Fever is a common problem in the intensive care unit (ICU). A prospective observational study in a general ICU reported fever (core temperature over 38.3°C) in 70% of patients, caused equally by infective and noninfective processes (1). In a large retrospective cohort study (24,204 ICU admissions), Laupland et al. (2) reported that 44% of patients experienced a temperature higher than 38.2°C during their ICU stay; 17% of these patients had positive cultures. The discovery of fever in an ICU patient has significant impact on health care costs, as blood cultures, radiologic imaging, and antibiotics routinely follow. It is, therefore, important to have a good understanding of the mechanisms and etiology of fever in ICU patients, how and when to initiate a diagnostic workup, and when initiation of antibiotics is indicated.

The Society of Critical Care Medicine and the Infectious Disease Society of America considers a temperature of 38.3°C or greater (101°F) a fever in an ICU patient which warrants further evaluation (3). This does not necessarily imply that a temperature below 38.3°C (101°F) does not require further investigation, as many variables determine a patient’s febrile response to an insult. In addition, it should be recognized that there is a daily fluctuation of temperature by 0.5° to 1.0°C, with women having wider variations in temperature than men. Furthermore, with aging, the maximal febrile response decreases by about 0.15°C per decade.

Accurate and reproducible measurement of body temperature is important in detecting disease and in monitoring patients with an elevated temperature. A variety of methods are used to measure body temperature, combining different sites, instruments, and techniques (4,5). Infrared ear thermometry has been demonstrated to provide values that are a few tenths of a degree below the temperature in the pulmonary artery and brain. Rectal temperatures obtained with a mercury thermometer or electronic probe are often a few tenths of a degree higher than core temperatures. However, patients perceive having rectal temperatures taken as unpleasant and intrusive. Furthermore, access to the rectum may be limited by patient position with an associated risk of rectal trauma. Many tachypneic patients are unable to keep their mouth closed to obtain an accurate oral temperature. Axillary measurements substantially underestimate core temperature and lack reproducibility. Body temperature is, therefore, most accurately measured by an intravascular thermistor; however, measurement by infrared ear thermometry or with an electronic probe in the rectum is an acceptable alternative.

Cytokines released by monocytic cells play a central role in the genesis of fever (6,7). The cytokines primarily involved in the development of fever include interleukin-1 (IL-1), interleukin-6 (IL-6), and tumor necrosis factor-α (TNF-α). These cytokines bind to their own specific receptors located in close proximity to the preoptic region of the anterior hypothalamus. Here the cytokine receptor interaction activates phospholipase A2, resulting in the liberation of plasma membrane arachidonic acid as substrate for the cyclooxygenase pathway.

Fever appears to be a preserved evolutionary response within the animal kingdom (8,9). With few exceptions, reptiles, amphibians, fish, and several invertebrate species have been shown to manifest fever in response to challenge with micro-organisms. Increased body temperature has been shown to enhance the resistance of animals to infection. Although fever has some harmful effects, it appears to be an adaptive, evolved response that helps rid the host of invading pathogens. Temperature elevation has been shown to enhance several parameters of immune function including antibody production, T-cell activation, production of cytokines, and enhanced neutrophil and macrophage function. Furthermore, some pathogens such as Streptococcus pneumoniae are inhibited by febrile temperatures.

Any disease process that results in the release of the pro-inflammatory cytokines IL-1, IL-6 and TNF-α will result in the development of fever. While infections are common causes of fever in ICU patients, many noninfectious inflammatory conditions cause the release of the pro-inflammatory cytokines and induce a febrile response. Similarly, it is important to appreciate that not all patients with infections are febrile. Approximately 10% of septic patients are hypothermic, and 35% normothermic at presentation. Septic patients who fail to develop a fever have a significantly higher mortality than febrile septic patients. The reason that patients with established infections fail to develop a febrile response is unclear; however, it appears that this aberrant response is not due to diminished cytokine production (10). The approach to a patient who presents to hospital with a fever is different from that of a patient who develops a fever in the ICU; this chapter reviews fever that develops in the ICU.
Fever Patterns

Attempts to derive reliable and consistent clues from evaluation of a patient's fever pattern is fraught with uncertainty and is not likely to be helpful diagnostically (11–13). Most patients have remittent or intermittent fever, which, when due to infection, usually follow a diurnal variation. Sustained fevers have been reported in patients with gram-negative pneumonia or CNS damage. The appearance of fever at different time points in the course of a patient's illness may, however, provide some diagnostic clues. Fevers that arise more than 48 hours after institution of mechanical ventilation may be secondary to a developing pneumonia. Fevers that arise 5 to 7 days postoperatively may be related to abscess formation. Fevers that arise 10 to 14 days postinstitution of antibiotics for intra-abdominal abscess may be due to fungal infections.

Infectious Causes

Hospital-acquired infections (HAIs) are infections developing in the hospital setting and are a worldwide problem occurring both in developed and in developing countries. The greatest percentage of HAIs are acquired in the ICU, with the most important being central line–associated bloodstream infection (CLABSI), catheter-associated urinary tract infections (CA-UTI), hospital/ventilator-associated pneumonia (VAP), *Clostridium difficile* enterocolitis, and nosocomial rhinosinusitis (NS). The infectious causes of fever in the ICU are listed in Table 82.1. It was estimated that, in 2002, a total of 1.7 million HAIs (4.5 per 100 admissions) occurred in the United States and that almost 99,000 deaths resulted from or were associated with a HAIs; similar data have been reported from Europe (14–16). These facts have been widely publicized in the lay press and attracted the attention of hospital administrators and governmental agencies. It is, however, likely that these estimates are inflated. More recent data suggests that there are approximately 440,000 to 640,000 HAIs annually in the United States (17,18). In a recent point prevalence study conducted in 183 acute care hospitals in 10 “geographically diverse states” in the United States, 4% of patients developed one or more HAIs (18). In this study, the most common infections were pneumonia (21.8%), surgical site infections (21.8%) and gastrointestinal infections (17.1%); *C. difficile* was the most commonly reported pathogen, causing 12.1% of all HAIs. Device-associated infections (CLABSI, CA-UTI, and VAP), which have traditionally been the major focus of infection control programs, accounted for only 25.6% of HAIs.

Noninfectious Causes

A large number of noninfectious conditions result in tissue injury with inflammation and a febrile reaction. Those noninfectious disorders which should be considered in ICU patients are listed in Table 82.2. For reasons that are not entirely clear, most noninfectious disorders usually do not lead to a fever in excess of 38.9°C (102°F); therefore, if the temperature increases above this threshold, the patient should be considered to have an infectious etiology as the cause of the fever (19). However, patients with drug fever may have a temperature >102°F. Similarly, fever secondary to blood transfusion may exceed 102°F. In patients with a temperature above 40°C (104°F), neuroleptic malignant syndrome, malignant hyperthermia, the serotonin syndrome, and subarachnoid hemorrhage must always be considered. The most common noninfectious causes of a fever in ICU patients include drug fever, transfusion of blood and blood products, alcohol withdrawal, postoperative fever, and thromboembolic disease. Acalculous cholecystitis is a relatively uncommon cause
of fever in ICU patients. However, as it may be associated with severe morbidity and mortality, it should always be considered in the differential diagnosis. Most of the clinical conditions listed in Table 82.2 are clinically obvious and do not require additional diagnostic tests to confirm their presence. However, a few of these disorders require special consideration.

**Drug Fever**

Most ICU patients receive numerous medications; all drugs have side effects, including fever. It is estimated that about 10% of inpatients develop drug fever during their hospital stay (20). The diagnosis of drug fever in ICU patients is challenging as the onset of fever can occur immediately after the administration of the drug or it can occur days, weeks, months, or even years after the patient has been on the offending medication. Furthermore, once the implicated medication is discontinued, the fever can persist in excess of 4 or 5 days. Associated rashes and leukocytosis occur in less than 20% of cases; an eosinophilia is suggestive of drug fever. Penicillins, cephalosporins, anti-convulsants, heparin, and histamine 2-blockers are commonly used ICU medications that are associated with drug fever.

**Postoperative Fever**

Surgery alone can cause a self-limited and spontaneously resolving fever (21–23). In the early postoperative period, a patient’s temperature may increase up to 1.4°C, with the peak occurring approximately 11 hours after surgery (21). Fifty percent of postoperative patients will develop a fever greater than or equal to 38°C, with 25% reaching 38.5°C or higher; the fever typically lasts for 2 to 3 days. Postoperative fever is believed to be caused by tissue injury and inflammation with associated cytokine release (21). The invasiveness of the procedure, as well as genetic factors, influences the degree of cytokine release and the febrile response. A good physical examination and history of the timing and sequence of events are crucial to help differentiate postoperative fever from other infectious and non-infectious causes of fever. Reactions to medications (especially anesthetics), blood products, and infections that might have existed prior to the surgery should also be considered during a patient’s early postoperative course. Nosocomial and surgical site infections usually develop 3 to 5 days after surgery.

Atelectasis is commonly implicated as a cause of postoperative fever (22). Standard ICU texts list atelectasis as a cause of fever, although they provide no primary source. Indeed a major surgery text states that “fever is almost always present (in patients with atelectasis)” (24). During rounds, many medical students and house staff have been taught that atelectasis is one of the “five” major causes of postoperative fever. However, there is very little data to support this widely held belief (myth). Engeron (25) studied 100 postoperative cardiac surgery patients and was unable to demonstrate a relationship between atelectasis and fever. Furthermore, when atelectasis is induced in experimental animals by ligation of a main-stem bronchus, fever does not occur (26). The role of atelectasis as a cause of fever is unclear; however, atelectasis probably does not cause fever in the absence of pulmonary infection.

**Blood Transfusions**

A large number of patients in the ICU will receive transfusions of blood products. Febrile nonhemolytic transfusion reactions are common following transfusion of blood and blood products. This is likely mediated by the transfusion of cytokines such as IL-1, IL-6, IL-8, and TNF-α, which accumulate with increasing length of blood storage (27,28). Febrile nonhemolytic reactions normally present within the first 6 hours after transfusion, are self-limiting, and may present with chills and rigors in addition to fever. It is crucial to differentiate these from febrile acute hemolytic transfusion reactions which can be life threatening. Leukoreduction has been shown to reduce the risk of febrile nonhemolytic transfusion reactions.

**Thromboembolic Disease**

Fever has been reported in 18% to 60% of patients with thromboembolic disease. Typically the fever is low grade (37.5°C to 38°C); however, fever up to 39°C has been reported (29,30).

**Acalculous Cholecystitis**

Acute acalculous cholecystitis (AAC) is an inflammatory condition of the gallbladder in the absence of calculi (31). AAC most commonly complicates surgery, multiple trauma, or burn injuries. However, this disease is not uncommon in medical patients undergoing mechanical ventilation. AAC is a disease with significant morbidity and mortality as it can lead to empyema, gangrenous gallbladder, and gallbladder perforation. A high index of suspicion is required as this can be a difficult diagnosis to make, especially in the endotracheally intubated and sedated patient. While initial presentation may be subtle, clinical features include fever, leukocytosis, abnormal liver function tests, a palpable right upper quadrant mass, vague abdominal discomfort, and jaundice. Untreated, bacterial superinfection may occur and this can progress to empyema, peritonitis, and septic shock.

**Malignant Hyperthermia**

Malignant hyperthermia is a rare genetic disorder of the muscle membrane causing an increase of calcium ions in the muscle cells. This can cause a variety of clinical problems, most commonly a dangerous hypermetabolic state after the use of agents such as the depolarizing neuromuscular blocking agent succinylcholine and inhaled anesthetic agents. This reaction typically occurs within 1 hour of anesthesia, but can be delayed for up to 10 hours. Patients’ presentation is with continually increasing fevers, muscle stiffness, and tachycardia, and can rapidly develop hemodynamic instability with progression into multiorgan failure. Since the introduction of dantrolene, the mortality of malignant hyperthermia has decreased from 80% in the 1960s to less than 10% today.

**Neuroleptic Malignant Syndrome**

Neuroleptic malignant syndrome is characterized by high fevers, a change in mental status, muscle rigidity, extrapyramidal symptoms, autonomic nervous system disturbances, and altered levels of consciousness. Symptoms usually begin within days to weeks of starting the offending drug, and patients typically have very high creatinine kinase levels. Neuroleptic malignant syndrome is caused by excessive dopaminergic blockade causing dopamine deficiency in the central nervous system (CNS). Agents most commonly implicated include neuroleptic medications and certain antihistamines. Treatment includes discontinuing the offending drug, aggressive supportive care, and close hemodynamic monitoring. Drug treatment of neuroleptic malignant syndrome is controversial. A case-controlled analysis
and a retrospective analysis of published cases suggested that dantrolene, bromocriptine, and amantadine may be beneficial.

**Serotonin Syndrome**

Serotonin syndrome is characterized by the triad of neuromuscular hyperactivity, autonomic hyperactivity, and change in mental status (32,33). It is not an idiosyncratic drug reaction but is a predictable response to serotonin excess in the CNS. It can occur from an overdose, drug interaction, or adverse drug effect involving serotonergic agents. Most severe cases result from a drug combination especially the combination of selective serotonin reuptake inhibitors (SSRIs) and monoamine oxidase inhibitors (MAOIs). It occurs in approximately 15% of patients with SSRI overdose, with hyperthermia developing in approximately half of cases, resulting from increased muscle activity due to agitation and tremor. A core temperature as high as 40°C is common in moderate to severe cases. Tachycardia, hypertension, mydriasis, hyperactive bowel sounds, myoclonus, and ocular clonus are common; however, not all of these symptoms are present in every patient. Hyperreflexia, clonus, and hypertonicity are greater in lower extremities than in upper extremities. Sustained clonus is usually found at the ankles. Most of the laboratory abnormalities are a consequence of poorly treated hyperthermia and include elevated CPK, serum creatinine, and aminotransferases, as well as a metabolic acidosis. The most important step in the treatment of the serotonin syndrome is removal of the offending drug. Control of agitation with a benzodiazepine is an essential step in the management. 5-HT2A antagonists (cyproheptadine and chlorpromazine) have been used in moderate to severe cases. There are no randomized clinical trials demonstrating the effectiveness of 5-HT2A antagonists.

**APPROACH TO THE FEBRILE ICU PATIENT**

The diagnostic workup of an ICU patient who develops a fever can be a daunting task. Frequently, the presence of a fever in the ICU patient triggers a battery of diagnostic tests that are costly, expose the patient to unnecessary risks, and often produce misleading or inconclusive results. It is, therefore, important that fever in ICU patients be evaluated in a systematic, prudent, clinically appropriate, and cost-effective manner (Fig. 82.1).

![Image of suggested algorithm for the management of fever](LWBK1580_C82_p957-963.indd)
The signs and symptoms of systemic inflammation are not useful in distinguishing infectious from noninfectious causes of the systemic inflammatory response syndrome (SIRS). Furthermore, despite exhaustive microbiologic tests, a pathogen is not isolated in about 25% of patients with suspected sepsis (34). While blood cultures are considered to provide the clinical gold standard for the diagnosis of bacterial infections, only about 20% to 30% of patients with sepsis have positive cultures; moreover, it takes 2 to 3 days before the results become available. Although molecular methods based on polymerase chain reaction (PCR) technology hold promise for the early diagnosis of bacterial infection and for pathogen identification, these are not in common clinical use.

Currently, a number of biomarkers have been evaluated as more specific indicators of infection. Procalcitonin (PCT) has, to date, been the most useful biomarker to aid in the diagnosis of sepsis. PCT, a propeptide of calcitonin, is normally produced in the C-cells of the thyroid. In healthy individuals, PCT levels are very low (below 0.01 ng/mL). In patients with sepsis, however, PCT levels increase dramatically, sometimes to more than several hundred nanograms per milliliter. The use of PCT for the diagnosis of sepsis and in determining the duration of antibiotics is controversial. The test is not perfect and should always be interpreted in the clinical context together with other diagnostic tests. Wacker (35) performed a meta-analysis to evaluate the diagnostic accuracy of PCT. In this meta-analysis, the sensitivity was 0.77 (95% CI 0.72–0.81), the specificity was 0.79 (95% CI 0.74–0.84), and the area under the ROC curve was 0.85 (95% CI 0.81–0.88). This diagnostic accuracy is better than any other single test to diagnose sepsis. A PCT above 0.5 ng/mL is highly suggestive of a bacterial infection, while a level below 0.1 ng/mL makes this diagnosis less likely (36). However, the optimal diagnostic threshold is unclear and has been reported to vary from 0.25 to 1.4 ng/mL (36,37). This variation in diagnostic threshold may be partly explained by the case-mix of each study and by the fact that patients’ with gram-negative infection have significantly higher PCT levels than those with gram-positive infections (38–40). Infection with a gram-negative pathogen is highly likely in a patient with a PCT level above 5 ng/mL. It should be noted that patients with fungal infections often have much lower or “normal” PCT level (38).

The following approach is suggested in patients who develop a fever in the ICU, with two temperature recordings above 38.3°C, a single temperature above 38.3°C with signs of sepsis or a single temperature above 39°C (see Fig. 82.1). A comprehensive physical examination and review of the chest radiograph is essential to identify infectious causes of a fever. In patients with a high fever and a high white cell count C. difficile infection should always be excluded. Because of the frequency, excess morbidity and mortality associated with bacteremia, blood cultures—two sets from different sites—are recommended in all febrile ICU patients. In patients with a central venous catheter (including PICCs), a CLABSI should always be considered. The catheter insertion site should be closely examined for signs of infection and consideration made for the removal of the device if no source of fever is identified. The urinary tract of patients with an indwelling urinary bladder catheter (IUBC) rapidly becomes colonized with gram-negative bacteria and candida species. Urinalysis and urine culture cannot adequately distinguish urinary tract colonization from urinary tract infection. It is widely quoted that CA-UTIs are the most common HAI in the ICU, accounting for approximately 23% of HAI infections among US adult ICU patients (41). It is, however, likely that these data are wrong and that most ICU patients who are treated for CA-UTIs have “asymptomatic” bacteriuria which does not require treatment. CA-UTI–related sepsis is exceedingly uncommon in general ICU patients. Consequently, unless the patient has had urologic surgery, has stents or stones routine culture of the urine should be avoided in ICU patients who develop a fever; removal of the IUBC is the first line of therapy in potential CA-UTI. Similarly, routine culture of sputa cannot distinguish respiratory tract colonization from infection and should not be performed as a routine in ICU patients who develop a fever.

Noninfectious causes of fever should be excluded; these include consideration of drug fever, alcohol or drug withdrawal, and venous thromboembolism. In patients with an obvious focus of infection (e.g., purulent nasal discharge, abdominal tenderness, profuse green diarrhea), a focused diagnostic workup is required. If there is no clinically obvious source of infection, and unless the patient is clinically deteriorating, it may be prudent to perform blood cultures and then observe the patient before embarking on the further diagnostic tests and commencing empiric antibiotics. However, the following features suggest bacterial infection and should prompt the immediate initiation of broad spectrum antibiotics pending further diagnostic workup:

- Temperature greater than 39°C (102°F);
- Fall in blood pressure or SBP to less than 90 mmHg
- Heart rate higher than 120 beats/min
- An increasing lactate or lactate over 2.0 mEq/L
- PCT greater than 0.5 ng/mL
- Bandemia over 5%
- Lymphocytopenia less than 0.5 × 10⁹ cells/µL
- Fall in platelet count or platelet count less than 150 × 10⁹ cells/µL
- Neutropenia with a neutrophil count less than 0.5 × 10⁹ cells/µL
- WBC count greater than 20,000 cells/µL.

In patients whose clinical picture is consistent with infection and in whom no clinically obvious source has been documented, removal of all central lines greater than 72 hours old is recommended, stool for C. difficile toxin (in those patients with loose stools and not on stool softeners), and an ultrasound examination, CT, or plain films of the maxillary sinuses are recommended. If the patient is at risk of abdominal sepsis or has any abdominal signs (tenderness, distension, unable to tolerate enteral feeds), a CT scan of abdomen is indicated. Patients with right upper quadrant tenderness require an abdominal ultrasound or CT examination. An IUBC should be removed as soon as it is no longer indicated.

Treatment of Fever

Data from a retrospective study of 636,051 patients showed that, although the presence of fever in the first 24 hours after ICU admission was associated with an increased risk of mortality in patients without infection, it was associated with a decreased risk of mortality in those with an infection (42). In this study, the adjusted in-hospital mortality risk progressively decreased with increasing peak temperature in patients with infection. Similarly, Weinstein and colleagues (43) reported that patients with spontaneous bacterial peritonitis had improved survival if they had a temperature greater than 38°C. While
fever is generally regarded as a beneficial response to infection, up to 70% of ICU patients with a fever are treated with antipyretic agents (44). Yet, the preponderance of data suggests that treating a fever in this setting is harmful. Schulman et al. (45) investigated the benefit of fever control in patients admitted to a trauma ICU. Patients were randomized to an active treatment group in which acetaminophen and cooling blankets were used to aggressively cool patients, as compared to a permisive group in which fever was only treated once it reached 40°C. In this study, there was a strong trend toward increased mortality in the active treatment group; all the patients who died in the aggressive treatment group had an infectious etiology as the cause of the fever. Lee et al. (46) performed a prospective observational study to determine the association between antipyretic treatment of fever and mortality in 1,423 critically ill patients with and without sepsis. These authors demonstrated that treatment with nonsteroidal anti-inflammatory drugs or acetaminophen independently increased 28-day mortality for septic patients (odds ratio (OR); NSAIDs: 2.61, p = 0.028, acetaminophen: 2.05, p = 0.01), but not for nonseptic patients. Against this background of convincing evidence demonstrating the harm of antipyretic agents in patients with sepsis, Schortgen and colleagues (47) performed a multicenter, RCT in which vasopressor-dependent febrile patients with septic shock were randomized to external cooling to achieve normothermia for 48 hours or no external cooling. In this study, there was a greater reduction of pressor use, more rapid shock reversal, and a lower mortality at 14 days (19% vs. 34%; p = 0.013) in the cooling group. However, the difference in mortality was no longer significant at ICU or hospital discharge. Based on the results of this single study and the fact that fever is widely believed to be beneficial in the setting of infection, external cooling cannot be recommended at this time. This study, however, does raise the possibility that external cooling may be beneficial in vasodilatory shock. The HEAT trial randomized 700 patients with fever (body temperature, ≥ 38°C) and known or suspected infection to receive either 1 g of intravenous acetaminophen or placebo every 6 hours until ICU discharge, resolution of fever, cessation of antimicrobial therapy, or death (48). The number of ICU-free days, the primary outcome of the study, did not differ between groups. Similarly, there was no difference in 90-day mortality between the groups. However, it should be noted that open-label acetaminophen was administered to 30% of patients assigned to acetaminophen and 29.4% assigned to placebo. Furthermore, the mean daily peak body temperature between the groups differed by only 0.25°C with the mean body temperature on day 1 being 37.5°C in the acetaminophen group and 37.0°C in the placebo group. While this study does not definitively answer the question of the role of fever control in ICU patients with infections, it does suggest that in this setting acetaminophen may not be harmful. Treatment of fever with acetaminophen may, therefore, be appropriate in patients who are highly symptomatic or have decreased cardiovascular reserve. However, it should be recognized that fever is an important vital sign that can be used to indicate resolution of the infectious process; treatment with antipyretics can mask nonresolution of infection.

In contrast to patients with infectious disorders, patients with acute cerebral insults (ischemic stroke, hemorrhagic stroke, SAH, head injury, after cardiac arrest) have worse outcomes with increased temperature. For these patients, the current recommendation is to maintain the patient’s temperature in the normothermic range. Antipyresis must always include an antipyretic agent, as external cooling alone increases heat generations and catecholamine production (49). Furthermore, acute hepatitis may occur in ICU patients with reduced glutathione reserves (e.g., alcoholics, malnourished) who have received regular therapeutic doses of acetaminophen.

**CONCLUSION**

Fever is a common finding in ICU patients, caused equally by infective and noninfective processes. A systematic and evidence-based approach should be followed in the diagnostic workup of ICU patients with fever. All ICU patients with a temperature greater than 38.3°C (101°F) require blood cultures and a clinical evaluation to determine the source of fever. Urine and sputum should not be routinely cultured in ICU patients with a fever. Contrary to common teaching, atelectasis does not cause a fever. Antipyretic agents should not be used to control fever in patients with an infection but are indicated in many noninfectious causes of fever.

**Key Points**

- Fever defined as a temperature of 38.3°C or greater (101°F) is common in ICU patients and warrants a diagnostic workup.
- In ICU patients a fever is caused equally by infective and noninfective causes.
- Body temperature is most accurately measured by an intravascular thermistor; however, measurement by infrared ear thermometry or with an electronic probe in the rectum is an acceptable alternative.
- Fever is an evolutionary preserved adaptive host response in reaction to invading pathogens that serves to enhance the immune response against the pathogen.
- HAI s are infections developing in the hospital setting. The most important HAI s in ICU patients include CLABSI, HAP/VAP, and C. difficile enterocolitis.
- The most common noninfectious causes of a fever in ICU patients include drug fever, transfusion of blood and blood products, alcohol withdrawal, and postoperative fever. Although widely quoted as a cause of fever, atelectasis alone does not cause fever.
- Aggressive treatment of fever is indicated in patients with acute cerebral insults.
- Treatment of fever with acetaminophen may be appropriate in patients with infections who are highly symptomatic or have decreased cardiovascular reserve.
- External cooling should be reserved to patients who have failed treatment with antipyretic agents, as external cooling alone may paradoxically increase heat production.

**References**


