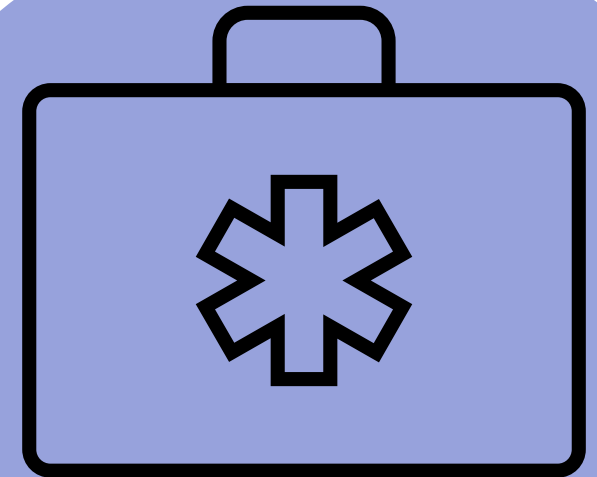




Sepsis Train the Trainer: Nursing Supervisors & On-call Physicians

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TIMELINE

- SIRS criteria came early and was used for decades.
- 2014 Society of Critical Care Medicine and European Society of Intensive Care Medicine met
- Developed SOFA and qSOFA
- qSOFA required no labs.



TIMELINE CONTINUED...

- Minnesota Hospital Association
- 100/100/100 Screening Tool
- Recommended for Long Term Care in 2016
- INTERACT published Care Path for Sepsis in 2017



Sloane et. al Comparison of Screening Tools with Hospital Sepsis Diagnosis for 59 Patients Transferred to Acute Care from SNF

Table 2

Performance of Screening Tools in Distinguishing Patients Transferred From a NH to a Hospital With Early Sepsis From Patients Without Sepsis*

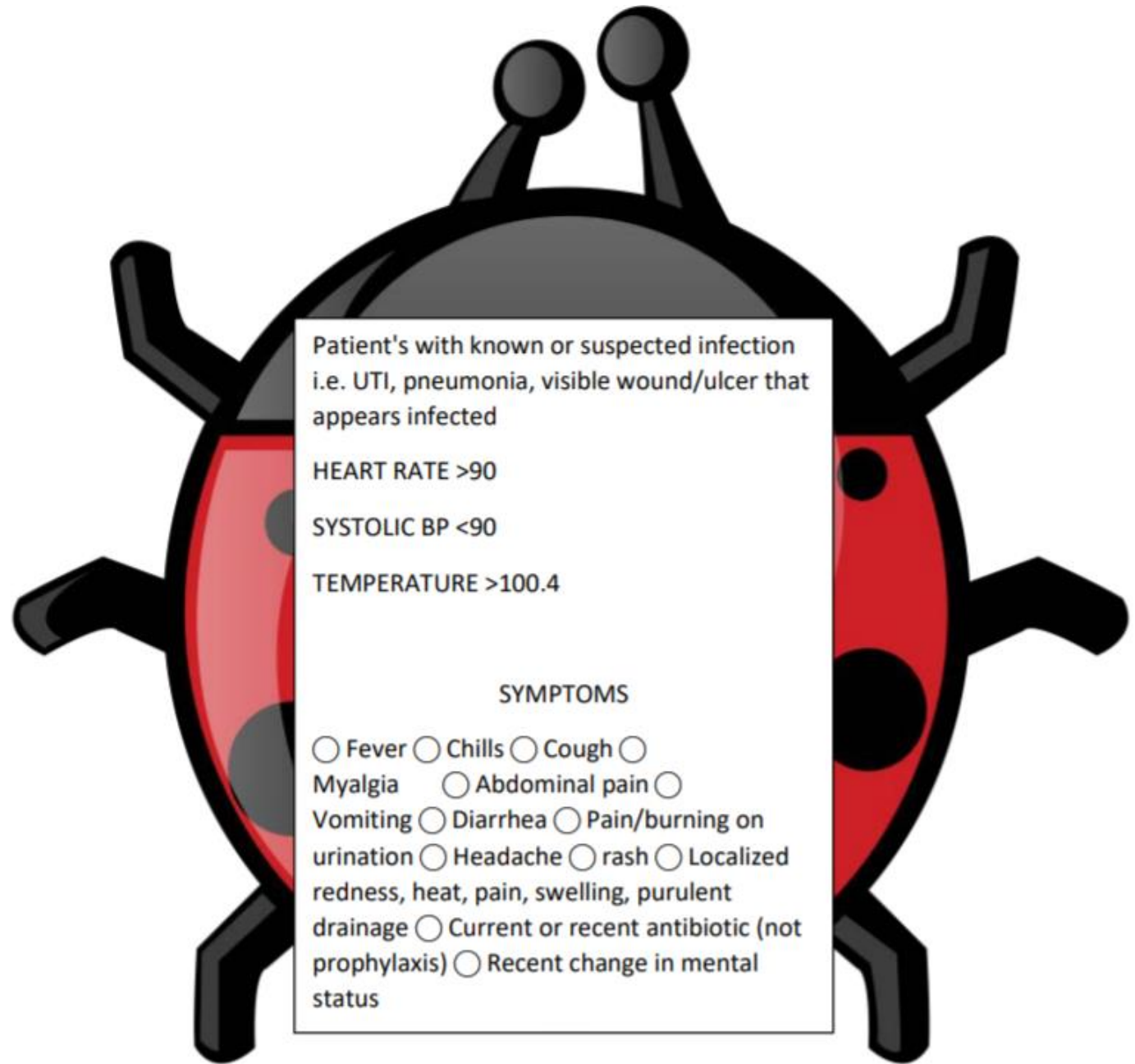
Sepsis Screening Tool	Variables	13–72 h Prior to Hospitalization		≤12 h Prior to Hospitalization	
		Nonsepsis	Sepsis	Nonsepsis	Sepsis
SIRS	Met screening criteria	6%	10%	12%	36%
	Sensitivity for sepsis		10%		36%
	Specificity for sepsis		94%		86%
qSOFA	Met screening criteria	4%	7%	13%	27%
	Sensitivity for sepsis		7%		27%
	Specificity for sepsis		96%		88%
100-100-100	Met screening criteria	16%	28%	31%	79%
	Sensitivity for sepsis		28%		79%
	Specificity for sepsis		84%		69%
Temperature ≥99.0° F	Met screening criteria	14%	22%	15%	51%
	Sensitivity for sepsis		22%		51%
	Specificity for sepsis		86%		85%
Temperature ≥100.2° F	Met screening criteria	3%	9%	7%	20%
	Sensitivity for sepsis		9%		40%
	Specificity for sepsis		97%		93%

*Analysis limited to study participants with complete vital sign data; n = 47 patients with a hospital discharge diagnosis of sepsis and 135 who were hospitalized without sepsis.

Review of Nursing Home Screening Tool for Use Agreement with Sepsis Diagnosis

- Glasgow Coma Scale not used
- 60% had notation of change in mental status
- 19% had a visit from a NP or physician in 12 hours prior to hospital transfer

Systemic
Inflammatory
Response Syndrome
(SIRS) CRITERIA
(STARFORUM BUG)



Patient's with known or suspected infection
i.e. UTI, pneumonia, visible wound/ulcer that
appears infected

HEART RATE >90

SYSTOLIC BP <90

TEMPERATURE >100.4

SYMPTOMS

- Fever
- Chills
- Cough
- Myalgia
- Abdominal pain
- Vomiting
- Diarrhea
- Pain/burning on urination
- Headache
- rash
- Localized redness, heat, pain, swelling, purulent drainage
- Current or recent antibiotic (not prophylaxis)
- Recent change in mental status

Systemic Inflammatory Response Syndrome (SIRS)

- > 100.4 degrees F
- < 96.8 degrees F
- > 90 Bpm heart rate
- > 20 per minute respiratory rate
- > 12,000 WBC count

SIRS Criteria

- Moderate sensitivity
- Low specificity
- Used extensively from 2003-2013



SIRS gave way to SOFA in 2014

- Quick
- Sequential
- Organ
- Failure
- Assessment



Q SOFA

- A sepsis screening tool for use in the non-ICU setting
- Developed in 2014 by The Third International Sepsis Consensus Definitions Task Force (a panel of sepsis experts)
- 3 criteria used to generate a score that identifies patients with suspected infection who are at greater risk for poor outcomes outside of the ICU.

Q SOFA

- 3 criteria used are as follows:
 - Altered mental status (Glasgow coma scale <15)
 - Low blood pressure (SBP ≤ 100 mmHg)
 - High respiratory rate (≥ 22 breaths per min)
- One point is assigned for each criterion met
- The presence of 2 or more Q SOFA points near the onset of infection is associated with a greater risk of death



Q SOFA

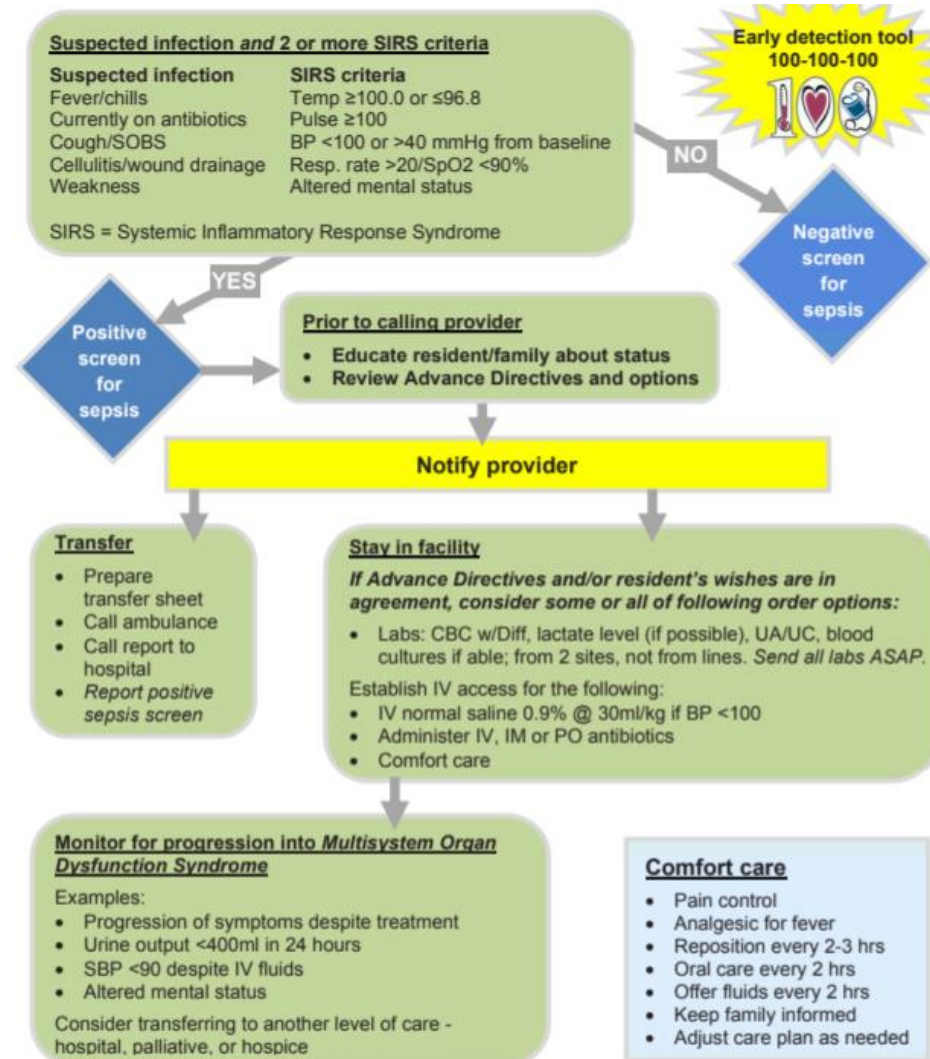
FOR DEMONSTRATION OF Q SOFA CALCULATION

VISIT <https://qsofa.org/calc.php> and enter the necessary values

Q SOFA LIMITATIONS

- Accurately assessing altered mental status can be difficult at the bedside.
- Q SOFA uses the Glasgow coma scale to define altered mental status for sepsis, however, the scale was created to measure a person's level of consciousness after a brain injury - and those with suspected sepsis may not necessarily have a brain injury.
- Lactate level was not included as a biomarker; this is a well-documented prognostic marker in patients with sepsis.

MINNESOTA HOSPITAL ASSOC. TOOL



Suspected infection and 2 or more SIRS criteria

Suspected infection

Fever/chills
Currently on antibiotics
Cough/SOBS
Cellulitis/wound drainage
Weakness

SIRS criteria

Temp ≥ 100.0 or ≤ 96.8
Pulse ≥ 100
BP < 100 or > 40 mmHg from baseline
Resp. rate > 20 /SpO2 $< 90\%$
Altered mental status

SIRS = Systemic Inflammatory Response Syndrome

NO

Early detection tool
100-100-100



Negative
screen
for
sepsis

YES

Positive
screen
for
sepsis

Prior to calling provider

- Educate resident/family about status
- Review Advance Directives and options

Notify provider

Notify provider

Transfer

- Prepare transfer sheet
- Call ambulance
- Call report to hospital
- *Report positive sepsis screen*

Stay in facility

If Advance Directives and/or resident's wishes are in agreement, consider some or all of following order options:

- Labs: CBC w/Diff, lactate level (if possible), UA/UC, blood cultures if able; from 2 sites, not from lines. *Send all labs ASAP.*

Establish IV access for the following:

- IV normal saline 0.9% @ 30ml/kg if BP <100
- Administer IV, IM or PO antibiotics
- Comfort care

Monitor for progression into *Multisystem Organ Dysfunction Syndrome*

Examples:

- Progression of symptoms despite treatment
- Urine output <400ml in 24 hours
- SBP <90 despite IV fluids
- Altered mental status

Consider transferring to another level of care - hospital, palliative, or hospice

Comfort care

- Pain control
- Analgesic for fever
- Reposition every 2-3 hrs
- Oral care every 2 hrs
- Offer fluids every 2 hrs
- Keep family informed
- Adjust care plan as ne

MINNESOTA HOSPITAL ASSOC. TOOL 100: 100: 100 USES

A screening triage tool for detection of sepsis in long term care settings

- Created in response to rising sepsis mortality among older adults.
- Initiates intensive surveillance of sepsis by front line medical staff
- Targeted to provide for more structured communication between front line medical staff (CNAs/GNAs/Med-Techs/Medical Assistants) and clinicians

MINNESOTA HOSPITAL ASSOC. TOOL

100; 100; 100

- 100 ↑ - **is their temperature above 100**
- 100 ↑ - **is their heart rate above 100**
- 100 ↑ - **is their blood pressure below 100**
- Does the resident just not look right? Has the resident's mental status changed? Screen for sepsis and notify the physician immediately.

ATLANTIC QUALITY IMPROVEMENT SEPSIS TOOL

Symptoms or Signs of Sepsis

- Infection (confirmed or suspected)
- Fever or feeling very cold
- Rapid heart rate
- Rapid breathing
- Shortness of breath
- Confusion or difficulty to arouse
- Complaints of extreme pain
- Pale/discoledored skin

YES

Take Vital Signs and draw WBC

- Temperature
- BP, pulse
- Respirations

Vital Sign Criteria (any met?)

- Infection (confirmed or suspected)
- PLUS —
- **Two or more of the following:**
 - Altered Mental Status (Glasgow Coma Scale <13)
 - Hypotension (systolic <100mmHg)
 - Tachypnea (RR >22)
 - Decreased urine output or darkened/concentrated urine

Sepsis = Infection + life-threatening organ dysfunction

Septic Shock = Sepsis + persistent hypotension despite fluid resuscitation and need for vasopressors to keep MAP >65mmHg.

YES

Notify MD/NP/PA

Review resident's wishes for life-sustaining treatment

NO

Consider Contacting MD/NP/PA for orders (for further evaluation and management)

- WBC
- Blood cultures X2 (prior to antibiotics)
- Lactate
- Coagulation tests (a PTT/INR)
- Serum Creatinine
- Platelet count
- Bilirubin
- Urinalysis
- Urine culture
- Blood glucose

Tests Ordered

Evaluate Results

- WBC >12,000 or <4,000 or >10% bands
- Lactate >2mm/L
- Platelets <100,000
- Serum Creatinine >2.0mg/dL
- aPTT.60secs or INR >1.5
- Bilirubin >2mg/dL
- Hyperglycemia (not diabetic)

YES

Manage in Facility

- Monitor vital signs, fluid intake/urine output
- Oral, IV or subcutaneous fluids if needed for hydration
- Update advance care plan and directives if appropriate

Monitor Response

- Sepsis criteria met
- Worsening condition

≡ ATLANTIC QUALITY IMPROVEMENT SEPSIS TOOL: USES

- A screening tool for early recognition of Sepsis in the NH setting
- Incorporates Q SOFA and 1 hour bundle of care for sepsis.
- Includes screening for sepsis AND septic shock
- Takes into consideration the resident's wishes for treatment – which is something other screening tools do not mention

≡ ATLANTIC QUALITY IMPROVEMENT SEPSIS TOOL: LIMITATIONS

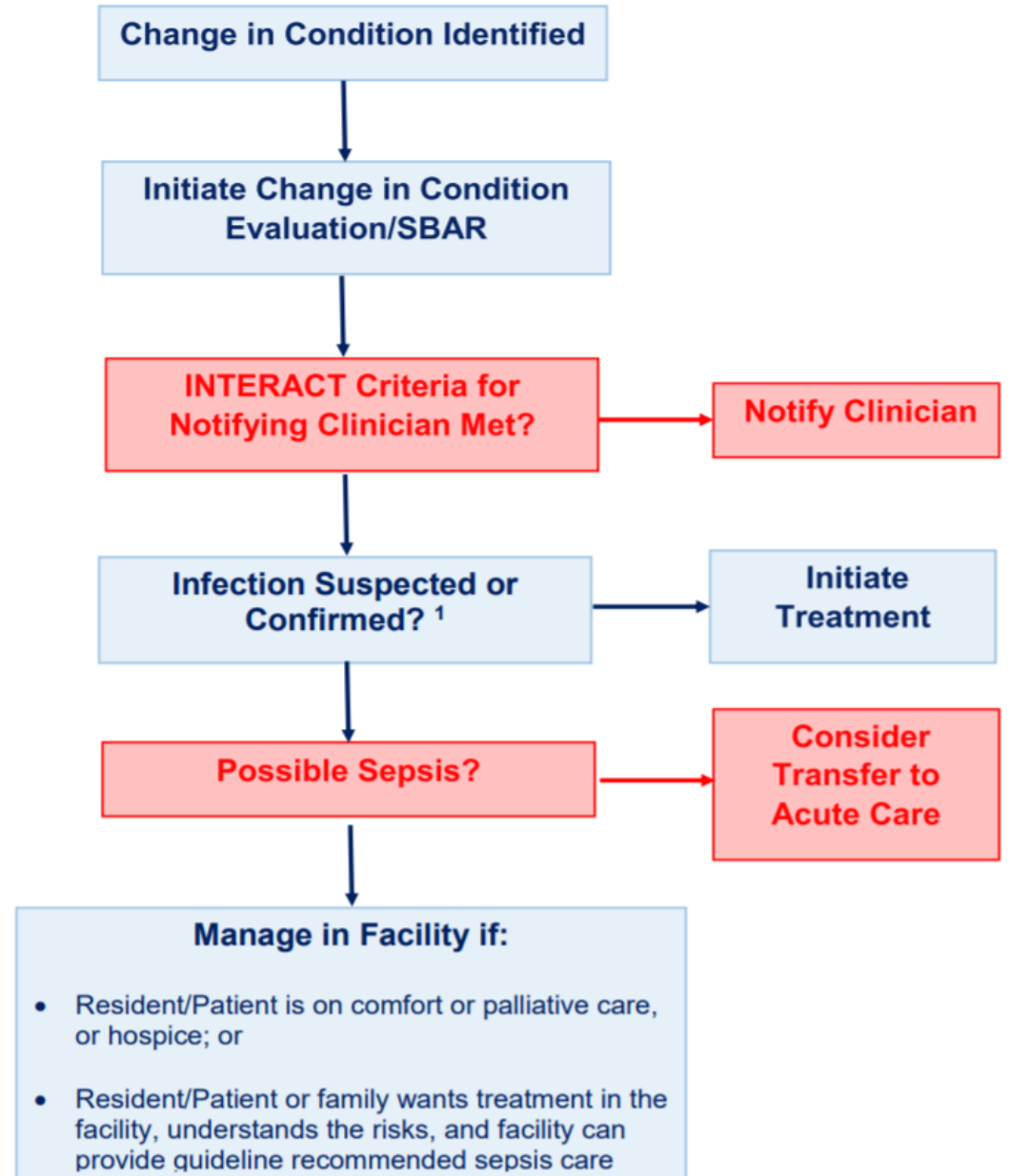
- Successful management and treatment for sepsis in the NH setting is heavily reliant on early detection and rapid response
- Reliance on necessary labs places burden on NH to ensure that lab used has a fast turnaround time – this may likely be out of the NH's control
- This tool encourages management of sepsis and septic shock in the facility – however, it should also include the need to transfer to the hospital setting for specialized care if ne



INTERACT TOOL

INTERACT focuses on reducing hospitalization of residents and begins with recognition of a change in status of a resident and provides a method to evaluate this change, for which there are many causes including infection.

Management of Possible Sepsis





INTERACT TOOL

- The INTERACT program includes more than a dozen separate tools.
- Some are designed to facilitate early identification of changes in condition while others are designed to improve communication between NH staff, medical providers, and other facilities.
- Some tools address implementation of advance directives, thereby reducing the use of acute hospital care when it is clearly not necessary (such as if the resident does not wish to be transferred to a hospital, and when the NH has capacity to handle sepsis).
- “Interventions to Reduce Acute Care Transfers” – INTERACT, is a quality improvement program that focuses on the management of acute changes in condition among residents in a skilled nursing facility, and other long-term care settings.



STOP AND WATCH

S

Seems different than usual

T

Talks or communicates less

O

Overall needs more help

P

Pain – new or worsening; Participated less in activities

a

Ate less

n

No bowel movement in 3 days; or diarrhea

d

Drank less

W

Weight change

A

Agitated or nervous more than usual

T

Tired, weak, confused, or drowsy

C

Change in skin color or condition

H

Help with walking, transferring, toileting more than usual

SEVERE SEPSIS SCREENING TOOL

SEVERE SEPSIS SCREENING TOOL

I. INFECTION

- Suspected or documented infection
- Antibiotic therapy

*If no checks above = NEGATIVE screen for sepsis. Initial _____



II. SIRS – Systemic Inflammatory Response Syndrome (lady bug form)

- Temperature **greater than or equal to 100.4° F or less or equal to 96.8° F**
- Heart rate **greater than 90 beats/minute**
- Systolic blood pressure **less than 90 mmHg**

*If less than two checked = NEGATIVE screen for sepsis. Initial _____

***If 2 above are checked, PATIENT SCREENED POSITIVE FOR SEPSIS; alert the nurse who will:**

Place resident on I & O. Monitor and record urine output every shift.

Obtain order for LACTIC ACID and proceed to Section III.



III. ORGAN DYSFUNCTION

- Respiratory: SaO2 less than 90% OR increasing O2 requirements
- Cardiovascular: SBP less than 90 mmHg or 40 mmHg less than baseline
- Renal: Urine output less than 0.5 ml/kg over last 8 hours
- CNS: Mental status changes

LABS: (Do not use lab results older than 24 hours.)

- Platelets less than 100,000
- INR greater than 1.5
- Bilirubin greater than or equal to 4 mg/dl
- Serum lactic acid greater than or equal to 2 mEq/l

***If 1 above checked, PATIENT SCREENS POSITIVE FOR SEVERE SEPSIS.**

CALL PHYSICIAN AND FOLLOW SBAR SCRIPT BELOW.

*If no checks above = NEGATIVE screen for sepsis. Initial _____

Continue to assess every two to four hours.



SITUATION: Tell physician resident screened positive for Severe Sepsis

BACKGROUND: Describe positive SIRS; inform physician if resident is currently being treated for a known infection; share which organ system has dysfunction

ASSESSMENT: Share VS and SaO2 (pulse ox)

RECOMMENDATION – REQUEST ORDER FOR FOLLOWING: Decrease BP, fluid bolus 30 ml/kg over 1 hour or faster if systolic blood pressure is less than 90 mmHg until hypotension resolved. If resident does not respond to bolus within one hour, send to ER.

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≡ MEASURING VITAL SIGNS

- Temperature
- Pulse
- Respiratory Rate
- Blood Pressure
- Oxygen Saturation

Tool Comparison Chart

Tool	Temp Elevation	Temp Depression	BP Hypotension	BP Hypertension	HR	O2 Sat	Resp Rate	Mental Status	White Blood Cell
SIRS	>100.4F	<96.8F	<100 or >40 mmHg		>90 bpm		20 or Pco2 <32	Altered Mental Status	>12,000 or < 4,000 or 10% bands
qSOFA	Biomarker not assessed	Biomarker not assessed	<100 mmHg					Glasgow coma scale <15	
Minn	>100	<96.8	<100 mmHg		>100 bpm		20 or Pco2 <32	Altered Mental Status	>12,000 or <4,000 or 10
Atlantic	N/A	N/A						Altered Mental Status	>12,000 or < 4,000 or 10% bands
INTERACT	>100.5		<90 or greater than 200 systolic	> 200	>100 or <50 bpm	<90%	> 28 or Pco2 < 10	Altered Mental Status	>14,000 or neutrophils > 90%

≡ Determining If There Is an Infection

- Assessing Symptoms
- Identifying a System that Might be Infected

≡ Documenting Change in Symptoms Associated With A System

- Use of Assessment Checklist
- SBAR to report results of Assessment.

≡ Informing Care Managers About the Results of Assessment

- CNAs need clear guidance about when to report
- Care managers need to take those reports seriously and to act upon them according to established protocols
- Feedback to CNAs and others who report about the disposition of the findings and why



Best Practices for Initiation of Quality Improvement/ Performance Improvement Initiative on Sepsis

≡ Role of the Electronic Health Record

- Prompts in Electronic Health Record that alert for additional monitoring
- Prompts in Electronic Health Record for order sets
- Prompts for high-risk patients for sepsis
- Ability to auto populate vital signs and labs to trigger alerts for clinical staff

≡ Use of the Electronic Health Record can support sepsis Decision Making

- An electronic alerting system was shown to reduce the time to initiation of therapy for sepsis
- High risk patients were identified and advanced practice nurses and attending physicians were notified when certain criteria were met
- The alert required some action be taken in response to cancel the alert
- The group of septic and septic shock patients prior to implementation of the alert had a mean of 3.5 hours longer time to treatment initiation when compared with patient post-implementation

☰ Notification Algorithm for Electronic Health Alerts

- Web-based/EHR predictive algorithms that elicit specific data such as but not limited to vital signs (BP, Temp, HR, RR, and SpO2) lab values, nurses notes, and event reports
- EHR serves as a data collection tool and repository for predicting risk of sepsis for patients. A system that provides a data collection tool that allows for continuous analysis and surveillance could be most beneficial
- System must be able to identify SIRS criteria and offer clinical decision support (CDS) to healthcare professionals (such as EPIC system developed collaboratively with UCSF or Cerner implementation at Intermountain Healthcare)

Definition of Sepsis Intervention

- Fluid Bolus
- Administration of Broad-Spectrum Antibiotics
- Collection of Blood Cultures
- Collection of a Lactic Acid level

Electronic Alerts for Sepsis Recognition



Simulation as a Tool for Certified Nursing Assistant and Provider Training

- Simulation using STOP AND WATCH and SBAR
- Two step training focusing initially on STOP AND WATCH to recognize sepsis symptoms early
- Second training focusing on SBAR to alert clinical supervisors about the septic patient's condition

≡ **Houston Medical Center Nurse Based Early Recognition and Response Program**

- Developed by Houston Medical Center to equip bedside nurses with an easier to use tool for sepsis screening
- Earlier program failed because bedside nurses found initial tool too cumbersome to use
- Adapted a tool that used SIRS criteria based on commonly collected data. Heart rate, respiratory rate, temperature, white blood cell count
- Used an ordinal scale based on deviations from normal (0 to 4)
- Combined with a yes/no score for acute mental deterioration

Nurse Based Early Recognition and Response

- A score greater than 4 triggers a review by a second responder
- Positive predictive value was 80.2%
- Negative predictive value 99.5%

Nurse Based Early Recognition and Response

- Started with a paper version
- Transitioned into a system fully integrated into the Electronic Health Record
- Auto populates with most recent vitals and labs
- System integrated throughout hospital, not just ER or ICU
- Patients screened on admission, at 12-hour intervals and when there is a change in condition

Nurse Based Early Recognition and Response

- Positive screen prompts a second responder (nurse practitioner) to evaluate
- Assess likelihood of sepsis
- Search for infection source
- Administer treatment without physician approval (physicians are informed)
- Treatment administered one hour after positive screen reevaluated by second responder

Nurse Based Early Recognition and Response Training

- Training on sepsis is required for bedside nurses prior to use of tool and on annual reexamination
- Simulation training (4 hour minimum) required for second responders

Nurse Based Early Recognition and Response Effectiveness

- Program was fully implemented in 2009
- In 2009, 2010 and 2011 the percentage of inpatient with positive screens for sepsis ranged from 11% to 12%
- The sepsis related death rate declined from 29.7% pre-implementation to 21.1% post implementation
- This was statistically significant at $p < .0001$

≡ Nurse Based Early Recognition and Response Costs

- Baseline period exhibited 411 sepsis stays (49 sepsis stays per 1000 Medicare stays)
- 39% reached CMS outlier status
- Cost of \$5.2 billion to Medicare
- 442 sepsis stays (48 sepsis stays per 1000 Medicare stays)
- 24% reached CMS outlier status during comparison period
- Costs \$3.2 million
- Savings of \$2.4 million

Nurse Based Early Recognition and Response Costs

- Long Term Acute Care Hospital (LTACH) and Skilled Nursing Facility Cohort
- Goal to Decrease Sepsis Related Admission Back to Acute Care by 25% from baseline
- Decrease CMS reimbursements for acute care admissions back to SNF by 27% from baseline

≡ **Nurse Based Early Recognition and Response Cost: Primary Drivers**

- Early Recognition in LTACH and SNF can sometimes prevent acute care admission or shorten them
- Requires a facility wide commitment to improving clinical care in sepsis

≡ **Nurse Based Early Recognition and Response Cost: Secondary Drivers**

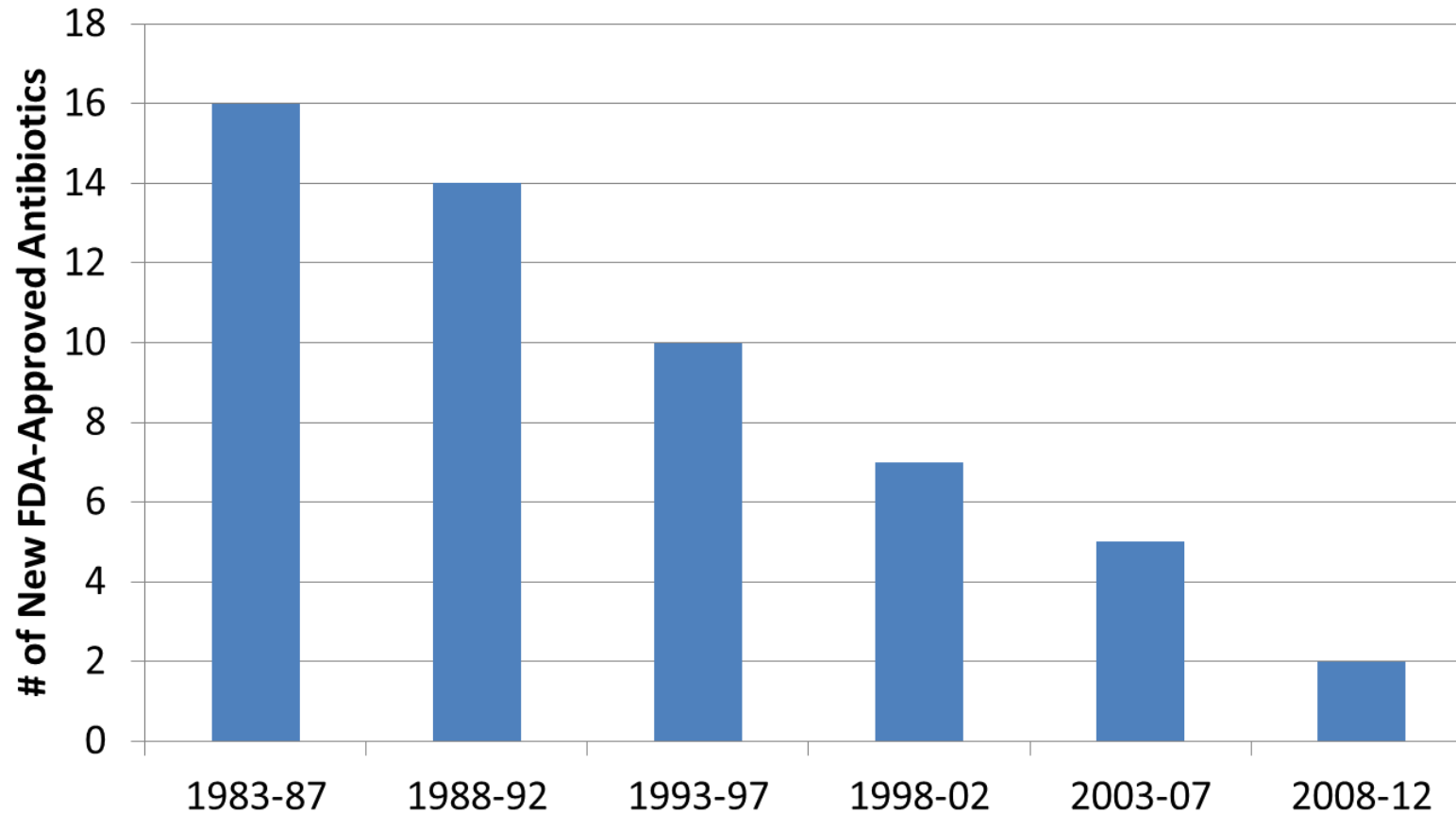
- Multidisciplinary Performance Improvement Team with Designated Medical Director
- Data-based monthly reviews/response
- Facility level process of care and outcomes
- Continuing medical and nursing education on sepsis and SEE

NURSING HOME INFECTION PREVENTIONIST TRAINING COURSE



www.cdc.gov

AHRQ: Few New Antibiotics



FDA = Food and Drug Administration

Source: Boucher HW, Talbot GH, Benjamin DK Jr., et al. 10 × '20 Progress—Development of new drugs active against gram-negative bacilli: an update from the Infectious Diseases Society of America. *Clin Infect Dis.* 2013 Jun;56(12):1685-94.

Nursing Home Antimicrobial Stewardship Guide
Determine Whether To Treat

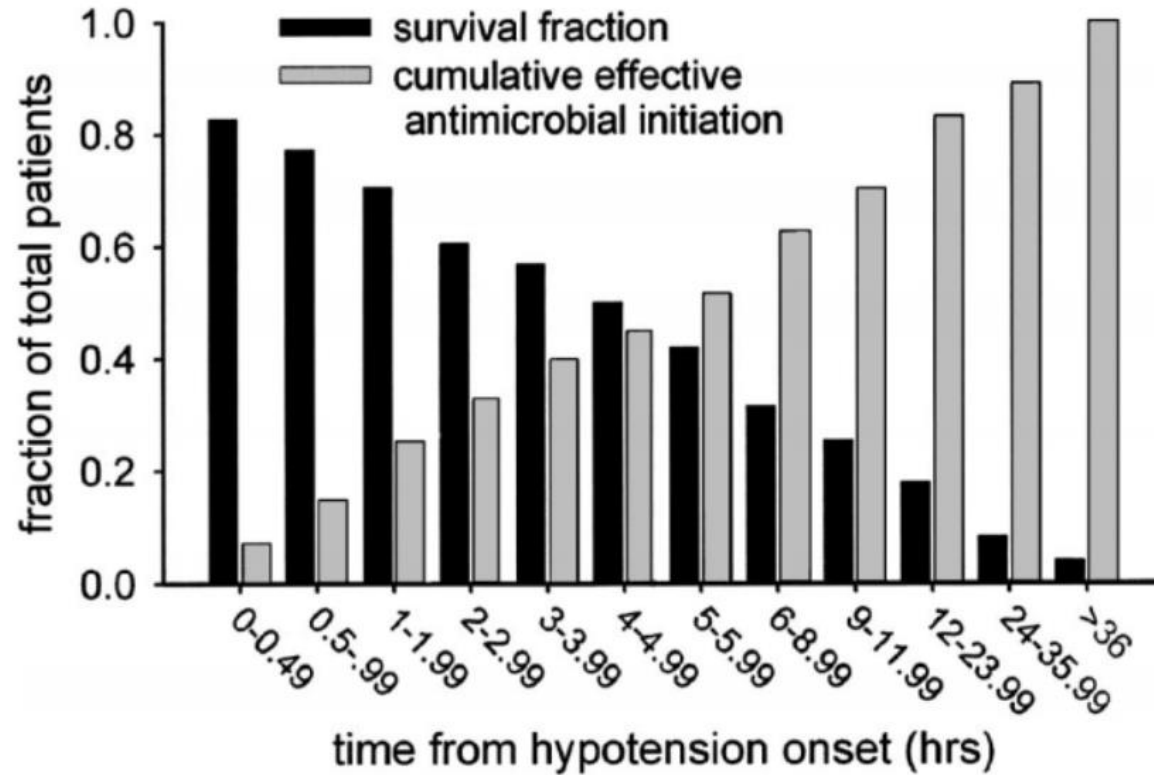


Figure 1. Cumulative effective antimicrobial initiation following onset of septic shock-associated hypotension and associated survival. The x-axis represents time (hrs) following first documentation of septic shock-associated hypotension. *Black bars* represent the fraction of patients surviving to hospital discharge for effective therapy initiated within the given time interval. The *gray bars* represent the cumulative fraction of patients having received effective antimicrobials at any given time point.