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Sepsis:

Updated Guidelines for Diagnosis and Treatment

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By: Stacy Stauffer, JD

Sepsis:
Updated Guidelines for Diagnosis and Treatment

INTRODUCTION

In writing about her own experience, a sepsis survivor described it as "a medical domino effect in which the final stage, septic shock, can be organ failure and death."[1] The definition for sepsis has modified over time, but currently it is defined as "a life-threatening organ failure caused by the host's inappropriate response to infection."[2] The Centers for Disease Control and Prevention (CDC) reports that on a yearly basis 1.7 million American adults develop sepsis. Of these, 350,000 adults who develop sepsis die during their hospitalization or are discharged to hospice. A third of people who die in hospitals suffer sepsis while hospitalized.[3] For patients in intensive care units, sepsis is consistently reported as an immediate cause of death.[2] Research indicates that episodes of sepsis are escalating, but programs like the Surviving Sepsis Campaign (SSC) and evolution of the recommendations/guidelines bundles for sepsis treatment have reduced mortality.[2]

One of the greatest barriers to successfully treating a sepsis patient is simply identifying the condition in the first place. Sepsis can escalate so rapidly, and its consequences are so severe that prevention, early diagnosis, and immediate treatment are the greatest weapons physicians possess against bad outcomes and potential liability. Patients often appear in the emergency department with the general complaint that "I don't feel good."[4] Symptoms may include either high or low temperature, general signs of infection, mental decline/confusion, feeling extremely ill, and severe pain and/or shortness of breath (SOB). "If we had a single test that identified sepsis it would make it much easier," says Mitchell Levy, MD, Professor of Medicine at The Warren Alpert Medical School of Brown University and a founding member of the SSC.[4]

Liability may result when patients or their families believe that early signs of sepsis go unheeded, and patients do not receive appropriate treatment in time to prevent severe injury or death. Case studies and current guidelines demonstrate how quickly patients with the condition can decompensate, leaving physicians with few options to save them. This article aims to summarize the most recent guidelines published by entities dedicated to the reduction of sepsis and its complications. It offers risk reduction strategies geared toward early detection and prevention of sepsis.

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CASE ONE:

Would Early Administration of Antibiotics Have Altered the Clinical Course of a Young Mother?

A patient may develop sepsis after a seemingly routine resolution to a common medical condition. The following case study is an example, illustrating what occurred after the uneventful birth of a healthy infant.

> Consider at what point during this patient's course you may have suspected and started treatment for sepsis.

The patient, a 28-year-old female with a 38-week gestational pregnancy, presented to the hospital emergency department at 1:45 p.m. on June 30, 2019. She reported leaking clear vaginal fluid since 11:00 a.m. and the onset of irregular contractions. The patient's past medical and social history were significant for morbid obesity, kidney stones, chlamydia, negative Rh factor status, chronic back pain, and prior smoking. The insured hospitalist (MD1) suspected premature rupture of membranes and consulted with the patient's obstetrician prior to admission. Upon admission, oxytocin followed by an epidural were administered. A viable male infant was born by vaginal delivery at 6:47 p.m. that same day, with no complications noted.

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On July 1 the on-call ob-gyn (MD2) examined the patient at 5:24 a.m. and found her doing well with no complaints. Vital signs revealed tachycardia but were otherwise within normal limits. Labs indicated a white blood cell (WBC) count of 15.9 with 61% bands. MD2's plan stated 1) stable, advance postpartum care, and 2) discharge next day.

On July 2 at 7:53 a.m. MD2 prepared to discharge the patient noting her as stable in the summary with vitals T 99, P 104, R 18, BP 105/59 and O2 sat of 97%. MD2 instructed her to return to the clinic in six weeks for examination.

At 12:30 p.m. the patient complained of abdominal pain and shortness of breath. The nurse assessed her vital signs which were recorded as T 99, P 128, R 24, and BP 125/75. Labs revealed a WBC of 7.7 with 84% bands, prompting the nurse to alert MD1. MD1 ordered an EKG and repeat CBC. At 1:30 p.m. the patient complained of even worse abdominal pain and asked for medications to make it stop.

MD2 evaluated the patient at 3:18 p.m. having been called in from home to further evaluate her abdominal pain. The patient exhibited slight distension but reported passing gas and three stools, with no nausea or vomiting. She experienced uterine contractions and was taking oxycodone acetaminophen and naproxen around the clock. Despite these meds the patient indicated the intensity of the pain made her feel she was "going in and out." MD2 was concerned that more narcotics may exacerbate the patient's respiratory distress and ordered lorazepam for anxiety. She also encouraged the patient to walk the halls to ease the abdominal distention and placed the discharge on hold for continued closer monitoring.

On July 3 at 2:33 a.m. the nurse notified MD2 that the patient's blood glucose was 34. Despite encouragement to eat crackers and peanut butter, the patient refused and complained of 10/10 pain. At 3:03 a.m. nursing notes indicated a blood glucose of 40 and at 4:19 a.m. a blood glucose of 47, prompting the nurse to notify MD2 who then consulted with MD1.

MD1 examined the patient at 4:20 a.m. noting that she had continued severe abdominal pain, loss of appetite, diarrhea, shortness of breath, and pain with deep inspiration, but no excess vaginal bleeding. The patient was reluctant to move but did roll from her side to her back when requested. On exam, her abdomen was distended, firm, and diffusely tender to palpation, but the exam was limited due to the patient's body habitus. Vitals were T 99.3, P 137, R 22, BP 97/51 and O2 sat of 93%. Labs revealed creatinine of 2.29, BUN 26, and bilirubin 3.9, prompting a stat abdominal CT scan.

A sepsis alert order was placed at 5:41 a.m. The CT results came in at 5:55 a.m. and revealed minimal opacity in the lower right lung lobe indicating possible early pneumonia, and esophageal distention. At 6:20 a.m. labs showed Hgb of 14.5, WBC of 4.3, bands of 45% and platelets of 74. Pain medication was provided at 6:35 a.m. but no antibiotics.

At 7:05 a.m. a nurse's aide called in the nurse as the patient was unresponsive at a vital sign check. CPR began and a code blue was called at 7:06 a.m. The code team arrived at 7:10 and transferred the patient to the CVICU where she was intubated on the first pass. She was discovered to be in ventricular fibrillation and was shocked with 200J and given amiodarone 300mg and magnesium. Sinus rhythm returned after subsequent shocks at 300J and 360J, and the patient was moved to the ICU where preparations were made to initiate the hypothermia protocol. Dopamine and epinephrine were administered, but the patient's cardiac rhythm converted to pulseless electrical activity (PEA). A code was again called, but the patient was unable to be revived. Despite intense efforts to revive the patient, she expired and was pronounced at 8:31 a.m.

The lab reported on July 5 that group A streptococcus grew from the blood culture collected on July 3.

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DISCUSSION

The patient's family brought claims against both MD1 and MD2. The allegations pointed out the decline in the patient's health over the approximately twelve hours between when MD2 saw her on July 2 and MD1 saw her on July 3. Plaintiffs argued that prophylactic antibiotics should have been administered but were not. Experts also believed that the patient's condition change on July 1 and July 2 was a red flag that should have been addressed by MD2. Plaintiffs alleged that the patient demonstrated clear signs of infection on July 2. By the time MD1 saw the patient again on July 3 the experts speculated it may have been too late to save her. While generally supportive of her care, defense experts conceded that MD1 appeared to have sepsis in her differential as early as the time she ordered additional labs and exams, yet she failed to order antibiotics. Note that even a sepsis alarm did not result in the patient receiving antibiotics. This made the claim more difficult to defend, and ultimately the case settled prior to trial.

RISK REDUCTION STRATEGIES

Consider the following strategies:[5]

- Create and employ a standardized method for sepsis screening that evaluates patients from intake through discharge and considers the specific patient population (adults, pediatrics, obstetrics, etc.).
- Train patient care teams on how to appropriately respond to EHR system sepsis alarms and monitor compliance.
- Promote effective handoffs with communication procedures that minimize information loss regarding patient status or diagnosis.
- Consider use of a focused sepsis rapid response team.
- Facilitate timely delivery of antimicrobials: stock common antimicrobials in areas such as the ED, the ICU, and on hospital units.
- Prepare peri-discharge evaluations for sepsis survivors to prevent or limit rehospitalization.

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STALKING SEPSIS WITH ARTIFICIAL INTELLIGENCE (AI): CAN MACHINE LEARNING IMPROVE SEPSIS OUTCOMES?

The Malone Center for Engineering in Healthcare at Johns Hopkins University created an AI detection system for sepsis called Targeted Real-Time Early Warning System (TREWS). A two-year study of the system involved 4,000 clinicians in five hospitals using TREWS to treat 590,000 patients. This system additionally reviewed 173,931 records of previous patients. TREWS tracks patients from arrival through discharge. Early identification of sepsis provides a challenge as the symptoms, such as fever or confusion, can mirror those of other illnesses. A patient's medical history is combined with ongoing lab results and symptoms, and the AI system informs staff if the patient is at risk for sepsis. Necessary treatment, such as antibiotics, can then be ordered. This system helps coordinate care over staff changes and patient transfer without loss of critical information.[6,7]

Suchi Saria, founding research director for the Malone Center and lead author for the studies with TREWS, states:

> *"One of the most effective ways of improving outcomes is early detection and giving the right treatments in a timely way, but historically this has been a difficult challenge due to lack of systems for accurate early identification."*[6]

Saria was inspired to create a system like TREWS having lost her young adult nephew to sepsis. "Sepsis develops very quickly and this is what happened in my nephew's case. When doctors detected it, he was already in septic shock," she said.[6]

The study, reported in *Nature Medicine*, looked at provider adoption of machine learning-based clinical decision support tools (CDS). TREWS detected sepsis as much as six hours earlier than historic methods in the most critically ill patients, where even an hour delay may doom a patient to death. Examination of 9,805 retroactively identified sepsis cases showed TREWS detected 82% of cases. Providers reviewed 89% of TREWS alerts, with 38% provider confirmation. Past efforts to identify sepsis using electronic tools resulted in detection of less than half as many cases as the TREWS system and only 2% to 5% accuracy. Use of TREWS means patients are 20% less likely to die of sepsis. Continued improvement in machine learning early warning systems must necessarily be paired with encouragement for providers to adopt use of the tools.[6,7]

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Sepsis Guidelines:
Recent Updates by the SSC and the CDC

In the fall of 2021, the SSC released its most current guidelines. SSC believes use of a performance improvement program for sepsis with rapid screening can reduce mortality. The guidelines also suggest administration of antibiotics within one hour if shock is present, and within three hours without shock. As noted elsewhere in this article, the SSC believes antibiotic use can be suspended if another diagnosis becomes apparent. Crystalloids are preferred as the "first-line" fluid for resuscitation, and starches are recommended against. Ventilation recommendations are more specific to patient condition. However, for patients with moderate to severe acute respiratory distress syndrome (ARDS), prone ventilation is recommended for more than 12 hours per day, and with consideration of veno-venous extracorporeal membrane oxygenation (ECMO) when available. The guidelines also address long-term care for sepsis survivors who most often face a very difficult and lengthy period of recovery.[8] A full discussion of the new SSC guidelines is beyond the scope of this article. Nevertheless, it is important to be aware that they highlight "recommendations for recognition and early care, source diagnosis and treatment of infection, hemodynamic care, ventilation, and additional therapeutic treatment recommendations."[2]

SEPSIS VS. SUPERBUGS: RAPID TREATMENT MUST OUTWEIGH RISKS OF ANTIBIOTIC OVERUSE

One complicated issue related to the guidelines on treating sepsis is the concern for unnecessary use of antibiotics. Many physicians feel alarmed by the development of antibiotic-resistant superbugs. However, the SSC Guidelines of 2021 now recommend that physicians administer antimicrobials within one hour to patients in septic shock or suspected septic shock. This is an update from the previous three-hour guideline. However, the risk of death for a septic patient is so severe that many clinicians believe rapid antibiotic administration is the safest choice.[4]

"You can't treat sepsis without antibiotics, so you have got to do everything in your power to preserve the antibiotics. It's a two-edged sword," says Steven Simpson, MD, Professor of Medicine at the University of Kansas. "Who we are trying to reserve antibiotics for is people with life-threatening organ dysfunction. You have to constantly think about both things."[4] Simpson notes that diligent cessation of antibiotic medication can help mitigate antibiotic resistance if a nonbacterial diagnosis is later revealed. Critically, waiting for absolute certainty may be the difference between life and death, the loss of a limb, or other severe medical consequences, which can lead to liability. Sepsis is such a critical condition that patient preservation and treatment necessarily must come before concerns about antibiotic resistance.[4,9]

RESOURCE

Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021

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The CDC published a comprehensive program addressing sepsis in 2023 called the "Hospital Sepsis Program Core Elements: 2023." The resource provides an overview of core elements in hospital sepsis programs and attempts to identify and summarize the critical attributes of the best programs.[4] The elements of the program are Hospital Leadership Commitment, Accountability, Multi-Professional Expertise, Action, Tracking, Reporting, and Education.[5]

To foster the best results with sepsis management programs, **hospital leadership** must ensure that programs have the means and assets to improve. Critically, leadership must devote the appropriate levels of staff, equipment, and finances to these programs to help deliver improvement. This can include allocated time for program leaders to run the program, data and technological support, and staff appointment to sepsis activities. Further, leadership must impress upon staff that sepsis prevention is a priority.[5]

Identifying an **accountable leader** or co-leader with notable communication skills and clinical sepsis expertise can help improve a program. Having a physician and nurse serve as co-leaders or champions is recommended. In large multi-facility systems, each facility should have its own champions. For a single facility, ideally, champions from varied disciplines would co-lead. Regular assessment of goals and performance should generate continuous improvement.[5] The CDC posits that 73% of hospitals maintain a sepsis committee; however, only 55% of these allow specified time for their sepsis program leaders to devote to the sepsis protocol in the hospital.[4]

Examples of **multi-professional expertise** can include positions like hospital sepsis coordinators that oversee the functions of the variety of disciplines involved in sepsis care. These may be composed of everything from infectious disease specialists, surgeons, and critical care, to data collection and management personnel. Further, support for sepsis programs may need coordination among core elements, such as Tracking and Education.[4]

The focus of any hospital sepsis program is to best serve patients and deliver good outcomes. Ideally this includes rapid detection, and evidence-based treatment and actions that are designed to shepherd a patient through the acute illness and into long-term recovery. Examples of **actions** might include using standardized screening tools and hospital guidelines/standardized care pathways, timely administration of antimicrobials, and well-orchestrated handoffs. Another action that can be effective in sepsis programs is use of a Code Sepsis protocol. This ordinarily involves a Code Sepsis huddle among multi-disciplinary staff to respond early to indications of sepsis so that treatment can be immediately delivered.[4]

Determining the effectiveness of hospital sepsis programs involves **tracking**. Tracking should identify the measures that are the most critical for a given program's success and enhancement. Care must also be given to assure that particular patient populations (adults, obstetric, pediatric, etc.) or demographic groups are not shortchanged or overlooked in sepsis management and long-term results. Tracking may include but is not limited to chart review, epidemiology metrics, sepsis management metrics, usability and use of program tools, and clinician feedback.[4]

Nurturing commitment and changing behavior in critical staff who serve sepsis programs can be a function of **reporting**. Hospital boards and leadership may also benefit from regular reporting to generate support and emphasize awareness. Good reporting includes explanation of data collection and manipulation. This may cover data and trends, or individual clinician feedback and recognition. Ideally, regular reporting of sepsis program treatment and outcomes should be provided to all stakeholders in the program.[4]

Education regarding sepsis is also critical for patients and their families or caregivers, who need to understand the signs/symptoms of immediate and recurring risks of sepsis. The best method of education may depend on the intended recipients. It might include everything from flyers or email/newsletters to webinars or in-person training. A study at the University of Kansas further supports the idea that formal guidelines to diagnose and treat sepsis created much better outcomes. The study tracked aspects of sepsis like early detection and time to antibiotic administration. The Kansas Health System discovered during their study that patients with sepsis initially suffered a 49% mortality rate. However, with complete overhaul of training they were able to reduce the mortality to 5% for patients arriving at the ED with sepsis. One of the members of the Kansas study team points out the necessity of educating even first-year medical students to be aware of sepsis symptoms.[4]

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CMS FACES BACKLASH AGAINST INTENT TO ADOPT PAY-FOR-PERFORMANCE APPROACH

A multi-society position paper describes the Centers for Medicare and Medicaid Services (CMS) plan to adopt the Severe Sepsis/Septic Shock Management Bundle, known as SEP-1, as a pay-for-performance measure in the Hospital Value-Based Purchasing Program in 2026. CMS originally made SEP-1 a pay-for-reporting plan in 2015. The paper argues against this change noting that:

> *Multiple studies indicate that SEP-1 implementation was associated with increased broad-spectrum antibiotic use, lactate measurements, and aggressive fluid resuscitation for patients with suspected sepsis but not with decreased mortality rates.*[9]

The authors of the paper believe SEP-1 should be set aside for more recent "sepsis metrics that focus on patient outcomes."[9] The paper points out that CMS is creating a "community-onset sepsis 30-day mortality electronic clinical quality measure (eCQM)"[9] which the authors advocate for. However, they argue that eCQM should abandon systemic inflammatory response syndrome (SIRS) criteria and diagnosis codes for infection or sepsis as primary signals for sepsis diagnosis. They opine that eliminating these factors from eCQM will "streamline implementation, decrease variability between hospitals, maintain vigilance for patients with sepsis but without SIRS, and avoid promoting antibiotic use in uninfected patients with SIRS."[9]

The paper entreats CMS to meld the eCQM with the CDC's Adult Sepsis Event surveillance metric, believing that will "promote unity in federal measures, decrease reporting burden for hospitals, and facilitate shared prevention initiatives. These steps will result in a more robust measure that will encourage hospitals to pay more attention to the full breadth of sepsis care, stimulate new innovations in diagnosis and treatment, and ultimately bring us closer to our shared goal of improving outcomes for patients."[9]

If your practice or facility uses SEP-1 as a diagnostic tool for sepsis, it may be time to consider revision. As described above, the newest guidelines seek to focus on the best patient outcomes rather than strict adherence to a protocol that has not demonstrated real-world results.

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CASE TWO:
Could Earlier Identification of Neutropenia Have Changed the Outcome?

The rapid onset and imminent threat that sepsis presents mean that physicians in every scenario must be alert to the potential diagnosis, even in everyday encounters with patients. Symptoms that may seem ordinary may be the beginning of a cascade that leads to significant injury or even death. The next case presents what initially appears to be a common viral infection.

Might the outcome have changed had the primary care physician (PCP) immediately sent the patient to a higher level of care?

On July 20, 2015, a 30-year-old male patient presented to his PCP with complaints of sore throat, weakness, fever, chills, and nausea for the past four days. The patient's past medical history included migraine headaches, narcolepsy, anxiety, and acne managed by a dermatologist. The patient had seen the dermatologist one month prior to this PCP visit, and minocycline therapy for suspected atypical folliculitis was initiated. Upon exam the patient was noted to have dry oral mucosa, pharyngeal erythema, tender palpable left submandibular lymphadenopathy, and a follicular rash on his upper chest and back. Vitals signs revealed P 100, BP 110/70, O2 sat of 99%, and T 101.7. Rapid strep test was negative. The PCP's differential diagnosis included severe pharyngitis due to viral illness vs sinus infection. He prescribed cefuroxime 250 mg, 1 tab bid for 10 days, and instructed the patient to hydrate and rest. He also recommended follow-up with dermatology as he disagreed with the recent atypical folliculitis diagnosis.

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On July 22 at 10:30 a.m., the patient presented to the ED with complaints of severe left-sided throat pain, fever, fatigue, and decreased urine output. The patient explained to the ED physician that he was started on cefuroxime a few days prior by his PCP but that his symptoms continued to worsen. He denied cough, trouble breathing, abdominal pain, or vomiting. Vital signs revealed BP 119/73, P 134, R 20, T 99.3, and O2 sat of 99%. Upon exam the ED physician noted left tonsillar tenderness and inflammation with exudate, and no evidence of abscess. The noted impression was pharyngitis without abscess, dehydration, and poorly managed pain. The plan was to initiate IV fluid hydration and to administer morphine and steroids. No labs were ordered. Over the next few hours the patient's pain continued, and his vitals were as follows:

Time	P	BP	O2 Sat %	Temp
12:00 p.m.	123	112/84	99	99.3
1:00 p.m.	111	98/58	100	99.6
2:00 p.m.	109	83/57	99	99.0
3:01 p.m.	134	98/63	98	99.6

After consultation with the hospitalist (MD1), it was decided that the patient be placed in the observation unit for continued rehydration and pain control. The diagnosis was acute pharyngitis with severe pain and dehydration secondary to inability to swallow. The patient moved to an observation bed at 5:00 p.m. with orders for IV NaCl 0.9%, acetaminophen and oxycodone PRN. MD1 evaluated the patient at 8:00 p.m. and documented his examination findings as very dry tongue and mucus membranes with significant erythema and inflammation of the anterior tonsillar pillars, soft palate, and posterior pharyngeal wall. He ordered the patient's home medications but discontinued minocycline and ordered doxycycline instead. He also ordered magic mouthwash, a liquid diet encouraging consumption of warm liquids, and a mouth rinse after every meal. No labs or imaging were ordered, but a throat swab was obtained and sent for culture. Vital signs were recorded throughout the remainder of the evening and into the following morning (July 23) as follows:

Time	P	BP	O2 Sat %	Temp
8:16 p.m.	112	105/74	95	99.6
11:45 p.m.	112	113/88	93	99.6
4:31 a.m.	116	101/72	92	98.6
7:53 a.m.	124	104/74	91	NR

On July 23 at 8:15 a.m., a nurse practitioner (NP) who worked on the hospitalist service evaluated the patient. After evaluation she ordered a CBC with differential and ordered the patient be admitted to the medical floor. In addition, she consulted with the on-call otolaryngologist over the phone who recommended a neck CT and the addition of IV methylprednisolone and ampicillin/sulbactam, which the NP ordered. At 9:45 a.m. the CBC results were:

White blood cells (WBC)	0.1 (4.8-10.8)
Red blood cells (RBC)	4.02 (4.1-5.3)
Hemoglobin (Hb)	11 (12-15)
Hematocrit (Hct)	37 (37-47)
Platelets (PLT)	89 (150-350)
BUN	24 (5-25)
Creatinine (Cr)	1.1 (0.5-1.5)

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The CT results became available at 10:45 a.m. They revealed bilateral tonsillar phlegmon with air space narrowing, worse on the left, with focal abscess extending inferior to this level along the posterior lateral aspects of the left hypopharynx. There were nodular infiltrates or underlying masses seen within the bilateral lung apices.

At 11:30 a.m. the NP's admission history and physical documentation indicated the patient appeared anxious and clammy with edema and tenderness from left anterior neck span to ear. It indicated a hoarse voice and an erythematous rash on the left anterior forearm. These findings prompted a call to the intensivist who recommended an infectious disease consult.

At 11:45 a.m. the nurse assessed the patient's vitals prior to administering the pain medication and found the patient's O2 sats to be 81% and his pulse to be 150. Nursing notes also indicated newly cyanotic fingertips. The nurse placed the patient on 4L O2 via nasal cannula with humidification, and O2 sats fluctuated between 88-90%, prompting her to notify the NP and request further bedside evaluation. The NP arrived and ordered a non-rebreather mask and saline bolus. The intensivist was consulted via phone, and orders were placed to transfer the patient to the ICU.

At 1:35 p.m. the patient arrived in the ICU and was evaluated by the intensivist (MD2). MD2 documented the diagnosis of neutropenia with associated thrombocytopenia, possibly related to severe infection. She ordered blood cultures, piperacillin/tazobactam, and vancomycin.

At 4:41 p.m. the otolaryngologist evaluated the patient in the ICU. He documented his findings of cervical adenopathy, pallor, mild trismus, mild right tonsillar edema and exudate, moderate left tonsil edema with fibrinous exudate over surface, and mild edema of uvula with no deviation and no audible stridor. He also documented that the CT indicated bilateral tonsillitis, significant left phlegmon with inflammation extending to hypopharynx, and left supraglottic edema. A rapid strep was negative and the patient was pancytopenic. With concurrent lung disease suggested by the CT that might represent seeding of infection, he recommended intubation due to laryngeal involvement.

At 5:14 p.m. the patient was intubated, and chest x-ray indicated diffuse bilateral perihilar airspace interstitial infiltrates throughout the lungs, probably noncardiogenic pulmonary edema or infiltrates, and possible small left lower lung effusion. At 8:47 p.m. echocardiogram revealed an ejection fraction of 40-45% and no valvular lesions. Transfer orders to a university medical center were initiated.

On July 24 the patient was admitted to the university medical center with a diagnosis of severe septic shock, respiratory failure, bacteremia, and pancytopenia. The patient was alert and agitated on arrival with sinus tachycardia; cool, mottled bilateral lower extremities; and scattered petechiae on the chest. There was also noted swelling around the neck and lower jaw with no crepitus appreciated. Radial pulses were palpable but thready, and dorsalis pedis pulses were not palpable. Assessment was concerning for septic emboli and a repeat neck CT was ordered. This indicated no fluid collections in the soft tissues of the neck, diffuse soft tissue edema in the neck due to third spacing of the fluid, and focal narrowing of the right internal jugular vein likely from a partially occluding thrombus identified in the wall. Broad spectrum antibiotics and antifungals were ordered. Initial blood cultures were negative.

The patient continued to decline and was placed on ECMO support, high-dose pressors, and hemodialysis. Cultures from the neck were obtained and revealed Serratia marcescens, an opportunistic gram-negative pathogen. Over the course of the next few days there was no improvement with increasing lactate, worsening acidosis, rhabdomyolysis, and bloody endotracheal tube secretions. The decision was made to stop medical intervention on July 29. The cause of death was severe septic shock and respiratory failure. Final blood cultures results, available postmortem, revealed Serratia marcescens.

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DISCUSSION

The patient's family filed a lawsuit against the hospital and the treating physicians alleging their mismanagement of the patient led to his untimely death. The source of sepsis in this case was likely hospital acquired due to his unbeknownst immunocompromised state upon admission. Experts theorized the patient developed minocycline-induced hypersensitivity syndrome leading to a constellation of symptoms mimicking infectious mononucleosis and eventually neutropenia. Due to his immunocompromised state, he was susceptible to hospital-acquired infections and unable to mount an appropriate response once infected. One expert believed the only physician that might have saved the patient was his PCP. The expert argued the PCP could have potentially discontinued the minocycline, consulted with the dermatologist regarding his rash suspicions, or immediately referred the patient to the ED for further work-up. This expert speculated that by the time the patient did go to the ED his neutropenia was advanced. Further, since the ED and hospital clinicians delayed obtaining labs, no one was aware of his immunocompromised state to initiate appropriate antimicrobial prophylaxis or ensure proper precautions to prevent opportunist infections and resultant sepsis. The case ultimately settled.

Review of the case studies and current guidelines demonstrates the importance of sepsis prevention and early identification to reduce impact and ultimately provide lifesaving treatment. Physicians in every type of practice or facility must be aware that sepsis can arise from the most seemingly mundane circumstances. Sepsis may result from what appear to be minor illnesses or simple wounds, and it may be exacerbated by chronic health conditions. Physician awareness and patient education are rudimentary steps that may help prevent sepsis from developing in the first instance and must be a frontline offensive strategy against this aggressive condition.

RISK REDUCTION STRATEGIES

Consider the following strategies:[3]

- Implement a robust infection control strategy in hospitals with proactive measures:
  - Ensure timely communication between lab and healthcare staff, and prioritize isolation for patients with pending lab results.
  - Establish clear protocols for protective isolation for patients with weakened immune systems or compromised health from infections.
  - Regularly train and update staff on infection control practices to further enhance preparedness.
- Heighten awareness for potential drug-induced hypersensitivities that may increase susceptibility to sepsis.
  - Communicate directly with specialist prescriber if this is in your differential diagnosis.
- Be prepared for the possibility of sepsis in any setting. Do not delay referring or transferring your patient to the appropriate level of care when this is suspected.
- Monitor your patient frequently/hourly for positive or negative change in status throughout treatment.
- Educate patients with chronic conditions, such as diabetes, cancer, or kidney disease, about their increased risk of sepsis.
- Educate patients on steps they can take to prevent sepsis, such as:
  - Staying current with vaccinations for infections like flu and pneumonia that may lead to sepsis.
  - Practicing proper wound care and hygiene (for example, handwashing).
- Stay up to date with the most current sepsis guidelines from SSC and the CDC and have plans in place to implement them.

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CONCLUSION

Sepsis is a critical illness that can affect anyone and arise from the most seemingly mundane of ailments. Alarmingly, the time from the patient's first symptoms to severe illness or death can be mere hours. Early recognition of sepsis and timely, aggressive treatment are necessary to give patients the best chance of survival. The CDC, as well as initiatives like the SSC, continues to update recommendations for best practices in diagnosing and treating sepsis and septic shock. New technology like AI appears promising as a tool to improve early recognition of sepsis to enable rapid treatment and improve survival rates. To protect patients and eliminate or reduce potential liability, providers in every setting must strive to maintain their awareness and knowledge about sepsis to ensure the earliest diagnosis and response.

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ENDNOTES

The documents referenced in this article, along with many other risk management resource documents and past editions of *Claims Rx*, are available by calling Risk Management at 844-223-9648 or by email at RiskAdvisor@ProAssurance.com.

1. Jackie Duda, "Sepsis Nearly Killed Me. This Is What it Was Like," *The Washington Post*, September 16, 2023, https://www.washingtonpost.com/wellness/2023/09/16/sepsis-septic-shock-experience-near-death/.
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