FAU MEDICINE
FLORIDA ATLANTIC UNIVERSITY

Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

Bernardo J. Reyes, MD, CMD

Assistant Professor of Geriatric Medicine
Associate Program Director,
Internal Medicine Residency
Charles E. Schmidt College of Medicine
Florida Atlantic University

Joseph G. Ouslander, MD

Professor of Geriatric Medicine
Senior Associate Dean for Geriatric Programs
Chair, Department of Integrated Medical Science
Charles E. Schmidt College of Medicine
Florida Atlantic University

Executive Editor, Journal of the American Geriatrics Society

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Conflicts of Interest and Acknowledgements

- The presenters thank Dr. Thomas Yoshikawa for his mentorship on the topic of sepsis in PAC/LTC; and Dr. Robin Jump for sharing slides from a previous AMDA presentation.
- Dr. Ouslander has been supported by grants from Point-Click-Care, NIH, and several other organizations; he serves as a medical advisory for Pathway Health and receives royalties from INTERACT Program training and licensing. All of his INTERACT-related work is subject to and approved by the policies of the FAU Financial Conflict of Interest Committee.
- Dr. Reyes has been supported by a grant from Point-Click-Care.

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Learning Objectives

1. Articulate reasons for the **increasing importance of sepsis in PAC/LTC.**
2. List the **challenges in diagnosing early sepsis in PAC/LTC population.**
3. Explain the **use of currently available tools to identify early sepsis.**
4. Describe an **assessment strategy and its sensitivity and specificity in diagnosing sepsis in the PAC/LTC population.**
5. List **approaches to management of early sepsis in the PAC/LTC setting.**
6. Understand **approaches to future research** on optimizing outcomes for patients with severe infections at risk for sepsis in the PAC/LTC setting.

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Audience Response Question 1

My primary facility has the following capabilities:

1. **S**tat lactate levels

- ❑ **Yes**
- ❑ **No**

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Audience Response Question 2

My primary facility has the following capabilities:

2. **B**lood culture bottles

- ❑ **Yes**
- ❑ **No**

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Audience Response Question 3

My primary facility has the following capabilities:

3. **S**tart IV Fluids within one hour

- ❑ **Yes**
- ❑ **No**

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Audience Response Question 4

My primary facility has the following capabilities:

4. Start IV broad spectrum antibiotics within one hour

- ❑ **Yes**
- ❑ **No**

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Audience Response Question 5 - Case Study 1

- **92 y/o male** admitted to your SNF after hip fracture repair complicated by urinary retention, which resolved in the hospital.
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- **Meds:** Metoprolol, Lisinopril, Furosemide, Sertraline
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- **Day 5**, the RN calls reporting that the patient has altered mental status, HR 58, BP 106/72, RR= 20, pulse ox 92% on room air, Temp 99.1 F. You order a CBC, UA, and Chemistry Panel.
- **Day 6,** the patient is too weak to leave his bed. You evaluate him and he has a Temp 101.2, Systolic BP 90, and appears delirious. He is transferred to the hospital and diagnosed with sepsis.

Was this hospital transfer potentially preventable or avoidable?

1. **N**o
2. **Y**es
3. **P**ossibly

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3. **P**ossibly

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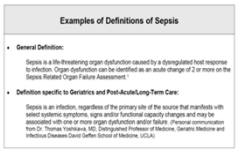
Incidence and Implications of Sepsis in PAC/LTC

Defining Sepsis



http://www.interact-pathway.com

Clinical Manifestations

https://www.cdc.gov/sepsis/

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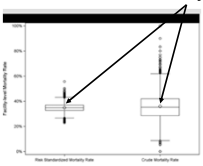
Incidence and Implications of Sepsis in PAC/LTC

https://www.cdc.gov/sepsis/

40% in hospital mortality rate



Critical Care Medicine46(11):1753-1760, November 2018.

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Challenges in Diagnosing Early Sepsis in the PAC/LTC Population

Rapid Diagnosis and Treatment is Essential for Survival

https://www.cdc.gov/sepsis/

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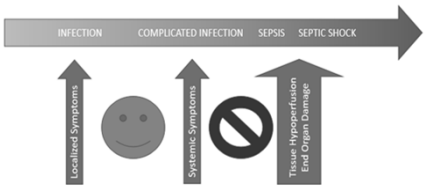
Challenges in Diagnosing Early Sepsis in the PAC/LTC Population

Rapid Diagnosis and Treatment is Essential for Survival



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Challenges in Diagnosing Early Sepsis in the PAC/LTC Population

Pressure to Reduce Hospital Transfers

- Medicare is shifting the "fee-for-service" system to value-based payment models, such as:
  - Medicare Managed Care
  - Financial penalties for hospital readmissions
  - Bundling of payments for episodes of care
  - Accountable Care Organizations
  - Others

These changes present *MAJOR OPPORTUNITIES* for geriatrics health professionals to improve care in the U.S. and reduce unnecessary emergency department visits, hospitalizations, and related complications and costs

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Challenges in Diagnosing Early Sepsis in the PAC/LTC Population

Potential Unintended Consequences

Unnecessary Hospitalizations, Complications and Costs

- Strategies for early diagnosis could result in too many hospital transfers if the tools being used to identify patients at risk for sepsis are too sensitive and not specific enough

Antibiotic Stewardship

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Tools Currently Available to Identify Early Sepsis

The qSOFA score (also known as quickSOFA) is a bedside prompt that may identify patients with suspected infection who are at greater risk for a poor outcome outside the intensive care unit (ICU). It uses three criteria, assigning one point for low blood pressure (SBP≤100 mmHg), high respiratory rate (≥22 breaths per min), or altered mentation (Glasgow coma scale<15).

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Tools Currently Available to Identify Early Sepsis

qSOFA Criteria [4,5]	"100/100/100" Criteria [2,3]
• Respiratory rate ≥22/minute = 1 point • Altered mentation = 1 point • Systolic blood pressure ≤100 mmHg = 1 point	• Temperature above 100 • Heart rate above 100 • Blood pressure below 100

http://www.qsofa.org/index.php

https://www.mnhospitals.org/Portals/0/Documents/ptsafety/SeeingSepsisLTC/1.1%20Seeing%20Sepsis%20-%20LTC%20Poster.pdf

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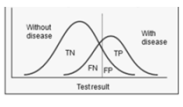
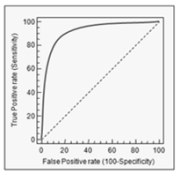
Tools Currently Available to Identify Early Sepsis

The Best Tool Should Be:

- **Sensitive** (we don't want to miss sepsis)
- **Specific** (we don't want to over-diagnose and send too many patients to the hospital)





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Tools Currently Available to Identify Early Sepsis

Sepsis diagnosis in Nursing Home

Journal of the American Medical Directors Association
Volume 19, Issue 6, June 2018, Pages 492-496.e1

Original Study

Can Sepsis Be Detected in the Nursing Home Prior to the Need for Hospital Transfer?

Philip D. Sloane MD, MPH [a, b, c], R. III, Kimberly Ward BA [a], David J. Weber MD, MPH [c, d], Christine E. Kistler MD, MASc [a, b], Benjamin Brown BS [c], Katherine Davis BS [c], Sheryl Zimmerman PhD [a, b]

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Tools Currently Available to Identify Early Sepsis

Sepsis screening tool	13-72 h to hospitalization, %	≤12 h before hospitalization, %
SIRS		
Sensitivity for sepsis	10	36
Specificity for sepsis	94	86
qSOFA		
Sensitivity for sepsis	7	27
Specificity for sepsis	96	88
100-100-100		
Sensitivity for sepsis	28	79
Specificity for sepsis	84	69

Abbreviations: qSOFA, quick sequential organ failure assessment; SIRS, systemic inflammatory response syndrome.
*Adapted from Sloane et al.[14]

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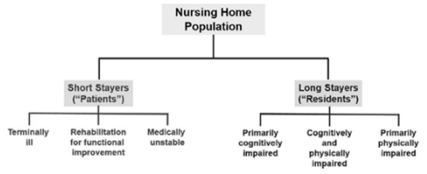
Challenges in Diagnosing Early Sepsis in the PAC/LTC Population

Heterogeneity of PAC/LTC Population



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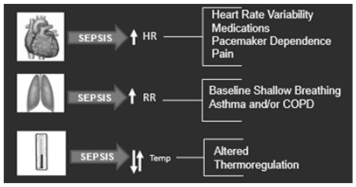
Challenges in Diagnosing Early Sepsis in the PAC/LTC Population

Non-Specific Presentation of Illness



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"100/100/100" Criteria [2,3]

- Temperature above 100
- Heart rate above 100
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qSOFA Criteria [4,5]

- Respiratory rate ≥22/minute = 1 point
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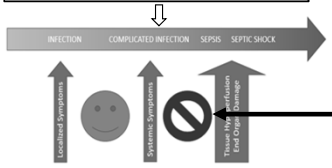

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[a]Adapted from Sloane et al.[24]

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Audience Response Question 6 - Case Study 2

- **85 y/o female** long-term resident
- **Active Medical Problems**: Parkinson's, DM, CKD, CHF (EF 35%)
- **Meds:** Carbidopa/levodopa, Furosemide, Sertraline, Lisinopril
- **Day 1** - more difficulty getting out of bed with assistance
- **Day 2** - not able to finish breakfast without assistance. A Stop and Watch is completed. In the afternoon the patient refused care. An INTERACT change in condition (CIC) evaluation is done by the RN and HR: 87 BP 89/68 RR is 22 Temp is 99.0
- MD is notified of the CIC and thinks the patient does not meet criteria for sepsis, but is concerned about changes in vital signs from baseline

Of the following, which would you do <u>first</u>?

1. **O**rder labs (CBC, CMP, LA, blood cultures)
2. **S**tart IV Fluids
3. **S**tart Antibiotics
4. **C**heck Advance Directives

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Case Study 2

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Key Points Illustrated by this Case

- Identify those at risk
- Prioritize diagnosis of sepsis
- Benefits of fluids even in patients with CHF
- Identify those who need to be transferred
- Early use of antibiotics vs. antibiotic stewardship

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Management of Early Sepsis in the PAC/LTC Setting

JAMDA 19 (2018) 465–471

JAMDA

journal homepage: www.jamda.com

Editorial

Early Identification and Management of Sepsis in Nursing Facilities: Challenges and Opportunities

Bernardo J. Reyes MD, Joseph Chang MD, Lena Vaynberg MD, Sanya Diaz NP, Joseph G. Ouslander MD *

Department of Integrated Medical Sciences, Charles E. Schmidt College of Medicine, Florida Atlantic University, Boca Raton, FL

Check for updates

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Management of Early Sepsis in the PAC/LTC Setting

INTERACT

INTERACT Guidance on Management of Possible Sepsis

Many skilled nursing facilities (SNFs) have requested an INTERACT "Care Path" for Sepsis, because this condition has been reported to be a common cause of hospital admissions and readmissions.

The INTERACT Program currently includes 10 Care Paths for the most common symptoms and signs that present as acute changes in condition, and that often result in hospital transfer. Because of the nature of the SNF population, any one of these symptoms or signs could be associated with an infection and possible sepsis. Moreover, sepsis is difficult to diagnose in the SNF setting and published criteria for infections vary.

Guideline recommended management of sepsis is beyond the capability of most SNFs. Thus, for the majority of residents/patients suspected of possible sepsis transfer to an acute hospital should be considered to safely and optimally manage this condition.

https://www.interact-pathway.com

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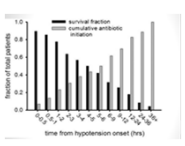
Management of Early Sepsis in the PAC/LTC Setting

Rapid Diagnosis and Treatment is Essential for Survival



Curr Infect Dis Rep 2015; 17 (7): 493

Antibiotic Choice

Source	Choice
Lung	antipseudo beta lactam+AG/Antipseudo FQ+vanc
Urine	Antipseudo betalactam
Undifferentiated	Antipseudo beta lactam+AG/Antipseudo FQ+vanc

Infectious Diseases in Older Adults of Long-Term Care Facilities: Update on Approach to Diagnosis and Management

Robin L. P. Jump, MD, PhD,† Christopher J. Crnich, MD, PhD,‡§ Lona Mody, MD, MSc,‖¶ Suzanne F. Bradley, MD,*† Lindsay E. Nicolle, MD,#** and Thomas T. Yoshikawa, MD*††***

J Am Geriatr Soc 66:789–803, 2018.

Table 3. Suggested Empirical Antibiotic Therapy for Nursing Home–Acquired Bacterial Pneumonia

Clinical Context	First Line	Second Line
Mild to moderate pneumonia symptoms	Cefpodoxime or cefuroxime axetil, cefdinir, and (first choice if aspiration suspected)	Doxycycline or levofloxacin
Severe pneumonia symptoms, failure to improve with appropriate empirical therapy	Ceftriaxone and azithromycin	Ertapenem or levofloxacin
Severe pneumonia symptoms, risk factors for methicillin-resistant Staphylococcus aureus in respiratory tract	Consider adding vancomycin or doxycycline	Consider adding linezolid
Known history or strong suspicion of Pseudomonas or resistant Gram-negative bacteria in respiratory tract	Cefepime or piperacillin with tazobactam	Levofloxacin or ceftazidime (other than ertapenem) or aztreonam

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Management of Early Sepsis in the PAC/LTC Setting

Equipment and Supplies

Category	Specific Components	
Durable equipment	• Automated digital blood pressure machine • Blood pressure cuffs (disposable) in several sizes	• Pulse oximeter • Thermometer
Supplies	• Mask and tubing for supplemental oxygen • Kits for placing intravenous catheters (include several sizes) • Blood drawing equipment including tourniquets • Chlorhexidine swabs for cleansing skin prior to placing intravenous catheters and collecting blood cultures • Kit for placing urinary catheter to monitor urine output	• Sterile gloves (include several sizes) for placing the urinary catheter • Personal protective equipment including gowns, gloves and masks (include several sets) • Dressing supplies, packing and tape • Bags of sterile crystalloid fluid (e.g., normal saline or lactated ringers)

Category	Specific Components	

Laboratory tests	• Blood culture bottles (at least 2 sets of aerobic and anaerobic bottles)
	• Sterile containers to collect additional specimens as clinically indicated:
	  • urine (from a newly placed catheter)
	  • sputum culture
	  • stool, particularly if liquid
		• Bacterial culture swabs
		• Viral culture swabs and transport medium
		• Collection tubes for common laboratory studies[1]

Antibiotics	• Oral: amoxicillin/clavulanic acid and linezolid • Intravenous: piperacillin/tazobactam and intravenous vancomycin	• If penicillin allergy: levofloxacin • If concern for C. difficile infection: oral vancomycin or fidaxomicin

Jump et al. JAMDA 2019; 20: 275 - 278

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Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

Management of Early Sepsis in the PAC/LTC Setting

WHAT IS A BUNDLE?

Hour-1 Bundle

- Measure lactate level. Re-measure if initial lactate is >2mmol/L
- Obtain blood cultures prior to antibiotic administration
- Administer broad- spectrum antibiotics
- Begin rapid administration of 30ml/kg crystalloid for hypotension or lactate ≥4mmol/L
- Apply vasopressors if patient is hypotensive during or after fluid resuscitation to maintain MAP≥65mm Hg

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Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

Management of Early Sepsis in the PAC/LTC Setting

Recommendations for Management of Sepsis [8]

1. At least 30 mL/kg of IV crystalloid fluid should be given within the first 3 hours
2. Additional fluid administration should be guided by frequent reassessment of hemodynamic status.
3. Mean Arteria Pressure (MAP) and serum lactate are considered adequate indicators of tissue perfusion. These values should be maintained at (Mean Arterial Pressure (MAP) ≥65 mmHg and lactate <2 mmol/L (<18 mg/dL).
4. To estimate MAP, double the diastolic blood pressure and add the sum to the systolic blood pressure. Then divide by 3.
5. Appropriate routine microbiologic cultures (including blood) should be obtained before starting antimicrobial therapy in patients with suspected sepsis.
6. Administration of IV antimicrobials should be initiated as soon as possible, with in 1 hour after recognition of sepsis.
7. Goals of care and prognosis should be discussed with patients and families.
8. Goals of care should be incorporated into treatment and end-of-life care planning, utilizing palliative care principles where appropriate.

Rhodes A, Evans LE, Alhazzani W, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Crit Care Med* 2017; 45:486-552.

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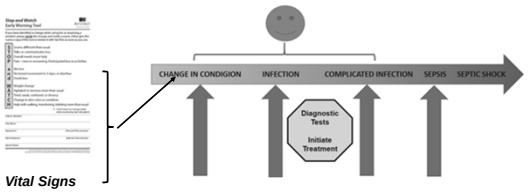
Management of Early Sepsis in the PAC/LTC Setting



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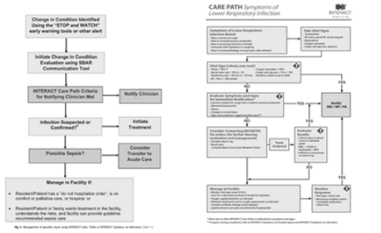
Management of Early Sepsis in the PAC/LTC Setting



https://www.interact-pathway.com

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Management of Early Sepsis in the PAC/LTC Setting

Critical Role of Advance Directives

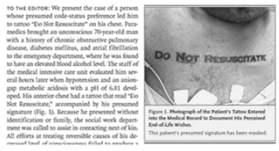
TO THE EDITOR: We present the case of a person whose presumed code-status preference led him to tattoo "Do Not Resuscitate" on his chest. Paramedics brought an unconscious 70-year-old man with a history of chronic obstructive pulmonary disease, diabetes mellitus, and atrial fibrillation to the emergency department, where he was found to have an elevated blood alcohol level. The staff of the medical intensive care unit evaluated him several hours later when hypotension and an anion-gap metabolic acidosis with a pH of 6.81 developed. His anterior chest had a tattoo that read "Do Not Resuscitate," accompanied by his presumed signature (Fig. 1). Because he presented without identification or family, the social work department was called to assist in contacting next of kin. All efforts at treating reversible causes of his de-

Figure 1. Photograph of the Patient's Tattoo Entered into the Medical Record to Document His Perceived End-of-Life Wishes.
This patient's presumed signature has been masked.

N ENGL J MED 377;22 NEJM.ORG NOVEMBER 30, 2017

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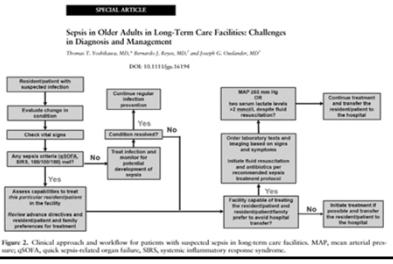
Management of Early Sepsis in the PAC/LTC Setting


SPECIAL ARTICLE

Sepsis in Older Adults in Long-Term Care Facilities: Challenges in Diagnosis and Management

Thomas T. Yoshikawa, MD,* Bernardo J. Reyes, MD,† and Joseph G. Ouslander, MD‡

DOI: 10.1111/jgs.14194

Figure 2. Clinical approach and workflow for patients with suspected sepsis in long-term care facilities. MAP, mean arterial pressure; qSOFA, quick sepsis-related organ failure, SIRS, systemic inflammatory response syndrome.

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Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

Management of Early Sepsis in the PAC/LTC Setting

Be Aware of Key Issues for Proactive Decision-Making:

- Mortality from sepsis is high
- Mortality is HIGHER if the full bundle is not implemented
- Treatment can be started, but optimal labs, monitoring, and other resources may not be available
- Even with early treatment, patients can deteriorate rapidly, thus rapid transfer is essential if ICU care is needed
- Advance Directives play a key role in decision making

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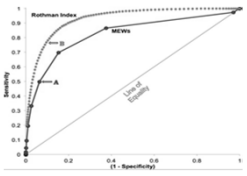
Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

Directions for Future Research

- Early warning systems suffer from high false-positive rates (low specificity)
- Higher frequency of assessments as patients get sicker can provide more data points for risk prediction
- Calculate risk based on data entry throughout the course of care
- Use variability in data



Modified Early Warning Score (MEWS) and Rothman Index (RI). 24-hour hospital mortality of general medical-surgical unit patients (N = 32,472)

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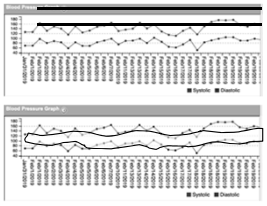
Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

Directions for Future Research

- Fixed parameters and single point in time measures are unlikely to be sensitive or specific enough
- Machine Learning ("AI") can help identify trends
  - What is considered normal variance
  - Modify normal variance based on evolving issues (adding or removing a blood pressure medication or a pacemaker implantation)
- How do you incorporate good old fashion clinical judgment into any calculation?
- When we get an alert, what we should do?



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Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

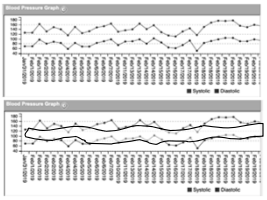
Directions for Future Research

Research questions

- Do changes in "vital parameters" identify patients with early infections who may go on to develop sepsis?
- What are the sensitivity and specificity of various change in vital parameters for this purpose?
- Can these data be used to develop a validated strategy to assist clinicians in identifying patients at high risk for developing sepsis?

Hypothesis

Changes in selected vital parameters can be identified that have greater than 80 percent sensitivity and greater than 80 percent specificity in identifying patients who are hospitalized with a diagnosis of sepsis in the following 10 days.



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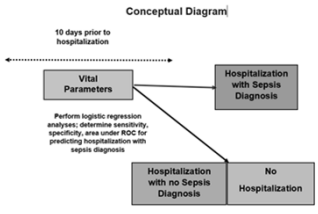
Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

Directions for Future Research



Data Requirements

- Gold Standard for diagnosis of sepsis– Medicare Claims Data
- Patient level data on vital parameters and other clinical data that can be linked to hospitalizations and Medicare billing codes.
- This requires:
  - Permission from facilities to access records
  - IRB approval for waiver of consent from patients
  - HIPPA compliant method of handling the data

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Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

Audience Response Question 7

After listening to this presentation do you think your primary facility:

1. **C**an currently manage early sepsis
2. **C**an prepare to manage early sepsis in the near future
3. **I**s not capable of managing early sepsis, and will continue to transfer patients as soon as a suspected severe infection is recognized

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Sepsis: Early Recognition & Optimizing Outcomes in PAC/LTC

Questions?

Comments?

Suggestions?

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