Sigma Theta Tau International's 29th International Nursing Research Congress

Evidence-Based Guidelines for Prevention, Screening, and Management of Multiple Organ Dysfunction Syndrome

Manju Daniel, PhD, MSN, APN, FNP-BC
Gagandeep Singh, BSN
School of Nursing, Northern Illinois University, DeKalb, IL, USA

Background

Mortality from sepsis increases 8% every hour the treatment is delayed. About 80% of the sepsis related mortality is preventable with early diagnosis and treatment. Sepsis is life-threatening organ dysfunction caused by a dysregulated host response to infection injuring it own tissues and organs. Worsening of sepsis into septic shock has the mortality rate of 54%. Over half of intensive care unit patients with sepsis have at least one organ system dysfunction and 20% have multiple organ dysfunction. Half of the mortality observed in intensive care unit is attributable to multiple organ dysfunction syndrome. Sepsis worsening and a risk of septic shock with organ failure or death or other poor outcomes including long-term physical, psychological, and cognitive disabilities, prolonged intensive care unit stay, and in-hospital mortality. Patients presenting with modest dysfunction can deteriorate further and fast which emphasizes the seriousness and need for prompt and appropriate interventions. Quick sequential organ failure assessment (q SOFA), is a bedside prompt that could be used in or outside of hospital settings including emergency departments, primary care clinics and skilled nursing facilities. Quick SOFA score of 2 or higher could identify adult patients with suspected infection, who are at greater risk for poor outcomes typically seen with worsening of sepsis. Score of >2 points on quick SOFA or full SOFA indicates organ dysfunction which is associated with an in-hospital mortality greater than10%. Worsening of SOFA over 72 hours statistically significant positive relationship to in-hospital mortality. Positive Glasgow coma scale score increases the risk of 30-day mortality. Similarly, older age and comorbidities increase the risk of 30-day mortality. Therefore, prevention, early detection and quick interventions is the key to prevent progression of sepsis to Multi-organ Dysfunction Syndrome.

Purpose

The purpose of this presentation is to describe: (a) clinical case studies, (b) evidence based guidelines on quick SOFA and Full SOFA for early detection of sepsis, and (c) and evidence based clinical guidelines for quick interventions to manage sepsis to prevent poor clinical outcomes related to multi-organ dysfunction syndrome.

Methods

Literature review was performed for evidence based clinical guidelines on prevention, assessment and clinical management of sepsis, septic shock and multiple organ dysfunction syndrome. Additional data was obtained from four clinical case studies related to sepsis, septic shock and multi-organ dysfunction syndrome. Clinical outcomes from the case studies were analyzed based on quick SOFA, full SOFA and implementation of 3-hour and 6-hour bundles for prompt clinical management of sepsis, septic shock and multiple organ dysfunction syndrome. Recommendations for evidence based clinical guidelines for empirical and targeted antibiotics were reviewed.

Results

The Surviving Sepsis Campaign Taskforce recommends the prompt utilization of quick SOFA, full SOFA, and implementation of evidence based 3-hour and 6-hour bundles for prompt clinical management of sepsis to prevent progression of sepsis to septic shock and multi-organ dysfunction syndrome. The evidence based clinical guidelines highlight the early identification and early treatment of sepsis to be the

primary focus. The management of sepsis needs to focus on early initiation of antibiotics, hemodynamic stabilization and pulmonary stabilization. Combination empiric therapy is recommended for patients with suspected multidrug-resistant microorganisms, severe infections associated with respiratory failure and septic shock, and septic shock and bacteremia from pneumococci. Combination therapy with broad-spectrum agents is recommended to cover gram- positive, gram-negative, and anaerobic bacteria. Specific combination therapy is recommended for different types of infections that could lead to sepsis including urinary tract infections, pneumonia, abdominal/pelvic infections, skin infections and meningitis. For empirical therapy, vancomycin or linezolid is also recommended due to the prevalence of methicillin resistant staph aureus. Increased layers of combination therapy layers is recommended when pseudomonas is suspected. For targeted therapy, broad spectrum monotherapy is considered to be adequate for immunocompetent patients. The Surviving Sepsis Campaign Taskforce's 3-hour and 6-hour bundles provide evidence based guidelines for hemodynamic stabilization. For pulmonary stabilization, the target is to have arterial oxygen saturation above 93% and central venous oxygen saturation of at least 70%, which is a good marker of tissue perfusion. Controlled, lung-sparing ventilation at low tidal volumes (6 mL/kg of body weight) and peak pressures no higher than 30 mbar whenever adequate oxygenation (>90% by pulse oximetry) cannot be achieved by hemodynamic stabilization and mask oxygen administration alone. Evidence based guidelines provide recommendations for specific baseline and ongoing laboratory and diagnostic testing. Evidence based guidelines provide recommendations for healthy lifestyle to minimize the risk factors for infection, sepsis and complications.

Conclusion

The importance of timing in early identification of sepsis and early treatment initiation is a gold prognostic factor for clinical outcomes related to sepsis. Quick SOFA is a reliable quick bedside prompt for early identification of suspected infection in hospital and non-hospital settings. Full SOFA is a good tool to assess for organ dysfunction. The management of sepsis needs to focus on early imitation of antibiotics, hemodynamic stabilization and pulmonary stabilization to prevent progression of sepsis to multi-organ dysfunction and subsequent poor clinical outcomes with multi-organ dysfunction syndrome. In primary care settings, patient education on healthy lifestyle is important to minimize the risk factors for preventable chronic illnesses to reduce the risk of complications with co-morbidities, infection, sepsis, and long-term physical, psychological, and cognitive disabilities as well as mortality related to sepsis.

Title:
Evidence-Based Guidelines for Prevention, Screening, and Management of Multiple Organ Dysfunction Syndrome

Keywords:
3-hour and 6-hour sepsis bundles, Multiple organ dysfunction syndrome and Quick & Full SOFA

References:

Centers for Disease Control and Prevention (2016). Clinical guidelines: bundles for implementing sepsis guidelines. Retrieved from https://www.cdc.gov/sepsis/clinicaltools/index.html

Dellinger, R., Levy, M., Rhodes, A., Annane, D., Gerlach, H., Opal, S… Sevransk, J. (2013). Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock 2012. *Critical Care Medicine, 41*(2), 580–637.

Infectious Disease Society of America. (2017). 2016 International Guidelines for Management of Sepsis and Septic Shock. Retrieved from http://www.idsociety.org/Guidelines/Patient_Care/IDSA_Practice_Guidelines/Infections_By_Organ_System-81567/Circulatory/Sepsis_and_Septic_Shock/

Rhodes, A., Evans, L., Alhazzani, W., Levy, M., Antonelli, M., Ferrer, R…., Kumar, A. (2017). Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2016. Critical Care Medicine, 45 (3). doi: 10.1097/CCM.0000000000002255

Howell, M., & Davis, A. (2017). Management of sepsis and septic shock. *Journal of American Medical Association, 317*(8), 847-848. doi:10.1001/jama.2017.0131

Raghunathan, K., Shaw, A., Nathanson, B., Sturmer, T., Brookhart, A., Stefan, M… Lindenauer, P. (2014). Association between the choice of IV crystalloid and in-hospital mortality among critically ill adults with sepsis. *Critical Care Medicine,42*(7), 1585–1591.

Singer, M., Deutschman, C., Seymour, C, Shankar-Hari, M., Annane, D., Bauer, M… Bellomo, R. (2016). The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). Journal of American Medical Association, 315(8), 801-810. doi:10.1001/jama.2016.0287

Surviving Sepsis Campaign (2016). International Guidelines for Management of Severe Sepsis and Septic Shock: 2016. Retrieved from http://www.survivingsepsis.org/Guidelines/Pages/default.aspx

Abstract Summary:
Sepsis is life-threatening organ dysfunction. Half of the mortality observed in the hospital settings is attributable to multiple organ dysfunction syndrome. Evidence based guidelines recommend early detection and quick interventions to prevent progression of sepsis to Multi-organ Dysfunction Syndrome. Early interventions to focus on antibiotics, hemodynamic stabilization and pulmonary stabilization.

Content Outline:
Learning objectives:

1. The learner will be able to describe the risk of poor clinical outcomes with sepsis and discuss the impact of utilization of quick SOFA and full SOFA for early identification of organ dysfunction
2. The learner will be able to discuss the evidence based clinical guidelines for early interventions for sepsis management

Introduction:

Mortality from sepsis increases 8% every hour the treatment is delayed. About 80% of the sepsis related mortality is preventable with early diagnosis and treatment. Sepsis is life-threatening organ dysfunction caused by a dysregulated host response to infection injuring it own tissues and organs. Worsening of sepsis into septic shock has the mortality rate of 54%. Over half of intensive care unit patients with sepsis have at least one organ system dysfunction and 20% have multiple organ dysfunction. Half of the mortality observed in intensive care unit is attributable to multiple organ dysfunction syndrome. Sepsis worsening and a risk of septic shock with organ failure or death or other poor outcomes including long-term physical, psychological, and cognitive disabilities, prolonged intensive care unit stay, and in-hospital mortality. Patients presenting with modest dysfunction can deteriorate further and fast which emphasizes the seriousness and need for prompt and appropriate interventions. Quick sequential organ failure assessment (q SOFA), is a bedside prompt that could be used in or outside of hospital settings including emergency departments, primary care clinics and skilled nursing facilities. Quick SOFA score of 2 or higher could identify adult patients with suspected infection, who are at greater risk for poor outcomes typically seen with worsening of sepsis. Score of >2 points on quick SOFA or full SOFA indicates organ dysfunction which is associated with an in-hospital mortality greater than10%. Worsening of SOFA over 72 hours statistically significant positive relationship to in-hospital mortality. Positive Glasgow coma scale score increases the risk of 30-day mortality. Similarly, older age and comorbidities increase the risk of 30-day mortality. Therefore, prevention, early detection and quick interventions is the key to prevent progression of sepsis to Multi-organ Dysfunction Syndrome.

Body:

Main point #1: Quick SOFA- A new bedside clinical score termed quick SOFA, could be used in or outside of hospital settings including emergency departments, to identify adult patients with suspected infection, at greater risk for poor outcomes typical of sepsis if they have at least 2 of the these clinical criteria of quick SOFA: Respiratory rate of 22/min or greater, Altered mentation, and Systolic blood pressure of 100mm Hg or less

Main point #2: Full SOFA- to be done in hospital settings to indicate organ dysfunction. To focus on respiration (PaO_2/FiO_2 i.e. pressure of O_2 in arterial blood/Fraction of inspired oxygen), cardiovascular (hypotension or vasopressors), coagulation (platelets), central nervous system (Glasgow coma scale), liver (bilirubin,) and renal (creatinine and oliguria).

Main point #3: The evidence based clinical guidelines highlight the early identification and early treatment of sepsis to be the primary focus. The management of sepsis needs to focus on early initiation of antibiotics, hemodynamic stabilization and pulmonary stabilization.

Main point #4: The Surviving Sepsis Campaign Taskforce's 3-hour and 6-hour bundles provide evidence based guidelines for early hemodynamic stabilization.

Main point #5: Combination empiric therapy is recommended for patients with suspected multidrug-resistant microorganisms, severe infections associated with respiratory failure and septic shock, and septic shock and bacteremia from pneumococci.

Main point #6: Combination therapy with broad-spectrum agents is recommended to cover gram- positive, gram-negative, and anaerobic bacteria. Specific combination therapy is recommended for different types of infections that could lead to sepsis including urinary tract infections, pneumonia, abdominal/pelvic infections, skin infections and meningitis.

Main point #7: For empirical therapy, vancomycin or linezolid is also recommended due to the prevalence of methicillin resistant staph aureus.

Main point #8: Increased layers of combination therapy layers is recommended when pseudomonas is suspected. For targeted therapy, broad spectrum monotherapy is considered to be adequate for immunocompetent patients.

Main point #9: For pulmonary stabilization, the target is to have arterial oxygen saturation above 93% and central venous oxygen saturation of at least 70%, which is a good marker of tissue perfusion. Controlled, lung-sparing ventilation at low tidal volumes (6 mL/kg of body weight) and peak pressures no higher than 30 mbar whenever adequate oxygenation (>90% by pulse oximetry) cannot be achieved by hemodynamic stabilization and mask oxygen administration alone.

Main point #10: Evidence based guidelines provide recommendations for specific baseline and ongoing laboratory and diagnostic testing. Evidence based guidelines provide recommendations for healthy lifestyle to minimize the risk factors for infection, sepsis and complications.

Conclusion: The importance of timing in early identification of sepsis and early treatment initiation is a gold prognostic factor for clinical outcomes related to sepsis. Quick SOFA is a reliable quick bedside prompt for early identification of suspected infection in hospital and non-hospital settings. Full SOFA is a good tool to assess for organ dysfunction. The management of sepsis needs to focus on early imitation of antibiotics, hemodynamic stabilization and pulmonary stabilization to prevent progression of sepsis to multi-organ dysfunction and subsequent poor clinical outcomes with multi-organ dysfunction syndrome. In primary care settings, patient education on healthy lifestyle is important to minimize the risk factors for

preventable chronic illnesses to reduce the risk of complications with co-morbidities, infection, sepsis, and long-term physical, psychological, and cognitive disabilities as well as mortality related to sepsis.

First Primary Presenting Author
Primary Presenting Author
Manju Daniel, PhD, MSN, APN, FNP-BC

Northern Illinois University
School of Nursing
Associate Professor
DeKalb IL
USA

Professional Experience: I am an Associate Professor at Northern Illinois University School of Nursing. I have been a faculty member in a university setting since 2005. My teaching background includes undergraduate and graduate nursing courses in clinical and classroom settings. My clinical experience includes community health and primary health care practice as a Family Nurse Practitioner. My research focus is immigrant health and physical activity lifestyle modification. I have publications specific to such topics and have been a member of Sigma Theta Tau Beta Omega since 2008.
Author Summary: Manju Daniel, PhD, MSN, APN, FNP-BC is an Associate Professor at Northern Illinois University, DeKalb, IL. She is a recipient of NIH-NINR grant focused on advancing nursing science in the area of healthcare disparities. Her current research focuses on developing the culturally-tailored lifestyle physical activity interventions for midlife South Asian Indian immigrants.

Second Author
Gagandeep Singh, BSN
Northern Illinois University
School of Nursing
Student
DeKalb IL
USA

Professional Experience: Presently, I am a senior undergraduate nursing student at Northern Illinois University. I work as a patient care technician on the geriatrics unit at Alexian Brothers Behavioral Health Hospital in Illinois. Over the summer of 2016, I did a student nurse internship at St. Alexius Medical Center in Illinois and I was placed in the emergency department for six weeks.
Author Summary: Gagandeep Singh is an undergraduate nursing student at Northern Illinois University. She is in the university honors program and mortar board senior honors society. She was in the Research Rookies program which has allowed her to present her research poster at two different conferences. She tutors for medical surgical classes and she is a peer mentor for the honors students. She will be inducted into Sigma Theta Tau Honor Society of Nursing in spring 2017.