

Sepsis

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1. Distinct immune profiles and clinical outcomes in sepsis subphenotypes based on temperature trajectories.

Authors: Bhavani S.V.;Spicer A.;Sinha P.;Malik A.;LopezEspina C.;Schmalz L.;Watson G.L.;Bhargava A.;Khan S.;Urdiales D.;Updike L.;Dagan A.;Davila H.;Demarco C.;Evans N.;Gosai F.;Iyer K.;Kurtzman N.;Palagiri A.V.;Sims M., et al

Publication Date: 2024

Journal: Intensive Care Medicine (pagination), pp. Date of Publication: 2024

Abstract: Purpose: Sepsis is a heterogeneous syndrome. Identification of sepsis subphenotypes with distinct immune profiles could lead to targeted therapies. This study investigates the immune profiles of patients with sepsis following distinct body temperature patterns (i.e., temperature trajectory subphenotypes). Method(s): Hospitalized patients from four hospitals between 2018 and 2022 with suspicion of infection were included. A previously validated temperature trajectory algorithm was used to classify study patients into temperature trajectory subphenotypes. Microbiological profiles, clinical outcomes, and levels of 31 biomarkers were compared between these subphenotypes. Result(s): The 3576 study patients were classified into four temperature trajectory subphenotypes: hyperthermic slow resolvers (N = 563, 16%), hyperthermic fast resolvers (N = 805, 23%), normothermic (N = 1693, 47%), hypothermic (N = 515, 14%). The mortality rate was significantly different between subphenotypes, with the highest rate in hypothermics (14.2%), followed by hyperthermic slow resolvers 6%, normothermic 5.5%, and lowest in hyperthermic fast resolvers 3.6% (p Result(s): The 3576 study patients were classified into four temperature trajectory subphenotypes: hyperthermic slow resolvers (N = 563, 16%), hyperthermic fast resolvers (N = 805, 23%), normothermic (N = 1693, 47%), hypothermic (N = 515, 14%). The mortality rate was significantly different between subphenotypes, with the highest rate in hypothermics (14.2%), followed by hyperthermic slow resolvers 6%, normothermic 5.5%, and lowest in hyperthermic fast resolvers 3.6% (p Conclusion(s): Sepsis subphenotypes identified using the universally available measurement of body temperature had distinct immune profiles. Hypothermic patients, who had the highest mortality rate, also had the lowest levels of most pro- and anti-inflammatory cytokines. Copyright © Springer-Verlag GmbH Germany, part of Springer Nature 2024.

2. Treatment with proton pump inhibitors is associated with secondary bacterial infections and sepsis in patients with COVID-19: a retrospective analysis of their joint impact on in-hospital prognosis.

Authors: Bianconi, Vanessa;Mannarino, Massimo R.;Figorilli, Filippo;Ricciutelli, Federica;De Carlo, Stefania;Zullo, Valentina;Corba, Martina;Sahebkar, Amirhossein;Greco, Alessia;Lombardini, Rita;Paltriccina, Rita and Pirro, Matteo

Publication Date: De ,2024

Journal: Annals of Medicine 56(1), pp. 2399761

Abstract: Introduction and objectives. Secondary bacterial infections (SBIs) contribute to worse in-hospital outcomes in patients with Coronavirus disease 2019 (COVID-19). Treatment with proton pump inhibitors (PPIs) is associated with an increased risk of bacterial infections in different clinical settings. However, the association between PPI treatment prior to hospital admission and the occurrence of either SBIs or secondary bacterial sepsis (SBS) as well as their joint impact on clinical outcomes of patients hospitalized for COVID-19 are not clarified. Patients and methods. We retrospectively analyzed preadmission PPI use, in-hospital occurrence of SBIs and SBS, and in-hospital outcomes of a cohort of patients hospitalized for COVID-19. Results. Among 1087 patients, 447 (41%) were on PPI treatment prior to hospital admission. During the hospital stay, 197 (18%) and 223 (20%) patients were diagnosed with SBIs and SBS, respectively. The composite endpoint of intensive care unit (ICU) admission/in-hospital death was met by 214 (20%) patients. Preadmission PPI treatment was independently associated with up to a 2.1-fold and 1.7-fold increased risk of SBIs and SBS, respectively. The occurrence of SBS was independently associated with up to a 2.2-fold increased risk

of ICU admission/in-hospital death. A significant preadmission PPI treatment x SBS interaction emerged in predicting ICU admission/in-hospital death ($F = 5.221$, $p = 0.023$). Conclusions. PPI treatment prior to hospital admission for COVID-19 is associated with an increased risk of SBIs and SBS. In addition, it interacts with SBS in predicting in-hospital prognosis. An appropriate use of PPIs may attenuate the risk of adverse clinical outcomes during hospitalization for COVID-19.

3. Clinical impact of the implementation of monocyte distribution width (MDW) measurement on time to anti-infective administration in sepsis patients in the emergency department: a before/after cohort study.

Authors: Cancellata de Abreu, Marta;Sala, Timothe;Houas, Enfel;Cherubini, Ilaria;Larsen, Martin and Hausfater, Pierre

Publication Date: Oct 27 ,2024

Journal: Critical Care (London, England) 28(1), pp. 346

Abstract: BACKGROUND: Timely recognition of sepsis in emergency department (ED) is challenging. We evaluated the impact of implementing the biomarker monocyte distribution width (MDW) at bedside, on the time to anti-infective administration. METHODS: We conducted a before-and-after cohort study in the ED of an academic hospital in Paris, to compare sepsis patients care and outcomes, before and after the implementation of point of care (POC) MDW measurement in the ED. During post-implementation period (period-2), MDW was measured with complete blood count by ED nurses with results given in 2 min: if above 21.5 units, ED physicians were asked to consider sepsis and to start an anti-infectious as soon as possible. Primary endpoint was time to anti-infectious administration (TTA) from ED arrival, and secondary endpoints were TTA from sepsis onset (TTAS), length of stay, mortality, and hospitalization rates. RESULTS: In total, 255 patients (period-1) and 180 patients (period-2) with sepsis were included. The TTA was 5.4 h (3.5-7.7) period-1 and 4.9 h (IQR 2.5-7.1) in period-2 ($p = 0.06$). MDW implementation significantly reduced the median TTAS from 3.7 h (IQR 1.5-5.8) in period-1, to 2.2 h (IQR 0.5-4.5) in period-2 ($p = 0.06$). In total, 255 patients (period-1) and 180 patients (period-2) with sepsis were included. The TTA was 5.4 h (3.5-7.7) period-1 and 4.9 h (IQR 2.5-7.1) in period-2 ($p = 0.06$). MDW implementation significantly reduced the median TTAS from 3.7 h (IQR 1.5-5.8) in period-1, to 2.2 h (IQR 0.5-4.5) in period-2 ($p = 0.06$). CONCLUSION: Implementing POC MDW measurement in the ED protocols enhances the timeliness of anti-infective administration from sepsis onset, meeting current sepsis management guidelines. Copyright © 2024. The Author(s).

4. Effect of low vs. high vancomycin trough level on the clinical outcomes of adult patients with sepsis or gram-positive bacterial infections: a systematic review and meta-analysis.

Authors: Chander, Subhash;Kumari, Roopa;Wang, Hong Yu;Mohammed, Yaqub Nadeem;Parkash, Om;Lohana, Sindhu;Sorath, Fnu;Lohana, Abhi Chand;Sadarat, Fnu and Shiwani, Sheena

Publication Date: Oct 07 ,2024

Journal: BMC Infectious Diseases 24(1), pp. 1114

Abstract: BACKGROUND & OBJECTIVE: The Infectious Disease Society of America guidelines recommend vancomycin trough levels of 15-20 mg/L for severe methicillin-resistant *Staphylococcus aureus*. However, recent consensus guidelines of four infectious disease organizations no longer recommend vancomycin dosing using minimum serum trough concentrations. Therefore, this study aimed to evaluate the impact of low ($= 15$ mg/L) vancomycin trough levels on clinical outcomes in adult patients with sepsis or gram-positive bacterial infections. METHOD: A systematic literature review from inception to December 2022 was conducted using four online databases, followed by a meta-analysis. The outcomes of interest included clinical response/efficacy, microbial clearance, length of ICU stay, treatment failure, nephrotoxicity, and mortality. RESULTS: Fourteen cohort studies met the inclusion criteria from which vancomycin trough concentration data were available for 5,228 participants. Our analysis found no association between vancomycin trough levels and clinical response [OR = 1.06

(95%CI 0.41-2.72], $p = 0.91$], microbial clearance [OR = 0.47 (95% CI 0.23-0.96), $p = 0.04$], ICU length of stay [MD=-1.01 (95%CI -5.73-3.71), $p = 0.68$], or nephrotoxicity [OR = 0.57 (95% CI 0.31-1.06), $p = 0.07$]. However, low trough levels were associated with a non-significant trend towards a lower risk of treatment failure [OR = 0.89 (95% CI 0.73-1.10), $p = 0.28$] and were significantly associated with reduced risk of all-cause mortality [OR = 0.74 (95% CI 0.62-0.90), $p = 0.002$]. **CONCLUSION:** Except for a lower risk of treatment failure and all-cause mortality at low vancomycin trough levels, this meta-analysis found no significant association between vancomycin trough levels and clinical outcomes in adult patients with sepsis or gram-positive bacterial infections. Copyright © 2024. The Author(s).

5. Association between red blood cells transfusion and 28-day mortality rate in septic patients with concomitant chronic kidney disease.

Authors: Chen, Lei;Lu, Honglei;Lv, Chenwei;Ni, Haibin;Yu, Renjun;Zhang, Bing and Hu, Xingxing

Publication Date: 10 10 ,2024

Journal: Scientific Reports 14(1), pp. 23769

Abstract: Patients with chronic kidney disease (CKD) often have impaired immune function, making them more prone to infections that can lead to sepsis. The coexistence of these conditions can result in decreased hemoglobin levels and is associated with a higher mortality rate. To investigate whether the transfusion of red blood cells (RBCs) improves the prognosis of septic patients with concomitant CKD and to explore the indications for red blood cell transfusion. This retrospective cohort study utilizes data from the MIMIC-IV (v2.0) database. The study enrolled 6,604 patients with sepsis and concomitant CKD admitted to the Intensive Care Unit (ICU). Propensity score matching (PSM) was applied to adjust for confounding factors. Multivariate Cox regression analysis revealed an association between RBC transfusion and a decreased risk of 28-day mortality (HR: 0.61, 95% CI: 0.54-0.70, $P = .05$, a Base Excess (BE) value = 5, a Base Excess (BE) value = 5, a Base Excess (BE) value Copyright © 2024. The Author(s).

6. Clinical Application of Metagenomic Next-Generation Sequencing in Sepsis Patients with Early Antibiotic Treatment.

Authors: Chen, Yongru;Chen, Chongyue;Chen, Wei;Gai, Wei;Zheng, Yafeng;Guo, Yuxin;Wang, Zhaoning;Chen, Yongsong and Cai, Zhiming

Publication Date: 2024

Journal: Infection & Drug Resistance 17, pp. 4695–4706

Abstract: Purpose: This study aimed to evaluate the clinical utility of metagenomic next-generation sequencing (mNGS) in sepsis patients who received early empirical antibiotic treatment. Patients and Methods: A retrospective analysis was conducted on clinical data from sepsis patients diagnosed in the Emergency Intensive Care Unit (EICU) between April 2019 and May 2023. All patients underwent standard conventional microbiological testing. Patients were categorized into either the mNGS group or the control group based on whether they underwent mNGS tests. Baseline variables were matched using propensity scores. Results: Out of 461 sepsis patients screened, 130 were included after propensity matching, with 65 patients in each group. Despite prior antibiotic treatment, 57 cases (87.69%) in the mNGS group had positive mNGS results, exceeding the culture detection rate (52.31%). Besides, a higher proportion of patients in the mNGS group experienced antibiotic adjustments compared to the control group (72.31% vs 53.85%). Mortality rates were also compared based on the duration of antibiotic exposure before mNGS sampling. Patients exposed to antibiotics for less than 24 hours had a lower mortality rate compared to those exposed for over 8 days (22.22% vs 42.86%). COX multivariate analysis identified mNGS testing, underlying diseases, lymphocyte percentage, infection site (respiratory and bloodstream) as independent risk factors for mortality in sepsis patients. Conclusion: With increased antibiotic exposure time, the positive rate of culture testing significantly decreased (44.44% vs 59.52% vs 35.71%, $P = 0.031$), whereas the positive rate of mNGS

remained stable (77.78% vs 88.10% vs 92.86%, $P = 0.557$). mNGS demonstrated less susceptibility to antibiotic exposure. Early mNGS detection positively impacted the prognosis of sepsis patients.
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7. Derivation and validation of generalized sepsis-induced acute respiratory failure phenotypes among critically ill patients: a retrospective study.

Authors: Choudhary, Tilendra;Upadhyaya, Pulakesh;Davis, Carolyn M.;Yang, Philip;Tallowin, Simon;Lisboa, Felipe A.;Schobel, Seth A.;Coopersmith, Craig M.;Elster, Eric A.;Buchman, Timothy G.;Dente, Christopher J. and Kamaleswaran, Rishikesan

Publication Date: Oct 01 ,2024

Journal: Critical Care (London, England) 28(1), pp. 321

Abstract: BACKGROUND: Septic patients who develop acute respiratory failure (ARF) requiring mechanical ventilation represent a heterogeneous subgroup of critically ill patients with widely variable clinical characteristics. Identifying distinct phenotypes of these patients may reveal insights about the broader heterogeneity in the clinical course of sepsis, considering multi-organ dynamics. We aimed to derive novel phenotypes of sepsis-induced ARF using observational clinical data and investigate the generalizability of the derived phenotypes. METHODS: We performed a multi-center retrospective study of ICU patients with sepsis who required mechanical ventilation for ≥ 24 h. Data from two different high-volume academic hospital centers were used, where all phenotypes were derived in MICU of Hospital-I (N = 3225). The derived phenotypes were validated in MICU of Hospital-II (N = 848), SICU of Hospital-I (N = 1112), and SICU of Hospital-II (N = 465). Clinical data from 24 h preceding intubation was used to derive distinct phenotypes using an explainable machine learning-based clustering model interpreted by clinical experts. RESULTS: Four distinct ARF phenotypes were identified: A (severe multi-organ dysfunction (MOD) with a high likelihood of kidney injury and heart failure), B (severe hypoxemic respiratory failure [median P/F = 123]), C (mild hypoxia [median P/F = 240]), and D (severe MOD with a high likelihood of hepatic injury, coagulopathy, and lactic acidosis). Patients in each phenotype showed differences in clinical course and mortality rates despite similarities in demographics and admission co-morbidities. The phenotypes were reproduced in external validation utilizing the MICU of Hospital-II and SICUs from Hospital-I and -II. Kaplan-Meier analysis showed significant difference in 28-day mortality across the phenotypes (p < 0.05). CONCLUSION: The phenotypes demonstrated unique patterns of organ injury and differences in clinical outcomes, which may help inform future research and clinical trial design for tailored management strategies. Copyright © 2024. The Author(s).

8. Corticosteroids for Managing Pediatric Sepsis and Septic Shock: A Systematic Review and Meta-analysis.

Authors: Deng J.;Bedri N.;Zuo Q.K.;Azab M.;Chang O.;Virdi R.;Hung J.;Venugopal K.;Tahir U. and Heybati, K.

Publication Date: 2024

Journal: The Pediatric Infectious Disease Journal (pagination), pp. Date of Publication: 25 Se 2024

Abstract: OBJECTIVE: To assess the efficacy and safety of corticosteroids for the management of pediatric sepsis and septic shock. DATA SOURCES: Ovid MEDLINE, Ovid Embase, CENTRAL, Web of

Science (Core Collection) and China National Knowledge Infrastructure were systematically searched up to September 2023. Preprint servers, clinical trial registries and the reference sections of previous reviews were hand-searched. **STUDY SELECTION:** Randomized controlled trials that enrolled pediatric sepsis, septic shock or systemic inflammatory response syndrome patients, compared the use of corticosteroid regimens against standard sepsis care and reported eligible outcomes were included. Title/abstract and full-text screening were conducted in-duplicate. **DATA EXTRACTION:** Eligible articles were extracted using a standardized form in-duplicate. Outcomes extracted include mortality incidence, hospital and pediatric intensive care unit length of stay, duration of shock, incidence of adverse events and serious adverse events and incidence of corticosteroid-related adverse events. The risk of bias was assessed using the Revised Cochrane Risk of Bias Tool for Assessing Randomized Trials. **DATA SYNTHESIS:** Random-effects meta-analyses were conducted, and the quality of evidence was assessed using the Grading of Recommendations, Assessment, Development and Evaluations approach. Sixteen randomized controlled trials (N = 973) were included. Corticosteroid use may be associated with reduced mortality risks (risk ratio: 0.65, 95% CI: 0.50-0.85), shorter length of hospital stay (MD: -3.76 days, 95% CI: -6.66 to -0.86), and shorter pediatric intensive care unit length of stay (MD -2.34 days, 95% CI: -3.14 to -1.53 days). Corticosteroid use may be associated with gastrointestinal bleeding but not a higher risk of secondary infection. No studies reported on serious adverse events. All findings were based on low to very low quality of evidence. **CONCLUSION(S):** While corticosteroids show promise for managing pediatric sepsis and septic shock, the question of how to select the best candidate and the most optimal regimen remains unanswered. Future trials need to focus on assessing corticosteroid-related adverse events and stratifying patient inclusion by sepsis subphenotypes. Copyright © 2024 Wolters Kluwer Health, Inc. All rights reserved.

9. Management and outcomes in pulmonary arterial hypertension patients with sepsis.

Authors: Flynn, Spencer;Chen, Haidee;Kerbel, Russell;Gupta, Summer;Jasuja, Sonia;Saggar, Rajan;Channick, Richard and Sherman, Alexander

Publication Date: Oct 28 ,2024

Journal: BMC Pulmonary Medicine 24(1), pp. 538

Abstract: **BACKGROUND:** Sepsis is a common cause of death in patients with pulmonary arterial hypertension (PAH). Treatment requires careful fluid management and hemodynamic support. This study compares patients with or without PAH presenting with sepsis with a focus on initial fluid resuscitation. **METHODS:** This retrospective analysis compared adults with and without PAH admitted for sepsis at two academic hospitals between 2013 and 2022. Prior PAH diagnosis was verified by review of right heart catheterization data and sepsis present on admission was verified by chart review. Demographics, vital signs, laboratory values, imaging results, treatment approaches, and all-cause mortality data were obtained. Controls were propensity score weighted by age, sex, and Charlson Comorbidity index. Logistic regression models controlling for age and Charlson comorbidity indices were used to examine factors associated with survival. **RESULTS:** Thirty patients admitted for sepsis with pre-existing PAH were compared to 96 matched controls. Controls received significantly more fluids at 24 h compared to PAH patients (median 0 mL v. 1216 mL, p : Thirty patients admitted for sepsis with pre-existing PAH were compared to 96 matched controls. Controls received significantly more fluids at 24 h compared to PAH patients (median 0 mL v. 1216 mL, p **CONCLUSION:** Patients with PAH and sepsis have high mortality and receive different treatments than controls, with more reliance on vasopressors and less on fluid resuscitation. PAH patients who received less fluids had higher mortality and those who received no fluids had a longer time to receiving antibiotics, indicating a potential delay in recognizing sepsis. Timely recognition of sepsis and dynamic decision-making around fluid resuscitation remains critical in this high-risk population. Copyright © 2024. The Author(s)

10. Bidirectional Interaction of Sepsis and Sleep Disorders: The Underlying Mechanisms and Clinical Implications

Authors: Guo, De-Zhi;Chen, Yu;Meng, Yan;Bian, Jin-Jun;Wang, Yi and Wang, Jia-Feng

Publication Date: 2024

Journal: Nature & Science of Sleep 16, pp. 1665–1678

Abstract: Sepsis is defined as life-threatening organ injury induced by infection, with high incidence and mortality. Sleep disorder is prevalent in septic patients and approximately 50% of patients with sepsis may develop atypical sleep patterns, but many of them may have been underdiagnosed by physicians. Sleep disorders and sepsis exhibit a close bidirectional relationship, with each condition significantly influencing the other. Conversely, sleep deprivation, sleep dysrhythmia and sleep fragmentation have been shown to impact the outcome of sepsis. This review endeavors to offer a comprehensive understanding of the intricate mechanisms that underpin the interplay between sepsis and sleep disorders, in addition to exploring potential clinical intervention strategies that could enhance outcomes for patients suffering from sepsis. Copyright © 2024 Guo et al.

11. Validation of MEWS, NEWS, NEWS-2 and qSOFA for different infection foci at the emergency department, the acutelines cohort.

Authors: HincapieOsorno C.;van Wijk R.J.;Postma D.F.;Koeze J.;Ter Maaten J.C.;Jaimes F. and Bouma, H. R.

Publication Date: 2024

Journal: European Journal of Clinical Microbiology and Infectious Diseases (pagination), pp. Date of Publication: 2024

Abstract: Purpose: Sepsis is a leading cause of morbidity and mortality globally. The lack of specific prognostic markers necessitates tools for early risk identification in patients with suspected infections in emergency department (ED). This study evaluates the prognostic accuracy of various Early Warning Scores (EWS)-MEWS, NEWS, NEWS-2, and qSOFA-for in-hospital mortality, 30-day mortality, and ICU admission, considering the site of infection. Method(s): A retrospective analysis was conducted using data from the Acutelines cohort, which included data collected from patients admitted to the University Medical Centre Groningen ED between September 2020 and July 2023. Patients were included if they had an ICD-10 code for infection. EWS were calculated using clinical data within 8 h post-admission. Predictive performance was assessed using AUC-ROC, calibration by the Hosmer-Lemeshow test and calibration curves, and operative characteristics like sensitivity and specificity. Result(s): A total of 1661 patients were analyzed, with infections distributed as follows: lower respiratory tract (32.9%), urinary tract (30.7%), abdominal (12.5%), skin and soft tissue (9.5%), and others (8.2%). The overall in-hospital mortality was 6.7%, and ICU admission was 7.1%. The highest AUC-ROC for in-hospital mortality prediction was observed with NEWS and NEWS-2 in abdominal infections (0.86), while the lowest was for qSOFA in skin and soft tissue infections (0.57). Predictive performance varied by infection site. Conclusion(s): The study highlights the variability in EWS performance based on infection site, emphasizing the need to consider the source of infection in EWS development for sepsis prognosis. Tailored or hybrid models may enhance predictive accuracy, balancing simplicity and specificity. Copyright © The Author(s) 2024.

12. Empirical antibiotic therapy for sepsis: save the anaerobic microbiota.

Authors: Kullberg R.F.J.;Haak B.W.;Chanderraj R.;Prescott H.C.;Dickson R.P. and Wiersinga, W. J.

Publication Date: 2024

Journal: The Lancet Respiratory Medicine (pagination), pp. Date of Publication: 2024

Abstract: Antibiotics are fundamental in sepsis management; however, the optimal empirical treatment remains debated. Despite anaerobes rarely being the causative pathogen of sepsis, antibiotics targeting them are frequently used, which might lead to unintended consequences. Multiple studies have shown that depletion of commensal anaerobic gut microbes by anti-anaerobic antibiotics

influences systemic immunity and is associated with increased mortality in patients with sepsis. However, this knowledge has not yet been translated into clinical practice. When considering empirical coverage of anaerobic pathogens in sepsis, most physicians advocate for a better-safe-than-sorry approach. In this Viewpoint, we argue that anti-anaerobic antibiotics could often result in being sorry rather than safe. We provide an overview of the limited necessity of anaerobic coverage and the potential detrimental effects of anaerobic depletion in sepsis. We aim to raise anaerobic awareness to reduce the unnecessary use of anti-anaerobic antibiotics in empirical sepsis treatment and improve patient outcomes. Copyright © 2024 Elsevier Ltd

13. Assessing the Risk of Delirium and Death in Sepsis Using the Braden Score: A Retrospective Study.

Authors: Li X.;Tang Y.;Bai Z.;Liang X.;Huang X.;Chen J.;Cheng H.;Lyu J. and Wang, Y.

Publication Date: 2024

Journal: Journal of Clinical Nursing (pagination), pp. Date of Publication: 11 Oct 2024

Abstract: AIMS AND OBJECTIVES: To provide a viable tool for the early clinical identification of high-risk populations in patients with sepsis. BACKGROUND: Sepsis-associated delirium (SAD) has the potential to significantly impact the short- and long-term prognosis of patients. However, accurately predicting and effectively managing SAD remains a significant challenge. METHOD(S): This study employed a retrospective analysis of adult sepsis patients admitted to the intensive care unit (ICU) for the first time. Patients were divided into two groups based on their initial Braden score upon admission to the ICU: a high-risk group (15 points). The relationship between Braden score and delirium was assessed using logistic regression and restricted cubic splines, while restricted mean survival time was employed to analyse the relationship between Braden scores and patients' 90- and 180-day mortality. RESULT(S): Of the 28,312 patients included in the study, those in the high-risk group exhibited a significantly elevated risk of delirium (44.8% vs. 29.7%) and higher 90-day (28.7% vs. 19.4%) and 180-day (33.2% vs. 24.1%) mortality rates (all p<0.05). CONCLUSION(S): Of the 28,312 patients included in the study, those in the high-risk group exhibited a significantly elevated risk of delirium (44.8% vs. 29.7%) and higher 90-day (28.7% vs. 19.4%) and 180-day (33.2% vs. 24.1%) mortality rates (all p<0.05). CONCLUSION(S): Of the 28,312 patients included in the study, those in the high-risk group exhibited a significantly elevated risk of delirium (44.8% vs. 29.7%) and higher 90-day (28.7% vs. 19.4%) and 180-day (33.2% vs. 24.1%) mortality rates (all p<0.05). CONCLUSION(S): Of the 28,312 patients included in the study, those in the high-risk group exhibited a significantly elevated risk of delirium (44.8% vs. 29.7%) and higher 90-day (28.7% vs. 19.4%) and 180-day (33.2% vs. 24.1%) mortality rates (all p<0.05). CONCLUSION(S): The Braden score is a simple and effective tool for the early identification of patients at increased risk of adverse outcomes in sepsis. DESIGN: Retrospective study. RELEVANCE TO CLINICAL PRACTICE: The Braden score can be employed by clinical nurses for the purpose of early identification of poor prognostic risk in patients with sepsis. REPORTING METHOD: This study was conducted according to the Strengthening Research in Observational Studies in Epidemiology (STROBE) guidelines. PATIENT OR PUBLIC CONTRIBUTION: Patients were involved in the sample of the study. Copyright © 2024 John Wiley & Sons Ltd

14. The diagnostic value of metagenomic next-generation sequencing in critically ill patients with sepsis: A retrospective cohort study.

Authors: Li, Chaozhong;Wang, Fang;Li, Wanrong;Sun, Guihu;Yang, Dexing;Yang, Ting;Yang, Guohui;Liang, Bo;Huang, Yun;Tang, Wenzhi;Li, Fei;Ye, Yujia;Qian, Chuanyun;Wu, Haiying and Meng, Zhaohui

Publication Date: Oct 11 ,2024

Journal: Medicine 103(41), pp. e39987

Abstract: Metagenomic next-generation sequencing (mNGS) is a new high-throughput sequencing method that may have great importance in early diagnosis and clinical management of sepsis. This study aimed to detect the difference between mNGS and comprehensive routine microbiological test (CMT), and to explore the diagnostic efficacy of mNGS in septic patients. This study retrospectively analyzed 150 sepsis patients who were admitted to the intensive care units of 4 hospitals in Southwest China from October 1, 2018, to October 1, 2021, and underwent both blood mNGS and CMT. The demographic and clinical characteristics of the patients were recorded, and the distribution of pathogens was analyzed. Additionally, the diagnostic performance and concordance between mNGS and CMT were compared to evaluate the etiological diagnostic value of mNGS in sepsis patients. In this study of 150 sepsis patients, bacterial infections were identified in 126 (84.0%), viral in 15 (10.0%), and fungal in 9 (6.0%). Among the sample types, sputum was most common, representing 62% of the total cases. Bronchoalveolar lavage fluid constituted 58.7%, blood 56.0%, with other specimens including pleural fluid at 29.3%, pus at 19.3%, swabs at 9.3%, cerebrospinal fluid at 8.7%, tissue at 6.0%, and bone marrow at 5.3%. mNGS demonstrated a diagnostic accuracy of 56.0% for sepsis, with a sensitivity of 84.4%, specificity of 26.0%, a positive predictive value of 54.6%, a negative predictive value of 61.3%. Metagenomic testing enables the rapid and early identification of infectious pathogens in sepsis patients, especially fungi and viruses. The study found that mNGS has high sensitivity in diagnosing sepsis patients, particularly for fungal and viral infections. mNGS technology is beneficial for critically ill sepsis patients. Copyright © 2024 the Author(s). Published by Wolters Kluwer Health, Inc.

15. Correlation between body mass index and gender-specific 28-day mortality in patients with sepsis: a retrospective cohort study.

Authors: Li, Chong;Huang, Huaping;Xia, Qingjie and Zhang, Li

Publication Date: 2024

Journal: Frontiers in Medicine 11, pp. 1462637

Abstract: Objective: To investigate the potential correlation between body mass index (BMI) and the 28-day mortality rate among sepsis patients and the gender difference in this association. Design: The current research was a retrospective cohort study. Participants: A total of 14,883 male and female cohorts of sepsis patients were included in the Medical Information Mart for Intensive Care IV (MIMIC-IV V2.2) database. Patients in each gender cohort were further classified as underweight, normal weight, overweight, or obese according to BMI and the World Health Organization (WHO) BMI categories. Outcomes: The 28-day mortality from the date of ICU hospitalization was the primary outcome measure. Results: The BMI and 28-day mortality exhibited an L-shaped relationship (p for nonlinearity for nonlinearity p for nonlinearity for nonlinearity p for nonlinearity = 0.045). Conclusion: This study proposes a link between extreme BMI and 28-day mortality in patients with sepsis. Underweight patients have an increased risk of mortality; however, this risk decreases in overweight and obese patients. Upon stratifying by sex, a U-shaped pattern was observed, indicating an association between BMI and 28-day mortality in males, while an L-shaped pattern emerged in females. Copyright © 2024 Li, Huang, Xia and Zhang.

16. Biomarkers as Predictors of Mortality in Sepsis and Septic Shock for Patients Admitted to Emergency Department: Who Is the Winner? A Prospective Study.

Authors: Luka, Sonia;Golea, Adela;Tat, Raluca Mihaela;Lupan Muresan, Eugenia Maria;Voicescu, George Teo;Vesa, Stefan Cristian and Ionescu, Daniela

Publication Date: Sep 24 ,2024

Journal: Journal of Clinical Medicine 13(19)

Abstract: Background/Objectives: Sepsis and septic shock remain significant contributors to high early

mortality rates among patients admitted to the emergency department (ED). The objective of this study was to identify among newer biomarkers those with the highest sensitivity in early mortality prediction. Methods: This prospective, unicentric, observational study enrolled 47 adult patients admitted to the ED between November 2020 and December 2022. This study monitored the kinetics of the older and newer biomarkers, including azurocidin (AZU1), soluble triggering receptor expressed on myeloid cells (sTREM), soluble urokinase-type plasminogen activator receptor (suPAR), high-sensitivity C-reactive protein (hsCRP), procalcitonin (PCT), and interleukin-6 (IL-6), and their capacity in predicting mortality. Results: SuPAR showed the most significant predictive utility for early prognosis of mortality in the ED, with an area under the curve (AUC) of 0.813 (95% CI: 0.672 to 0.912), a cutoff value > 8168 ng/mL, sensitivity of 75%, and specificity of 81.48% (p Conclusions: In our study, suPAR, IL-6, and PCT showed good predictive value for short-term mortality in sepsis and septic shock patients.

17. Impact of Non-Alcoholic Fatty Liver Disease on Sepsis Inpatient Outcomes: A Nationwide Sample Analysis (2000-2019).

Authors: Lyu, Xiuhong;Liu, Bolun;Li, Yiting;Wang, Yichen;Miskovsky, John;Gaitanis, Melissa;Promrat, Kittichai and Wu, Wen-Chih

Publication Date: Sep 26 ,2024

Journal: Journal of Clinical Medicine 13(19)

Abstract: Background/Objectives: Patients with Non-Alcoholic Fatty Liver Disease (NAFLD) are reported to have an increased risk of developing severe infections, leading to hospitalizations with sepsis. However, data regarding the impact of comorbid NAFLD on in-hospital outcomes of patients with sepsis is scarce. Methods: This nationwide retrospective observational study using discharge data from the National Inpatient Sample (NIS), Healthcare Cost and Utilization Project (HCUP), and Agency for Healthcare Research and Quality included 21,057,911 adult patients who were admitted to hospitals in the United States between 2000 and 2019 with a primary discharge diagnosis of sepsis. These patients were categorized according to the presence or absence of comorbid NAFLD. The twenty-year trend of nationwide NAFLD prevalence among sepsis inpatients was elucidated. Multivariable logistic regression analysis was used to analyze NAFLD's impact on sepsis outcomes. Results: In the twenty-year study period, the prevalence of NALFD among sepsis inpatients trended up from 1.2% in 2000 to 4.2% in 2019. Similar trends were observed in regional analysis. While overall sepsis mortality decreased, comorbid NAFLD in sepsis patients was consistently associated with a higher adjusted in-hospital all-cause mortality rate (adjusted odds ratio (OR), 1.19; 95% confidence interval (CI), 1.07-1.32), higher odds of developing septic shock, and higher likelihood of development of multi-organ dysfunction. Conclusions: Comorbid NAFLD in the stage of NASH or cirrhosis is associated with higher in-hospital all-cause mortality and worse clinical outcomes in sepsis inpatients. Addressing this rising epidemic will be of paramount importance to improve sepsis in-hospital outcomes.

18. Shadows and lights in sepsis immunotherapy.

Authors: Monneret G.;Haem Rahimi M.;Lukaszewicz A.C.;Venet F. and Gossez, M.

Publication Date: 2024

Journal: Expert Opinion on Pharmacotherapy (pagination), pp. Date of Publication: 2024

Abstract: Introduction: Sepsis remains a major global public health challenge. The host's response in sepsis involves both an exaggerated inflammatory reaction and immunosuppressive mechanisms. A better understanding of this response has shed light on the failure of anti-inflammatory therapies administered under the 'one size fits all' approach during the last decades. Areas covered: To date, patients' management has moved toward a comprehensive precision medicine approach that aims to personalize immunotherapy, whether anti-inflammatory or immunostimulatory. Large Prospective interventional randomized controlled trials validating this approach are about to start. A crucial prerequisite for these studies is to stratify patients based on biomarkers that will help defining the

patients' immuno-inflammatory trajectory. Expert opinion: Some biomarkers are already available in routine clinical care, while improvements are anticipated through the standardized use of transcriptomics and other multi-omics technologies in this field. With these precautions in mind, it is reasonable to anticipate improvement in outcomes in sepsis. Copyright © 2024 Informa UK Limited, trading as Taylor & Francis Group.

19. Decreased cardio-respiratory information transfer is associated with deterioration and a poor prognosis in critically ill patients with sepsis.

Authors: Morandotti C.; Wikner M.; Li Q.; Ito E.; Tan C.; Chen P.Y.; Cawthorn A.; Lilaonitkul W. and Mani, A. R.

Publication Date: 2024

Journal: medRxiv (pagination), pp. Date of Publication: 20 Aug 2024

Abstract: Assessing illness severity in the ICU is crucial for early prediction of deterioration and prognosis. Traditional prognostic scores often treat organ systems separately, overlooking the body's interconnected nature. Network physiology offers a new approach to understanding these complex interactions. This study used the concept of transfer entropy (TE) to measure information flow between heart rate (HR), respiratory rate (RR), and capillary oxygen saturation (SpO₂) in critically ill sepsis patients, hypothesizing that TE between these signals would correlate with disease outcome. The retrospective cohort study utilized the MIMIC III Clinical Database, including patients who met Sepsis-3 criteria on admission and had 30 minutes of continuous HR, RR, and SpO₂ data. TE between the signals was calculated to create physiological network maps. Cox regression assessed the relationship between cardiorespiratory network indices and both deterioration (SOFA score increase of ≥ 2 points at 48 hours) and 30-day mortality. Among 164 patients, higher information flow from SpO₂ to HR [TE(SpO₂->HR)] and reciprocal flow between HR and RR [TE(RR->HR) and TE(HR->RR)] were linked to reduced mortality, independent of age, mechanical ventilation, SOFA score, and comorbidity. Reductions in TE(HR->RR), TE(RR->HR), TE(SpO₂->RR), and TE(SpO₂->HR) were associated with increased risk of 48-hour deterioration. After adjustment for potential confounders, only TE(HR->RR) and TE(RR->HR) remained statistically significant. The study confirmed that physiological network mapping using routine signals in sepsis patients could indicate illness severity and that higher TE values were generally associated with improved outcomes. **New & Noteworthy:** This study adopts an integrative approach through physiological network analysis to investigate sepsis, with the goal of identifying differences in information transfer between physiological signals in sepsis survivors versus non-survivors. We found that greater information flow between heart rate, respiratory rate, and capillary oxygen saturation was associated with reduced mortality, independent of age, disease severity, and comorbidities. Additionally, reduced information transfer was linked to an increased risk of 48-hour deterioration in patients with sepsis. Copyright The copyright holder for this preprint is the author/funder, who has granted medRxiv a license to display the preprint in perpetuity. All rights reserved. No reuse allowed without permission.

20. Development and Validation of a Policy Tree Approach for Optimizing Intravenous Fluids in Critically Ill Patients with Sepsis and Acute Kidney Injury.

Authors: Oh W.; Takkavatakarn K.; Kittrell H.; Shawwa K.; Gomez H.; Sawant A.S.; Tandon P.; Kumar G.; Sterling M.; Hofer I.; Chan L.; Oropello J.; Kohli Seth R.; Charney A.W.; Kraft M.; Kovatch P.; Kellum J.A.; Nadkarni G.N. and Sakhuja, A.

Publication Date: 2024

Journal: medRxiv (pagination), pp. Date of Publication: 07 Aug 2024

Abstract: Purpose: Intravenous fluids are mainstay of management of acute kidney injury (AKI) after sepsis but can cause fluid overload. Recent literature shows that restrictive fluid strategy may be beneficial in some patients with AKI, however, identifying these patients is challenging. We aimed to

develop and validate a machine learning algorithm to identify patients who would benefit from a restrictive fluid strategy. Method(s): We included patients with sepsis who developed AKI within 48 hours of ICU admission and defined restrictive fluid strategy as receiving Method(s): We included patients with sepsis who developed AKI within 48 hours of ICU admission and defined restrictive fluid strategy as receiving Result(s): Among 2,091 patients in the external validation cohort, policy tree recommended restrictive fluids for 88.2%. Among these, patients who received restrictive fluids demonstrated significantly higher rate of early AKI reversal (48.2% vs 39.6%, pResult(s): Among 2,091 patients in the external validation cohort, policy tree recommended restrictive fluids for 88.2%. Among these, patients who received restrictive fluids demonstrated significantly higher rate of early AKI reversal (48.2% vs 39.6%, pConclusion(s): Policy tree based on causal machine learning can identify septic patients with AKI who benefit from a restrictive fluid strategy. This approach needs to be validated in prospective trials. Copyright The copyright holder for this preprint is the author/funder, who has granted medRxiv a license to display the preprint in perpetuity. It is made available under a CC-BY-NC-ND 4.0 International license.

21. Hyperoxia in Sepsis and Septic Shock: A Comprehensive Review of Clinical Evidence and Therapeutic Implications

Authors: Paunikar, Sharayu and Chakole, Vivek

Publication Date: Se ,2024

Journal: Cureus 16(9), pp. e68597

Abstract: Sepsis and septic shock are leading causes of mortality in intensive care units, characterized by a dysregulated immune response to infection, leading to severe organ dysfunction. Oxygen therapy is a cornerstone of supportive care in sepsis management, aimed at correcting hypoxemia and improving tissue oxygenation. However, the administration of supplemental oxygen must be carefully managed to avoid hyperoxia, which can lead to oxidative stress and additional tissue damage. This review aims to comprehensively analyze the clinical evidence regarding hyperoxia in the context of sepsis and septic shock, evaluating its potential therapeutic benefits and risks and discussing the implications for clinical practice. A thorough literature review included observational studies, randomized controlled trials (RCTs), meta-analyses, and clinical guidelines. The review focuses on the pathophysiology of sepsis, the mechanisms of hyperoxia-induced injury, and the clinical outcomes associated with different oxygenation strategies. The evidence suggests that while oxygen is crucial in managing sepsis, the risk of hyperoxia-related complications is significant. Hyperoxia has been associated with increased mortality and adverse outcomes in septic patients due to mechanisms such as oxidative stress, impaired microcirculation, and potential worsening of organ dysfunction. RCTs and meta-analyses indicate that conservative oxygen therapy may be beneficial in reducing these risks, though optimal oxygenation targets remain under investigation. This review highlights the importance of careful oxygen management in sepsis and septic shock, emphasizing the need for individualized oxygen therapy to avoid the dangers of hyperoxia. Further research is required to refine oxygenation strategies, establish clear clinical guidelines, and optimize outcomes for sepsis and septic shock patients. Balancing adequate oxygenation with the prevention of hyperoxia-induced injury is crucial in improving the prognosis of these critically ill patients. Copyright © 2024, Paunikar et al.

22. The Gut Microbiome in Sepsis: From Dysbiosis to Personalized Therapy.

Authors: Piccioni A.; Spagnuolo F.; Candelli M.; Voza A.; Covino M.; Gasbarrini A. and Franceschi, F.

Publication Date: 2024

Journal: Journal of Clinical Medicine 13(20) (pagination), pp. Article Number: 6082. Date of Publication: October 2024

Abstract: Sepsis is a complex clinical syndrome characterized by an uncontrolled inflammatory response to an infection that may result in septic shock and death. Recent research has revealed a crucial link between sepsis and alterations in the gut microbiota, showing that the microbiome could serve an essential function in its pathogenesis and prognosis. In sepsis, the gut microbiota undergoes significant dysbiosis, transitioning from a beneficial commensal flora to a predominance of pathobionts. This transformation can lead to a dysfunction of the intestinal barrier, compromising the host's immune response, which contributes to the severity of the disease. The gut microbiota is an intricate system of protozoa, fungi, bacteria, and viruses that are essential for maintaining immunity and metabolic balance. In sepsis, there is a reduction in microbial heterogeneity and a predominance of pathogenic bacteria, such as proteobacteria, which can exacerbate inflammation and negatively influence clinical outcomes. Microbial compounds, such as short-chain fatty acids (SCFAs), perform a crucial task in modulating the inflammatory response and maintaining intestinal barrier function. However, the role of other microbiota components, such as viruses and fungi, in sepsis remains unclear. Innovative therapeutic strategies aim to modulate the gut microbiota to improve the management of sepsis. These include selective digestive decontamination (SDD), probiotics, prebiotics, synbiotics, postbiotics, and fecal microbiota transplantation (FMT), all of which have shown potential, although variable, results. The future of sepsis management could benefit greatly from personalized treatment based on the microbiota. Rapid and easy-to-implement tests to assess microbiome profiles and metabolites associated with sepsis could revolutionize the disease's diagnosis and management. These approaches could not only improve patient prognosis but also reduce dependence on antibiotic therapies and promote more targeted and sustainable treatment strategies. Nevertheless, there is still limited clarity regarding the ideal composition of the microbiota, which should be further characterized in the near future. Similarly, the benefits of therapeutic approaches should be validated through additional studies. Copyright © 2024 by the authors.

23. 3-STEP MODEL- AN EXPLORATIVE NOVEL APPROACH TO CLASSIFY SEPSIS: A LONGITUDINAL OBSERVATIONAL STUDY.

Authors: Pilania J.;Panda P.K.;Das A.;Chauhan U. and Ravikant

Publication Date: 2024a

Journal: medRxiv (pagination), pp. Date of Publication: 07 Aug 2024

Abstract: Introduction: Sepsis remains a critical healthcare challenge worldwide, demanding prompt identification and treatment to improve patient outcomes. Given the absence of a definitive gold standard diagnostic test, there is an imperative need for adjunct diagnostic tools to aid in early sepsis detection and guide effective treatment strategies. This study introduces a novel 3-step model to identify and classify sepsis, integrating current knowledge and clinical guidelines to enhance diagnostic precision. Method(s): This longitudinal observational study was conducted at a tertiary care teaching hospital in northern India. Adult patients admitted with suspected sepsis underwent screening using predefined criteria. The 3-step model consisted of Step 1, assessing dysregulated host response using a National Early Warning Score-2 (NEWS-2) score of ≥ 6 ; Step 2, evaluating risk factors for infection; and Step 3, confirming infection presence through clinical, supportive, or confirmatory evidence. Patients were categorized into Asepsis, Possible sepsis, Probable sepsis, or Confirmed sepsis at various intervals during hospitalization. Result(s): A total of 230 patients were included. Initial categorization on Day 1 showed 13.0% in Asepsis, 35.2% in Possible sepsis, 51.3% in Probable sepsis, and 0.4% in confirmed sepsis. By Day 7, shifts were observed with 49.7% in Asepsis, 9.5% in Possible sepsis, 25.4% in Probable sepsis, and 15.4% in confirmed sepsis. At discharge or death, categories were 60.4% Asepsis, 5.2% Possible sepsis, 21.7% Probable sepsis, and 12.6% Confirmed sepsis. Transitions between categories were noted throughout hospitalisation, demonstrating the dynamic nature of sepsis progression and response to treatment. Conclusion(s): The 3-step model effectively stratifies sepsis status over hospitalization, facilitating early identification and classification of septic patients. This approach holds promise for enhancing diagnostic accuracy, guiding clinical decision-making, and optimizing antibiotic stewardship practices. Further validation across diverse patient cohorts and healthcare settings is essential to confirm its utility and generalizability. Copyright The copyright holder for this preprint is the author/funder, who has granted medRxiv a license to

24. RIGHT SEPSIS CLASSIFICATION- MUST FOR ANTIMICROBIAL STEWARDSHIP: A LONGITUDINAL OBSERVATIONAL STUDY.

Authors: Pilania J.;Panda P.K.;Das A.;Chauhan U. and Ravikant

Publication Date: 2024b

Journal: medRxiv (pagination), pp. Date of Publication: 07 Aug 2024

Abstract: Background: Sepsis is a critical medical condition characterized by life-threatening organ dysfunction triggered by a dysregulated response to infection. It poses a substantial global health burden, with significant morbidity, mortality, and economic costs, particularly pronounced in low- and middle-income countries. Effective management of sepsis relies on early recognition and appropriate intervention, underscoring the importance of accurate classification to guide treatment decisions. Objective(s): This longitudinal observational study aimed to assess the distribution of sepsis categories and the use of empirical antibiotics classified by the WHO AWaRe system in a tertiary care hospital in Northern India. The study also aimed to highlight implications for antimicrobial stewardship by examining the use of AWaRe group antibiotics and their correlation with sepsis classifications. Method(s): A total of 1867 patients admitted with suspected sepsis were screened, with 230 meeting inclusion criteria. Patients were categorized into different sepsis classes (Asepsis, Possible Sepsis, Probable Sepsis, Confirm Sepsis) and followed until discharge or Day-28. Descriptive statistical analysis was employed to assess sepsis categories and empirical antibiotic usage classified by Access, Watch, and Reserve categories according to the WHO AWaRe system. Result(s): Among the study cohort (mean age 40.70 +/- 14.49 years, 50.9% female), initial sepsis classification predominantly included Probable Sepsis (51.3%) and Possible Sepsis (35.7%), evolving to Asepsis (57.8%) upon final classification. Empirical antibiotic use showed a concerning predominance of Watch group antibiotics (92.5%), with Ceftriaxone (45.7%) and piperacillin-tazobactam (31.7%) being the most commonly prescribed. Conclusion(s): The dynamic nature of sepsis classification underscores the complexity of diagnosing and managing this condition. Accurate categorization is pivotal for clinical decision-making, optimizing antibiotic use, and combating antimicrobial resistance. The majority of the asepsis category was levelled as probable or possible sepsis and given antibiotics. The high reliance on Watch group antibiotics in empirical therapy signals a need for enhanced diagnostic strategies to refine treatment initiation, potentially reducing unnecessary antibiotic exposure. Future efforts should focus on establishing sepsis classification checklists and promoting adherence to antimicrobial stewardship principles to mitigate the global threat of antimicrobial resistance. Copyright The copyright holder for this preprint is the author/funder, who has granted medRxiv a license to display the preprint in perpetuity. It is made available under a CC-BY-NC-ND 4.0 International license.

25. AI Algorithms for Modeling the Risk, Progression, and Treatment of Sepsis, Including Early-Onset Sepsis-A Systematic Review

Authors: Tadel, Karolina;Dudek, Andrzej and Bil-Lula, Iwona

Publication Date: Oct 07 ,2024

Journal: Journal of Clinical Medicine 13(19)

Abstract: Sepsis remains a significant contributor to neonatal mortality worldwide. However, the nonspecific nature of sepsis symptoms in neonates often leads to the necessity of empirical treatment, placing a burden of ineffective treatment on patients. Furthermore, the global challenge of antimicrobial resistance is exacerbating the situation. Artificial intelligence (AI) is transforming medical practice and in hospital settings. AI shows great potential for assessing sepsis risk and devising optimal treatment strategies. Background/Objectives: This review aims to investigate the application of AI in the detection and management of neonatal sepsis. Methods: A systematic literature review (SLR) evaluating AI methods in modeling and classifying sepsis between 1 January 2014, and 1 January 2024, was

conducted. PubMed, Scopus, Cochrane, and Web of Science were systematically searched for English-language studies focusing on neonatal sepsis. Results: The analyzed studies predominantly utilized retrospective electronic medical record (EMR) data to develop, validate, and test AI models to predict sepsis occurrence and relevant parameters. Key predictors included low gestational age, low birth weight, high results of C-reactive protein and white blood cell counts, and tachycardia and respiratory failure. Machine learning models such as logistic regression, random forest, K-nearest neighbor (KNN), support vector machine (SVM), and XGBoost demonstrated effectiveness in this context. Conclusions: The summarized results of this review highlight the great promise of AI as a clinical decision support system for diagnostics, risk assessment, and personalized therapy selection in managing neonatal sepsis.

26. Development of an Electronic Clinical Surveillance Measure for Unnecessary Rapid Antibiotic Administration in Suspected Sepsis.

Authors: Taylor S.P.;Palakshappa J.A.;Chou S.H.;Gibbs K.;King J.;Patel N. and Kowalkowski, M.

Publication Date: 2024

Journal: Clinical Infectious Diseases : An Official Publication of the Infectious Diseases Society of America (pagination), pp. Date of Publication: 03 Oct 2024

Abstract: BACKGROUND: Substantial efforts focus on monitoring and reducing delays in antibiotic treatment for sepsis, but little has been done to characterize the balancing measure of sepsis overtreatment. We aimed to establish preliminary validity and usefulness of electronic health record (EHR) data-derived criteria for sepsis overtreatment surveillance (SEP-OS). METHOD(S): We evaluated adults with potential sepsis (≥ 2 Systemic Inflammatory Response Syndrome criteria within 6 hours of arrival) presenting to the emergency department of 12 hospitals, excluding patients with shock. We defined SEP-OS as the proportion of patients receiving rapid IV antibiotics (METHOD(S): We evaluated adults with potential sepsis (≥ 2 Systemic Inflammatory Response Syndrome criteria within 6 hours of arrival) presenting to the emergency department of 12 hospitals, excluding patients with shock. We defined SEP-OS as the proportion of patients receiving rapid IV antibiotics (RESULT(S): Of 113 764 eligible patients, the prevalence of sepsis overtreatment was 22.5%. The measure met prespecified criteria for reliability, content, construct, and criterion validity. Patients classified by the SEP-OS overtreatment criteria had higher median antibiotic days (4 days [IQR, 2-5] vs 1 day [1-2]; P RESULT(S): Of 113 764 eligible patients, the prevalence of sepsis overtreatment was 22.5%. The measure met prespecified criteria for reliability, content, construct, and criterion validity. Patients classified by the SEP-OS overtreatment criteria had higher median antibiotic days (4 days [IQR, 2-5] vs 1 day [1-2]; P RESULT(S): Of 113 764 eligible patients, the prevalence of sepsis overtreatment was 22.5%. The measure met prespecified criteria for reliability, content, construct, and criterion validity. Patients classified by the SEP-OS overtreatment criteria had higher median antibiotic days (4 days [IQR, 2-5] vs 1 day [1-2]; P RESULT(S): Of 113 764 eligible patients, the prevalence of sepsis overtreatment was 22.5%. The measure met prespecified criteria for reliability, content, construct, and criterion validity. Patients classified by the SEP-OS overtreatment criteria had higher median antibiotic days (4 days [IQR, 2-5] vs 1 day [1-2]; P CONCLUSION(S): We developed a novel, valid EHR metric for clinical surveillance of sepsis overtreatment. Applying this metric to a large cohort of potential sepsis patients revealed a high rate of overtreatment and provides a useful tool to inform sepsis quality-improvement targets. Copyright © The Author(s) 2024. Published by Oxford University Press on behalf of Infectious Diseases Society of America. All rights reserved. For commercial re-use, please contact reprints@oup.com for reprints and translation rights for reprints. All other permissions can be obtained through our RightsLink service via the Permissions link on the article page on our site-for further information please con

27. Clinical Characteristics and Risk Factors of Sepsis in Patients with Liver Abscess.

Authors: Wang K.;Guo W.;Zhu J.;Guo Y. and Gao, W.

Publication Date: 2024

Journal: British Journal of Hospital Medicine (London, England : 2005) 85(9), pp. 1–15

Abstract: Aims/Background Liver abscess (LA) is a serious medical condition that predisposes patients to sepsis. However, predicting sepsis in LA patients has rarely been explored. This study employed univariate and multivariate logistic regression analyses to identify independent risk factors for sepsis, which would provide guidance for clinical diagnosis and treatment. Methods A total of 122 patients with LA treated in Peking University People's Hospital from 1 January 2016 to 31 October 2022 were recruited. Among the cases, 35 patients had sepsis (sepsis group) while the remaining 87 did not have sepsis (non-sepsis group). Clinical data were collected for all enrolled cases. Univariate analysis was performed to identify potential predictors, which were tested in multivariable logistic analysis to pinpoint the independent risk factors for sepsis in LA patients; these findings were utilized to develop a prediction model. Receiver operating characteristic (ROC) curve was used to evaluate the diagnostic efficacy of the prediction model. Informed consent to participate was obtained from the patients or their relatives. Results The incidence of shivering in the sepsis group was significantly higher than that in the non-sepsis group ($p < 0.05$). Through the univariate analysis, it was found that the reduction in platelet count and prothrombin time activity and the elevation of glycosylated hemoglobin (HbA1c) and procalcitonin (PCT) were more significant in the sepsis group than in the non-sepsis group ($p < 0.05$). Multivariate logistic regression analysis revealed that PCT and HbA1c were independent risk predictors of sepsis in LA patients within the derivation cohort ($p < 0.05$). Conclusion Elevated levels of HbA1c and PCT were independent risk factors for sepsis associated with LA. Patients with LA exhibiting elevated PCT levels demonstrated a 21% increased susceptibility to sepsis, and those with elevated HbA1c levels showed a 38% heightened risk for sepsis.

28. Elevated Triglyceride-Glucose (TyG) Index Predicts Poor Clinical Outcomes in Critically Ill AECOPD Patients: A Retrospective Study.

Authors: Wang, Xin;Cui, Xuerong;Fan, Huaping and Hu, Tianyang

Publication Date: 2024

Journal: International Journal of Copd 19, pp. 2217–2228

Abstract: Purpose: The triglyceride-glucose (TyG) index is a surrogate biomarker of insulin resistance which has been widely used in intensive care unit (ICU) to predict prognosis. However, its role in critically ill acute exacerbation of COPD (AECOPD) patients remains largely unknown. Material and methods: A total of 645 AECOPD patients were included in this retrospective cohort study, which extracted data from the eICU Collaborative Research Database (eICU-CRD). The TyG index was calculated as $\ln(\text{fasting triglycerides (mg/dL)} \times \text{fasting plasma glucose (mg/dL)})/2$. The primary endpoint includes in-hospital mortality and ICU mortality. The secondary endpoint was sepsis, acute kidney injury (AKI), and acute respiratory failure (ARF). Results: Multivariable Cox regression analysis revealed that the TyG index was independently associated with an increased risk of in-hospital mortality (hazard ratio, HR: 1.45, 95% CI: 1.04-2.01, $P = 0.028$) and ICU mortality (HR: 2.13, 95% CI: 1.28-3.54, $P = 0.004$). Moreover, the TyG index was independently associated with an increased risk of sepsis (odds ratio, OR: 1.54, 95% CI: 1.24-1.93, $P < 0.001$). Conclusion: Elevated TyG index was independently associated with an increased risk of poor clinical outcomes in critically ill AECOPD patients. A prospective study to define TyG as a biomarker for prognosis prediction in critically ill AECOPD patients is warranted. Copyright © 2024 Wang et al.

29. Enhancing sepsis therapy: the evolving role of enteral nutrition

Authors: Xu, Fuchao;Lu, Geng and Wang, Jun

Publication Date: 2024

Journal: Frontiers in Nutrition 11, pp. 1421632

Abstract: Sepsis is a life-threatening organ dysfunction syndrome caused by a dysregulated response to infection in the body. Effective treatment of sepsis poses a significant challenge in today's clinical field. In recent years, enteral nutrition has garnered significant attention as an essential supportive therapeutic strategy. Serving as a means to provide ample nutritional support directly through the gastrointestinal tract, enteral nutrition not only addresses the nutritional depletion caused by the disease but also holds potential advantages in regulating immune function, maintaining intestinal mucosal barrier integrity, and promoting tissue repair. This article delves into the latest advancements of enteral nutrition in the treatment of sepsis, with a particular focus on its application effectiveness in clinical practice, potential mechanisms, and challenges faced. By examining relevant basic and clinical research, the aim is to provide a deeper understanding of nutritional therapy for sepsis patients and offer valuable insights for future research and clinical practice. Copyright © 2024 Xu, Lu and Wang.

30. **Early detection of sepsis using machine learning algorithms: a systematic review and network meta-analysis.**

Authors: Yadgarov, Mikhail Ya.;Landoni, Giovanni;Berikashvili, Levan B.;Polyakov, Petr A.;Kadantseva, Kristina K.;Smirnova, Anastasia V.;Kuznetsov, Ivan V.;Shemetova, Maria M.;Yakovlev, Alexey A. and Likhvantsev, Valery V.

Publication Date: 2024

Journal: Frontiers in Medicine 11, pp. 1491358

Abstract: Background: With machine learning (ML) carving a niche in diverse medical disciplines, its role in sepsis prediction, a condition where the 'golden hour' is critical, is of paramount interest. This study assesses the factors influencing the efficacy of ML models in sepsis prediction, aiming to optimize their use in clinical practice. Methods: We searched Medline, PubMed, Google Scholar, and CENTRAL for studies published from inception to October 2023. We focused on studies predicting sepsis in real-time settings in adult patients in any hospital settings without language limits. The primary outcome was area under the curve (AUC) of the receiver operating characteristic. This meta-analysis was conducted according to PRISMA-NMA guidelines and Cochrane Handbook recommendations. A Network Meta-Analysis using the CINeMA approach compared ML models against traditional scoring systems, with meta-regression identifying factors affecting model quality. Results: From 3,953 studies, 73 articles encompassing 457,932 septic patients and 256 models were analyzed. The pooled AUC for ML models was 0.825 and it significantly outperformed traditional scoring systems. Neural Network and Decision Tree models demonstrated the highest AUC metrics. Significant factors influencing AUC included ML model type, dataset type, and prediction window. Conclusion: This study establishes the superiority of ML models, especially Neural Network and Decision Tree types, in sepsis prediction. It highlights the importance of model type and dataset characteristics for prediction accuracy, emphasizing the necessity for standardized reporting and validation in ML healthcare applications. These findings call for broader clinical implementation to evaluate the effectiveness of these models in diverse patient groups. Systematic review registration: <https://inplasy.com/inplasy-2023-12-0062/>, identifier, INPLASY2023120062. Copyright © 2024 Yadgarov, Landoni, Berikashvili, Polyakov, Kadantseva, Smirnova, Kuznetsov, Shemetova, Yakovlev and Likhvantsev.

31. **Advanced biomarker clustering analysis reveals mortality predictors in burn patients with sepsis.**

Authors: Yoon J.;Kym D.;Cho Y.S.;Hur J. and Yoon, D.

Publication Date: 2024

Journal: Scientific Reports 14(1), pp. 22784

Abstract: This study addresses the challenge of predicting mortality in sepsis among burn patients. Given the heterogeneity of sepsis, especially in the context of burn injuries, this study aims to identify reliable biomarkers for mortality prediction. The study is a retrospective review, focusing on the

evaluation of various biomarkers and their changes over time in a burn patient cohort. Conducted in the Burn Intensive Care Unit of Hangang Sacred Heart Hospital, the study involved a retrospective review of 1,659 adult burn patients from January 2010 to December 2022. Key biomarkers analyzed include lactate levels, pH, platelets, procalcitonin, and others. Advanced clustering methodologies, such as dynamic time warping and hierarchical clustering, were utilized to classify patients into distinct groups based on their biomarker profiles and clinical outcomes. The study identified four patient clusters with unique lactate level trajectories. Significant findings include the identification of procalcitonin, pH, and platelets as key predictors of mortality, with varying degrees of efficacy across different clusters. For instance, in the "Persistent Rise" cluster, pH and platelet count showed Area Under the Curve (AUC) values of 0.756 and 0.753, respectively, indicating their strong predictive power. The study concludes that a combination of biomarkers, especially lactate dynamics, can effectively predict mortality in burn-induced sepsis. The results advocate for a more personalized approach in managing sepsis in burn patients, considering the specific biomarker trajectories. These findings are crucial for enhancing treatment strategies and improving patient outcomes in burn care. Copyright © 2024. The Author(s).

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