESIS & ANALYSIS OF EVIDENCE

Key Theme	Findings
Implementation of Sepsis Bundles	Early recognition, ICU admissions, care standardization
Barriers Encountered in Adhering to Sepsis Bundles	Provider resistance, workflow disruptions, EHR (Electronic Health Record) alarm fatigue
Quality Improvement Approach to Optimize Sepsis Management	Automated alerts, real-time feedback and interdisciplinary collaboration

STEP 5: DESIGN & PILOT THE PRACTICE CHANGE



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STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

Purpose:

- To increase the utilization of sepsis bundles among healthcare providers in the inpatient setting

Method:

- Implementing a standardize sepsis order set that is automatically triggered when patient meets Systemic Inflammatory Response Syndrome (SIRS), or Sepsis criteria

STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

Diversity, Equity and Inclusion:

- Ensure sepsis bundles are applied uniformly across all patient demographics who meet SIRS/Sepsis criteria, to promote equitable care

Ethical Considerations:

Justice

- Ensuring fair access to high-quality care

Beneficence

- Promote optimal patient care by implementing EBP

STEP 5: DESIGN AND PILOT THE PRACTICE CHANGE

Methods:

- **Population**- Adults 18-years of age and older, in the ICU, Med-Surg, Step-down, behavioral health, and cardiac care with a diagnosis of sepsis or septic shock. Except, patients with terminal illness, and palliative measures

STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

- Permissions & Approval:

✓ Practice mentor, Hospital Medicine team

✓ Sepsis Committee, Sepsis Navigator

✓ UVA Institutional Review Board (IRB); not human subject research

× Data Use/Contractual change

STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

Sepsis Spotlight

- Monthly topic focusing on maintaining sepsis as a high-priority issue within the hospital through education and awareness campaigns
- "Sepsis Spotlight" Monthly Newsletter, latest updates in sepsis management

SEPSIS SPOTLIGHT

Sepsis Timer Defined

Promoting Timely Recognition and Bundle Compliance

What it is: A structured approach to monitor the progression of Sepsis care using clinical triggers and standardized documentation

Purpose: Supports adherence to evidence-based sepsis protocols by encouraging early identification, timely order set activation, and completion of bundle components

Key Triggers: Positive IP or ED Sepsis Screening

Year-To-Date Compliance: XX%

SEPSIS SPOTLIGHT

Sepsis Bundle Defined

A – Assess & Alert
B – Blood Cultures
L – Lactate Measurement
A – Antibiotics Administration
S – Saline/Source Control
T – Time/Titration of Fliuds or Vasopressor

SIRS Criteria:	Organ Dysfunction:
Temp < 96.8 or >100.9	SBP <90 or MAP <65
Heart Rate >90	Inc O2 req. -BiPap/Intubation
Resp Rate >20	Creatinine >2.0 (not on HD)
WBC < 4k or 12k	Lactic Acid >2.0
	Total bilirubin > 2.0mg/dL

Sepsis = SIRS + Organ Dysfunction+ Known or Suspected Infection

(Marik & Taeb, 2017)

STEP 5: SEPSIS TIMER

Epic Sepsis Timer

- Ensures timely execution of sepsis bundle components
- Tracks compliance and prompts completion of intervention
- Ensures timely administration and intervention
- Activated by positive sepsis screening in ED/IP or new sepsis order set
- Ensures adherence to CMS guidelines

SEPSIS TIMER

The Epic Sepsis Timer (ESM)

- Time tracking of key interventions

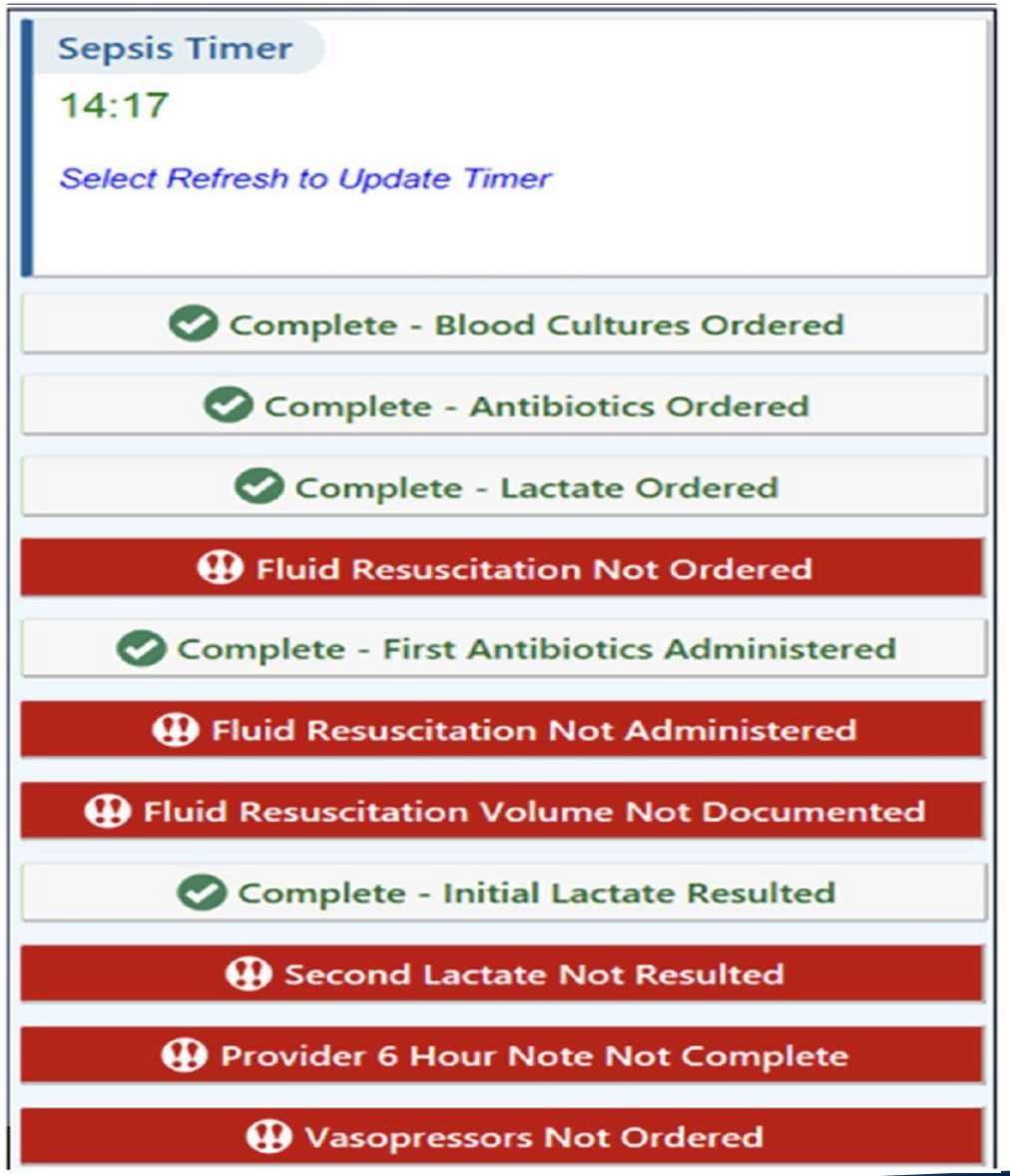


Image: (Fixler et al., 2023)

STEP 5: EPIC SEPSIS MODEL

Epic Sepsis Model (ESM) Inpatient Predictive Analytic Tool:

- Predicts sepsis risk using EHR data
- VS, WBC, glucose, lactate, creatinine, T. bili, platelets, GCS, age
- Time of hospital admission
- Predictive Accuracy: sensitivity of 86%, specificity 80% for sepsis detection

Impact on Mortality: for patients with high ESM scores without antibiotics decreased from 24.3% to 15.9%.

Purpose: to help ensure consistent application of sepsis protocols

Implementation: Supports early intervention by alerting clinicians

(Cull et al., 2023)

STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

Observing and Comparing Sepsis Alerts

- Monitoring and evaluating the response to sepsis alerts in the ED and IP setting
- Sepsis bundle implementation process
- Real-time monitoring to track the responsiveness and accuracy of sepsis alerts across different departments which helped shape educational initiatives and drive workflow improvements

STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

Data Analysis

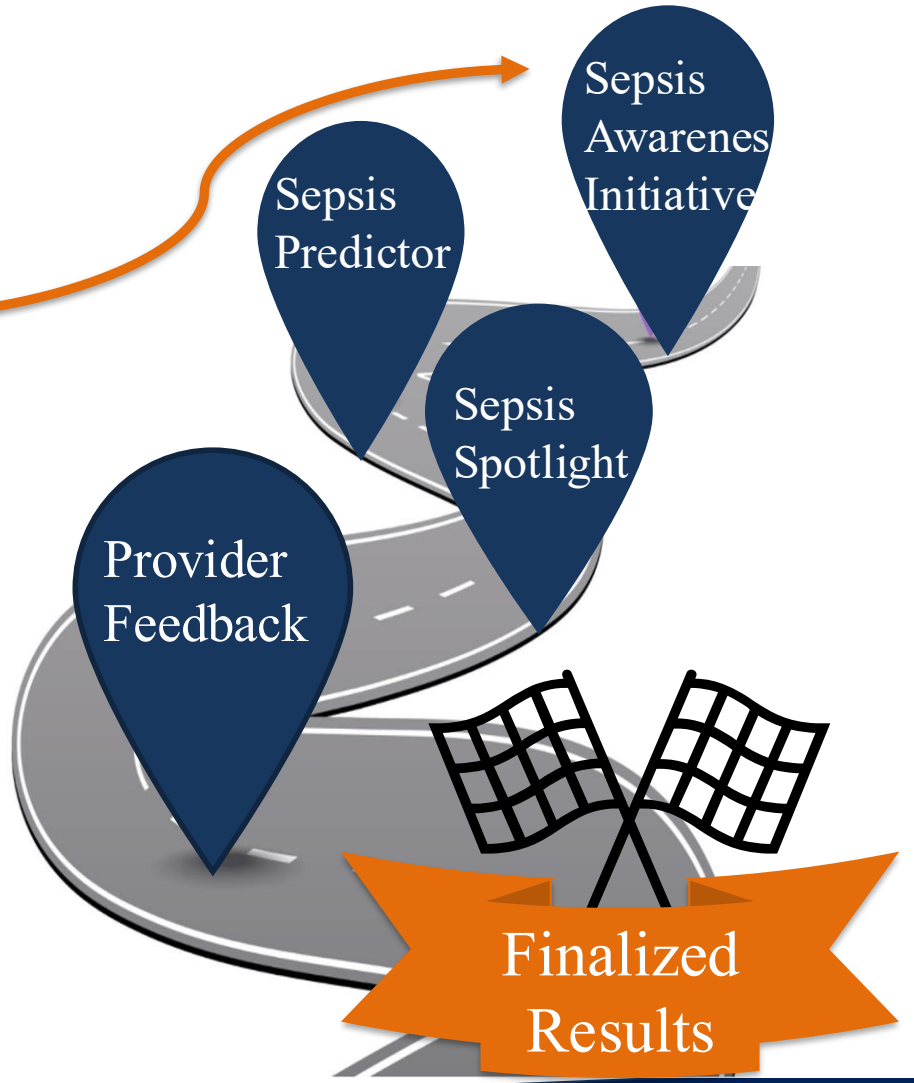
- Tableau and EHR
- Data visualization using charts, graphs, dashboards and reports
- Understand the effectiveness of current sepsis protocols and making necessary adjustments
- Collect comprehensive data on every sepsis case, including time to diagnosis, bundle compliance and patient outcomes

STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

Analyze Sepsis Bundle Compliance → Compare & Observe Sepsis Alerts → Address Common Fallouts

Sepsis Committee Meeting

Implementation Timeline
July 2024– April 2025



STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

Educational Initiatives

- Ensure adherence to evidence-based interventions when SIRS/sepsis criteria is met

Monitor Compliance and Outcomes

- Track sepsis bundle compliance in the inpatient and ED setting
- Track Key Performance Indicators: time to antibiotics, lactate measurement, length of stay, ICU admissions, 30-day readmission rate

Utilize Predictive Analytic Tools

- Sepsis Predictor Model

STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

Strengths

- Aligns with established clinical guidelines to improve patient outcomes
- Enhances early sepsis recognition reducing mortality rates
- Reduce length of stay, and lower healthcare costs
- Fosters collaboration among nurses, physicians and healthcare staff
- Designed to seamlessly fit into existing hospital protocols

STEP 5: DESIGN & PILOT THE PRACTICE CHANGE

Limitations

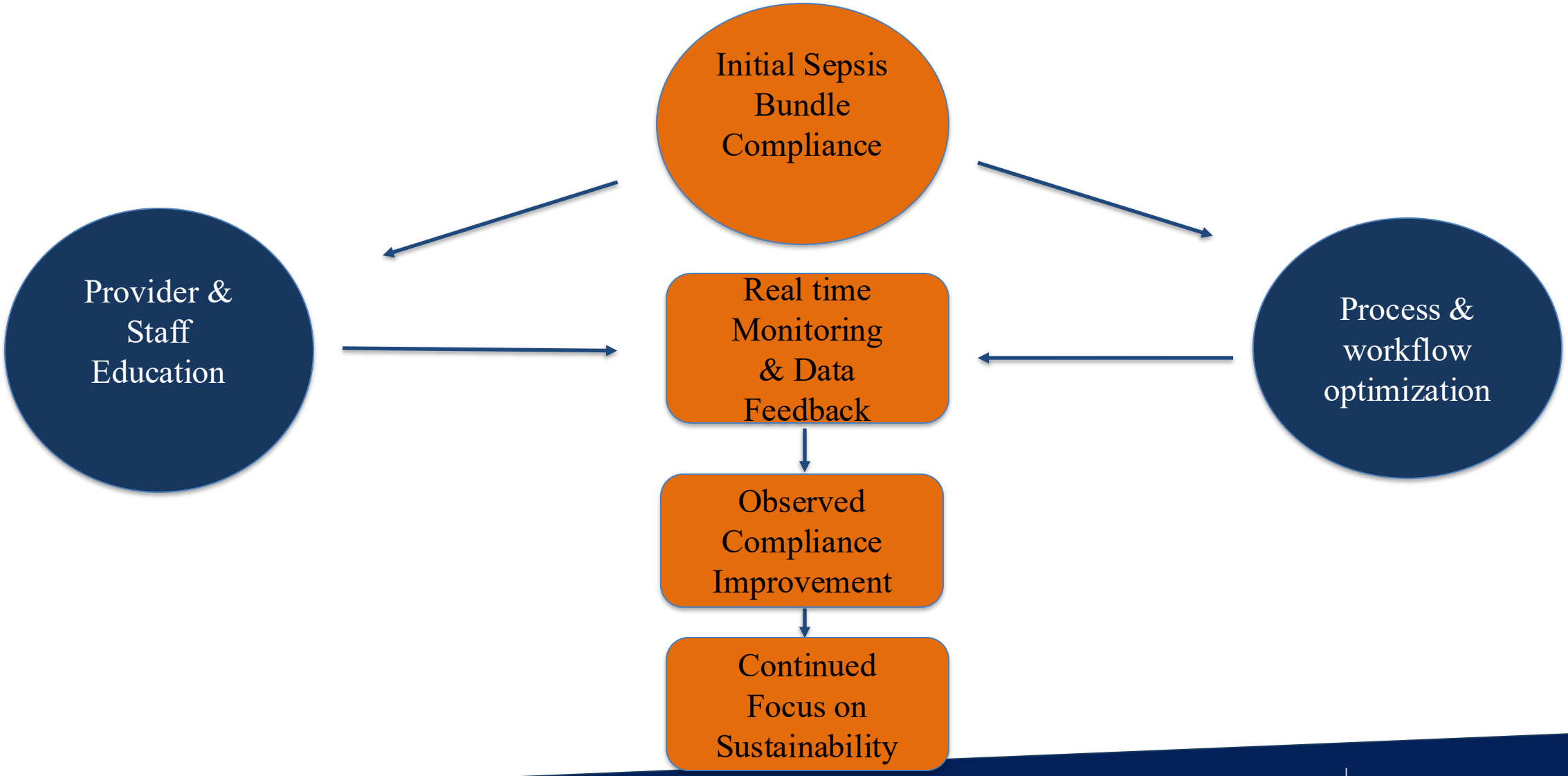
- Not generalizable
- Compliance may be affected by competing clinical priorities, lack of stakeholder buy-in and evolving sepsis criteria
- Implementation may require additional education sessions, EHR modifications and staff training

STEP 6: INTEGRATE & SUSTAIN THE PRACTICE CHANGE

Sustainability Plan

- Embed sepsis bundle in EHR to ensure clinical workflow
- Annual sepsis bundle training to maintain competency and adherence
- Secure leadership buy-in and encourage continuous physician and nurse feedback
- Align with CMS requirements by tracking sepsis bundle compliance metrics

SEP-1 BUNDLE COMPLIANCE IMPROVEMENT



CHALLENGES, LESSONS LEARNED AND KEY TAKEAWAYS

IRB Challenges

- Multi-site IRB approvals, lack of standardized approach
- Delays and data limitations
- Specific data & outcomes not presented

CHALLENGES, LESSONS LEARNED AND KEY TAKEAWAYS

Lessons Learned from Managing Change

Team Buy-In & Communication

- Success requires consistent engagement, educational initiatives and team alignment
- 1:1 physician meetings, concerns for SIRS criteria and CMS billing
- Low specificity and high false-positive, over diagnosis and treatment

Bridging Policy and Practice

- Aligning bedside practice with evolving sepsis criteria: SEP-1, SEP-3

CHALLENGES, LESSONS LEARNED AND KEY TAKEAWAYS

Key Takeaways: Bridging the Gap

- Ensuring policy changes translate into improved patient outcomes

Sepsis Alliance & Expert Pioneer Insights

- Interviewed Dr. Emanuel Rivers, EGDT (2001)
- CMS billing, Evolving sepsis criteria
- Controversial

STEP 7: DISSIMINATE RESULTS

Step 7: Disseminate Results

- Manuscript submission to The Journal of the American Association of Nurse Practitioners
- Poster presentation at Virginia Council of Nurse Practitioner March 2025
- Utilize UVA library database: Libra

STEP 7: DESSMINATE RESULTS

A Review of Evolving Criteria for Sepsis: Implications for Clinical Practice

Aatika K. Wright DNP (c), MSN, APRN, CCRN, CSC-CMC, AGACNP-BC, Shelly Smith, PhD, DNP, APRN-BC, FAAN, FNAP

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BACKGROUND:

Sepsis impacts over 1.7 million U.S. adults annually with a >20% mortality rate, emphasizing the need for timely, accurate diagnosis. *The American Journal of Medicine* critiques SIRS for low specificity and high false positives. Sepsis-3 introduced SOFA and qSOFA to enhance diagnostic accuracy, but reliance on SIRS for CMS billing creates confusion and impedes adoption.

PURPOSE:

1. Inconsistent documentation of SOFA/qSOFA scores
2. Ongoing use of SIRS for billing

METHODS:

A literature review was conducted to compare the diagnostic accuracy, sensitivity, and clinical outcomes of SIRS, SOFA, and qSOFA criteria & explore the integration of these criteria into clinical workflows, billing systems, and provider education efforts. The databases Embase, ScienceDirect, and Pubmed were searched using key words: *Sepsis-3, SIRS criteria*

FINDINGS:

Category	SIRS	SOFA	qSOFA
Diagnostic Accuracy	Low specificity; high false positive rate	High specificity; support early interventions	Reduced false positives; sensitivity gaps noted
Clinical Workflows	SIRS in billing is a barrier to SOFA adoption	Workflow integration challenges, compounded by CMS reliance on SIRS	Easy to implement but lacks sensitivity for early sepsis recognition
Provider Education	Familiarity widespread but not evidence-based	Limited awareness; requires targeted education for adoption	Requires education; simpler scoring approach
Policy Implications	CMS reliance on SIRS contradicts SEP-3 guidelines, delaying widespread adoption	Aligns with evidence-based guidelines	Partial alignment; complement SOFA

CONCLUSIONS:

- Provider education and streamlined documentation are essential to improve sepsis mortality and efficiency in clinical workflows.
- Transitioning to SOFA/qSOFA criteria in sepsis diagnosis, improves specificity and prognostic accuracy compared to SIRS.
- Continued reliance on SIRS for CMS billing creates misalignment with EBP, leading to documentation challenges.
- This misalignment complicates the integration of electronic tools for sepsis management and delays the adoption of SEP-3 criteria.

RECCOMENDATIONS

Aligning CMS billing with EBP, enhancing provider education, and streamlining documentation are key to improving sepsis diagnosis and patient outcomes

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Terri L. Yost, PhD, RN, FNP-BC
Amanda Datesman, MLIS, BSN, RN

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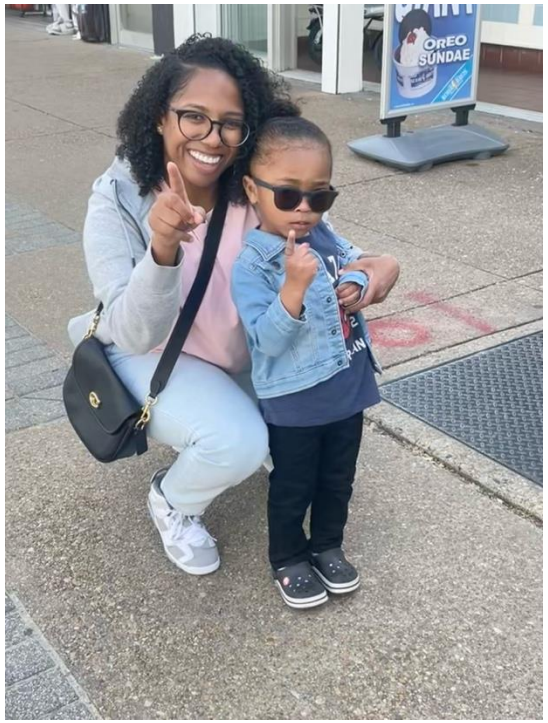

To my adopted parents, Aunt Mary and Uncle Pete—thank you for laying the foundation. To my mentors, Dr. Carline Jean-Gilles and Dr. Debra Barksdale—your guidance has lit my path, and I stand on your shoulders. To my family and friends—thank you for your unwavering love and support. I am the living, breathing proof of your impact. Finally, to my Godson, Big Kori—YOU are the light at the end of this tunnel.

QUESTIONS?

KEY TERMS

CMS: Center for Medicare and Medicaid Services

ED: Emergency Department

EGDT: Early Goal Directed Therapy

EHR: Electronic Health Record

GCS: Glasgow Coma Scale

IP: Inpatient

MAP: Mean Arterial Pressure

RR: Respiratory Rate

SBP: Systolic Blood Pressure

SEP-1: Severe Sepsis and Septic Shock Early Management Bundle

SEP-3: Sepsis-3

SIRS: Systemic Inflammatory Response Syndrome

SOFA: Sequential Organ Function Assessment

qSOFA: Quick SOFA

T. Bili: Total Bilirubin

VS: Vital Signs

WBC: White Blood Cell

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EVOLUTION OF SEPSIS CRITERIA

FEATURE	SIRS '92	SOFA '96	qSOFA '16
Purpose	Identify systemic inflammation	Assess organ dysfunction	Rapid bedside assessment of sepsis risk
Criteria	T: <96.8 or >100.9 HR > 90, RR >20, WBC <4K or >12k	Pao2/FiO2 ratio Platelets, GCS, Bili, MAP or vasopressor, Cr or UOP	GCS, RR≥ 22, SBP ≤ 100
# of Criteria	≥2	0-4 pts	≥ 2 indicates high risk
Setting	ICU and ED	Primarily ICU	ED, IP, pre-hospital
Sensitivity	High	High	Moderate
Specificity	Low	High	Higher than SIRS
Relation to SEP-3	Removed from definition	Integral part of definition	Screening to for suspected infection

(Singer et al., 2016)