

بسم الله الرحمن الرحيم

Fever in the surgical patient and after cesarean section





Definition

- Fever is common in the first few days after major surgery and can pose a diagnostic challenge for the care team.
- the standard definition of febrile morbidity for surgical patients:
 - temperature higher than or equal to 100.4°F (38°C)
 - on two occasions at least 4 hours apart during the postoperative period
 - excluding the first 24 hours
- another defined:
 - Two consecutive temperature elevations greater than 101.0°F (38.3°C)



Febrile morbidity

- occur in as many as one-half of patients .it is often self-limited and resolves without therapy
- is usually noninfectious in origin
- Most early postoperative fever is caused by the inflammatory stimulus of tissue damage and exposure to foreign materials that occurs during surgery and resolves spontaneously over a few days.
- Some call this "physiologic" fever.
Therefore, early postoperative fever occurring in the first three days after surgery often requires no further diagnostic workup other than a review of the patient's history and medications and a focused physical examination



Febrile morbidity

- Starting on postoperative day 4, infections related to the surgical procedure are more common. At this time, the differential diagnosis also includes noninfectious conditions, some of which are life-threatening
- A correct diagnosis with early initiation of appropriate therapy can be lifesaving.
- Infections are most commonly of the superficial or deep surgical site, the urinary tract, or the lungs.
- Noninfectious causes include inflammatory reactions, drug fever, and deep vein thrombosis.
- It is important to consider a broad differential and not to assume that fever is due to infection.
- It is also important to highlight that for many conditions, the presence of fever is variable and its absence does not eliminate the possibility of a condition being present.



TIMING OF POSTOPERATIVE FEVER

- differential diagnosis (infectious and noninfectious causes of fever) :

Immediate postoperative (within hours of surgery)

Early postoperative (postoperative day 0 through day 3)

Late postoperative (postoperative days 4 through 30)

Delayed (more than 30 days after the procedure)



Immediate postoperative

- Perioperative fever has its onset in the operating suite or within hours after surgery.
- Most fevers that occur in this time period are inflammatory and self-limited.
- Immediate postoperative fevers can also depend on the type of surgery but tend to be greater in patients with longer and more extensive surgical procedures .
- Causes of fever that are potentially life-threatening can occur in the immediate postoperative period.
- A history and physical examination will likely reveal the most common causes and will determine if additional evaluation or treatment is necessary.



The differential diagnosis of immediate postoperative fever

- Inflammation as a direct consequence of surgery
- response to surgical stress
- Trauma- or burn- induced inflammation

Inflammatory pyrogenic cytokine mediators (such as interleukin [IL]-1, IL-6, tumor necrosis factor, and interferon gamma)

Over half of these patients had a maximum temperature measured that exceeded 38°C (100.4°F).



The differential diagnosis of immediate postoperative fever



Immune-mediated reactions

such as reactions to antimicrobials and to transfused blood products administered in the operating room

The vasodilation that often accompanies these reactions makes hypotension a common presenting sign; rash may accompany fever in some patients with medication reactions.

These reactions often resolve after the transfusion or when the medication is discontinued but should be noted as possible transfusion reaction or medication allergy.



The differential diagnosis of immediate postoperative fever

- Malignant hyperthermia

Malignant hyperthermia (MH) typically presents within 30 minutes following the administration of a triggering agent (eg, inhaled anesthetics, succinylcholine)

but has been reported later in the operative course and also following cessation of anesthesia.

- MH is an inherited disorder most commonly manifesting as hypermetabolism associated with general anesthesia.
- Prompt recognition of the initial clinical signs and treatment with dantrolene limits the morbidity and mortality associated with this disorder.



The differential diagnosis of immediate postoperative fever

- Infections predating the operation

Patients who undergo surgery for an infection will often continue to have fevers related to that infection and should be treated accordingly.

- As an example, a patient with bacterial peritonitis



Early postoperative

- Early postoperative fever has an onset within the first three days after surgery.
- There are many causes of fever in the early postoperative period, and some can be life-threatening.
- Occasionally, fever is a manifestation of a community-acquired infection that predates surgery, such as a viral upper respiratory tract infection.
- Nosocomial infections are **not** common during this period.
- A focused history and physical examination are usually sufficient to rule out nosocomial infection, and cultures or imaging are usually **not** indicated



The differential diagnosis of early postoperative fever

- Continued stress-mediated inflammation as a direct consequence of surgery
- Trauma- or burn-mediated inflammation
- Infections predating the operation

Stress-mediated, immune-mediated and infection predating surgery can continue to cause fever within the first three days after surgery.

Fever caused by severe trauma or burns begins in the perioperative period and can persist with gradual resolution over days or even weeks



The differential diagnosis of early postoperative fever



Myocardial infarction

Myocardial infarction is a known complication of major surgery and is the most common serious postoperative complication that occurs on day 0 .

The risk of postoperative myocardial infarction significantly decreases after the first 72 hours from surgery.

Fever uncommonly accompanies myocardial infarction, but may occur, especially if there is pericarditis (ie, Dressler syndrome).



The differential diagnosis of early postoperative fever

- Urinary tract infection

Catheter-related infection should be considered for any patient with a catheter in place, especially if insertion was performed under emergency or nonsterile conditions.

The risk of urinary tract infection (UTI) increases with the duration of catheterization .

UTI is more common in patients who have undergone a genitourinary procedure and in those who have chronic, indwelling catheters prior to surgery.

Providers should be aware that positive cultures in patients with indwelling catheters who have no urinary symptoms may be due to chronic colonization or asymptomatic bacteriuria and not the cause of the current fever .



The differential diagnosis of early postoperative fever



Early surgical site infection

While surgical site infection (SSI) most often presents five days or more after surgery, two organisms, group A streptococcus and *Clostridium perfringens*, can cause fulminant SSI within a few hours after surgery.

These infections, although rare, cause brisk inflammatory reactions with fever as well as signs at the surgical site, including erythema and wound drainage.



The differential diagnosis of early postoperative fever



Pneumonia

Pneumonia associated with surgery most commonly occurs within the first postoperative week, with a peak incidence on day 2 .

The risk of pneumonia tapers to a stable, lower rate after the first postoperative week.

Aspiration pneumonia should be considered, especially if the patient has vomited when the gag reflex is suppressed by anesthesia or analgesia needed for endotracheal intubation.

A nasogastric tube also increases the risk of aspiration .

For patients who remain intubated after the initial surgery, the risk of ventilator-associated pneumonia (VAP) increases with the duration of mechanical ventilation .



The differential diagnosis of early postoperative fever



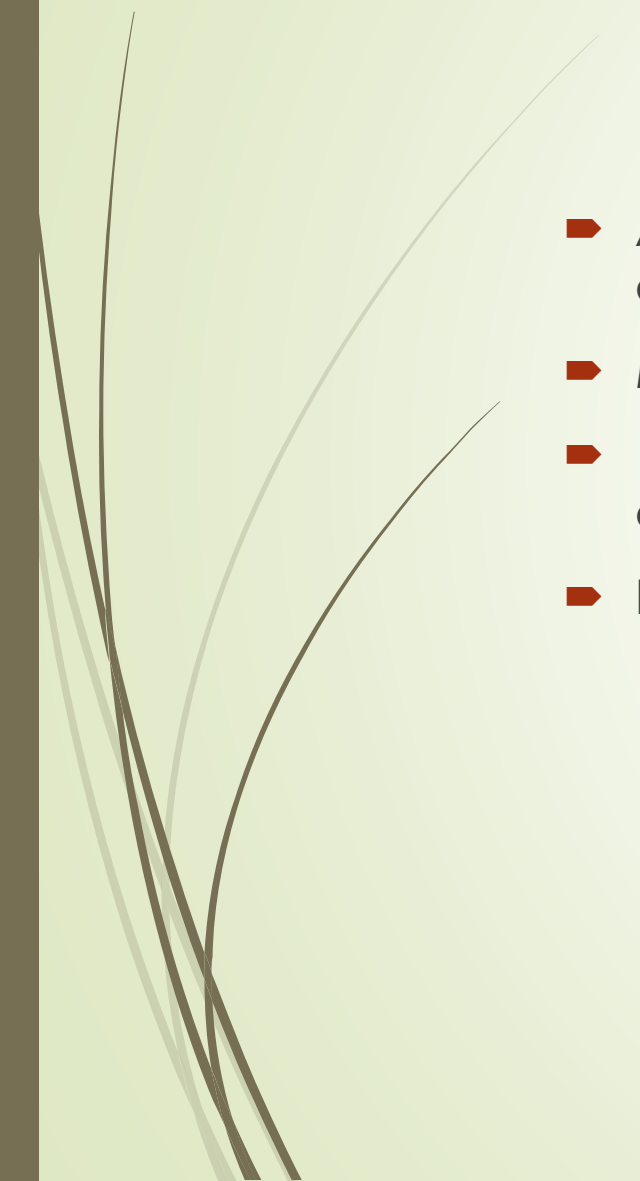
Other noninfectious causes

Early postoperative fever can also be caused by noninfectious conditions, such as

- pancreatitis
- venous thromboembolism
- alcohol withdrawal
- acute gout
- or thyrotoxicosis



Late postoperative

- After postoperative day 3, infection (surgical site, catheter-related, antibiotic-associated) is a common cause of fever.
 - Many patients have been discharged from the hospital by this time.
 - SSI is the most commonly diagnosed cause of fever after day 3 and continues to be the most common cause through postoperative day 30.
 - However, noninfectious causes do continue to occur.
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Surgical site infections (SSIs)

- SSI most often presents four days or more after surgery.
- SSIs can be classified as superficial incisional, deep incisional, or organ/space .
- The most common causative pathogens depend on the surgery performed.
For example, skin flora are most commonly found in infections after clean operations,
whereas gastrointestinal flora most commonly cause infections after operations on the gastrointestinal tract .



Surgery-specific complications

- Fever may also be related to specific complications of the surgeries performed.
As an example, patients who have gastrointestinal tract surgery may develop anastomotic leaks, which can lead to deep/organ space infections, abscesses, or fistulae.



Other infections

- Patients who require critical care after surgery are at higher risk for developing fever.
- Nosocomial infections are more common in these patients because of their treatment with invasive medical devices.

Device-related infections due to bacteria and fungi include
intravascular catheter-related infection with or without bacteremia
ventilator-associated pneumonia
urinary tract infection
acalculous cholecystitis,
and sinusitis .

- Catheter exit site infections and bacteremia associated with intravascular catheters tend to occur in the late postoperative period.
- Fever from antibiotic-associated diarrhea, typically attributed to *Clostridioides* (formerly *Clostridium*) *difficile*, also occurs more commonly during this period.



Noninfectious causes

- ▶ Noninfectious causes of fever in the late postoperative period include:
 - febrile drug reactions
 - venous thromboembolism
 - and gout.
- ▶ Febrile drug reactions are a frequent cause of late postoperative fever. Beta-lactam antibiotics and sulfa-containing products are commonly implicated, but other medications, such as H2 blockers, procainamide, phenytoin, and heparin, should be considered.
- ▶ Venous thromboembolism should be considered as a cause of fever in patients with impaired mobility, such as in patients who are debilitated from chronic medical problems, or due to injury or as a result of the surgical procedure .



Delayed postoperative

- In patients who have recovered from their initial operation, most fevers that occur after four weeks are unrelated to the surgery.
 - Some possible exceptions include delayed infections of implanted devices such as hernia mesh or orthopedic prostheses and development of delayed fistulae.
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CLINICAL EVALUATION

- The febrile postoperative patient should be evaluated systematically .

- History :

Review the medical record for a history of fever following prior surgeries

Also consider how allergies, medications, and preexisting medical conditions might contribute to the fever.



Recent medical history

➤ Review the patient record for:

Was fever present prior to surgery?

Are there symptoms or signs associated with the fever?

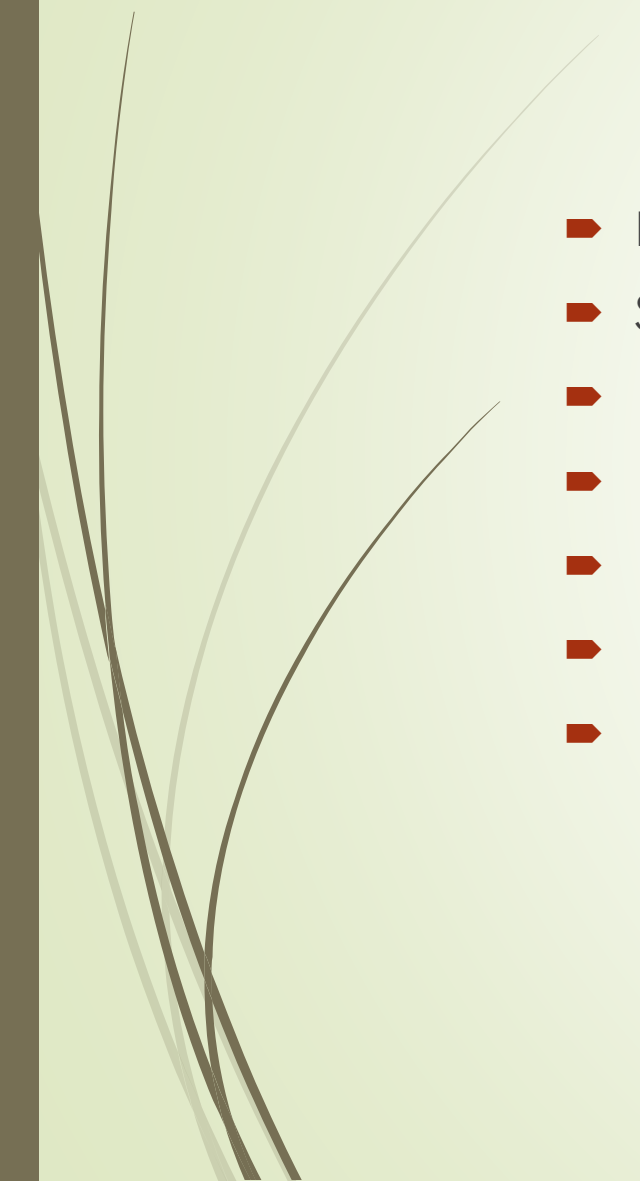
Have household contacts had fever recently?

Has the patient traveled to areas where endemic or epidemic infectious diseases occur?

Has the patient had other recent procedures or initiated new drugs prior to surgery?



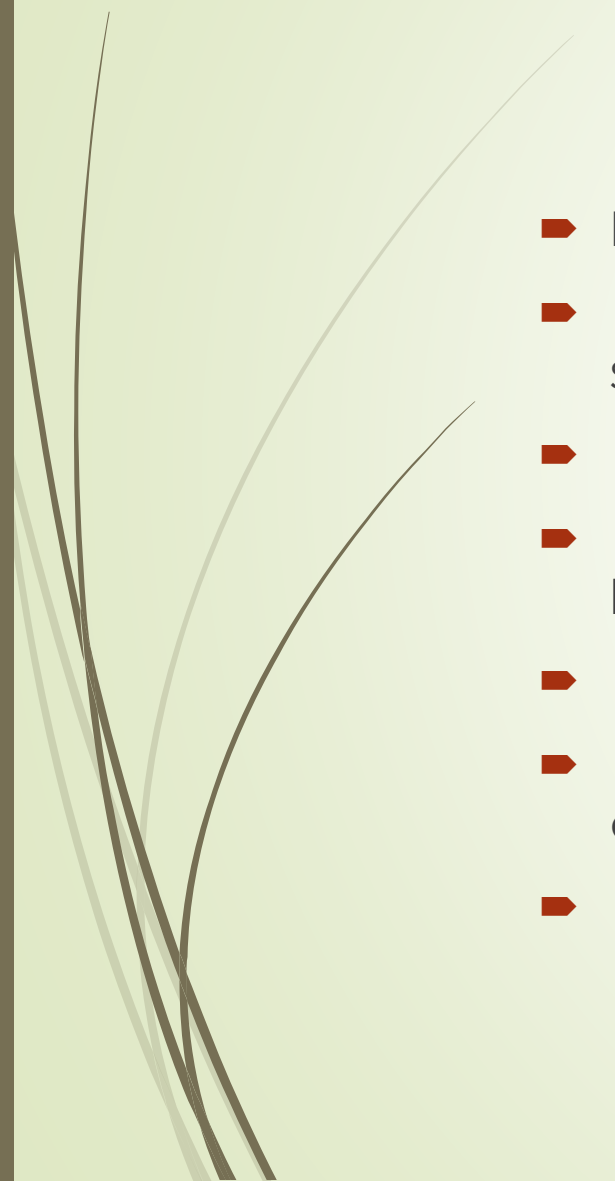
Ask the patient and nurse about

- Pain
 - Sputum production, quality, and volume
 - Presence of diarrhea
 - Urinary symptoms
 - Drainage from surgical site or around drains
 - Condition of any intravenous or bladder catheter sites
 - Skin changes (rash, purpura/bruising, erythema, and pallor)
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Physical examination

- Thorough physical examination
In particular, pay special attention to the surgical site.
(Surgical sites should always be examined, even in the immediate post-operative phase).
- Also, symptomatic nonoperative areas of the body (painful areas, for example) should be examined thoroughly.
- Review the record of the patient's vital signs, including temperature, heart rate, and respiratory rate.
Determine temperature range in the past day and peak daily temperature values during the hospital stay.
Check nurses' notes for fevers not recorded in the vital signs record and other transient patient symptoms and signs

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- Examine the skin for rash, erythema, ecchymosis, hematoma, and pallor.
 - Auscultate the lungs for crackles, wheezes, and for the absence of breath sounds in dependent and apical regions.
 - Auscultate the heart for murmurs, gallops, and rubs.
 - Evaluate the abdomen for tenderness, distention, and hyper- or hypoactive bowel sounds.
 - Examine the surgical site for erythema, swelling, tenderness, and drainage.
 - Examine catheter, tube, and drain sites for erythema, swelling, tenderness, and drainage.
 - Evaluate the extremities for edema, erythema, duskiness, and tenderness



In gynecologic patients

- inspection and palpation of the vaginal cuff for signs of induration, tenderness, or purulent drainage.

And

- A pelvic examination should be performed :
 - to identify a mass consistent with a pelvic hematoma or abscess
 - and
 - to look for signs of pelvic cellulitis



Surgical sites/tubes/drains

- The surgical site(s) should be examined. This sometimes requires a surgical team member to be present so that surgical dressings can be removed and inspection can be done together to minimize manipulation of the wound
 - Tube and drain exit sites must be similarly examined and characterized
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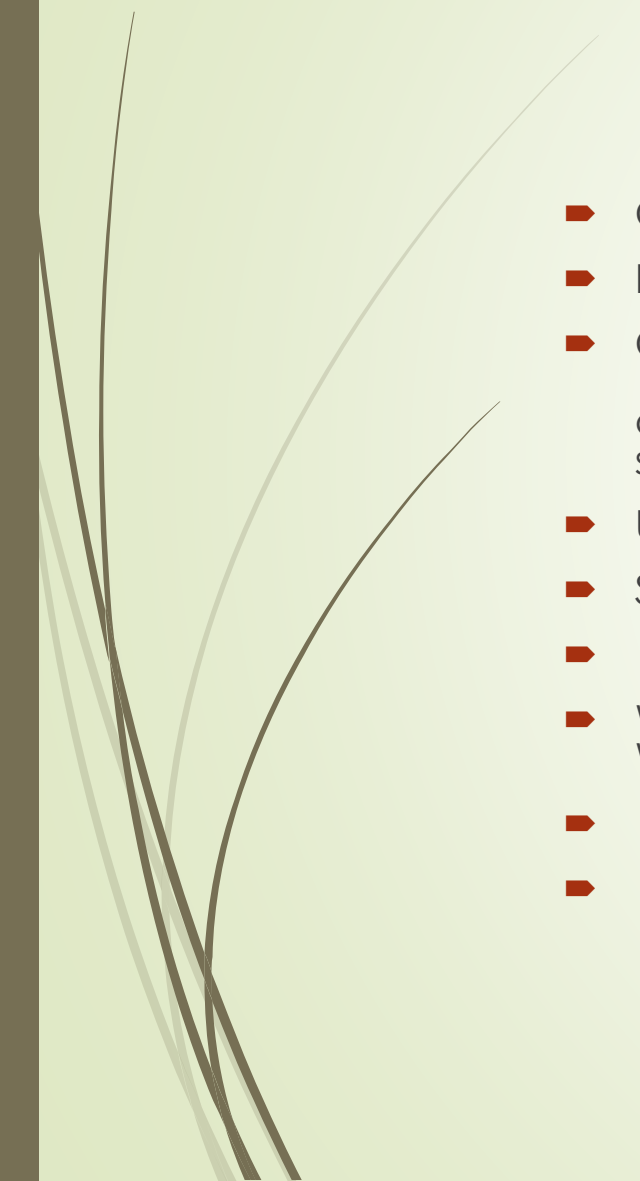


Further testing

- Fever in the first day or two after surgery usually resolves spontaneously. Additional investigation in febrile but otherwise clinically unremarkable postoperative patients is probably not indicated for most patients until the third postoperative day .
- The need for further testing should be determined based upon the results of the clinical evaluation.
- As an example, a chest radiograph may be obtained in the patient with acute respiratory complaints but is not needed in all patients with postoperative fever.
- urine culture in patients with Foley catheters, can provide misleading results and should be reserved for patients with symptoms.



Laboratories



- Comprehensive laboratory screening is not indicated for most patients.
- Laboratory testing and cultures may include:
- Complete blood count (CBC) with differential
For most patients who are being evaluated for postoperative fever, we obtain a CBC with differential white blood cell count, unless there is a likely explanation for fever and low suspicion for infection or allergic reaction.
- Urinalysis and culture.
- Sputum gram stain and culture.
- Blood culture (at least two sets from separate "sticks").
- Wound culture
Wound cultures should not be performed as a swab of the surface of the wound.
- Drains, which are potentially colonized, should not be cultured.
- Additional blood tests such as liver function tests, pancreatic enzymes



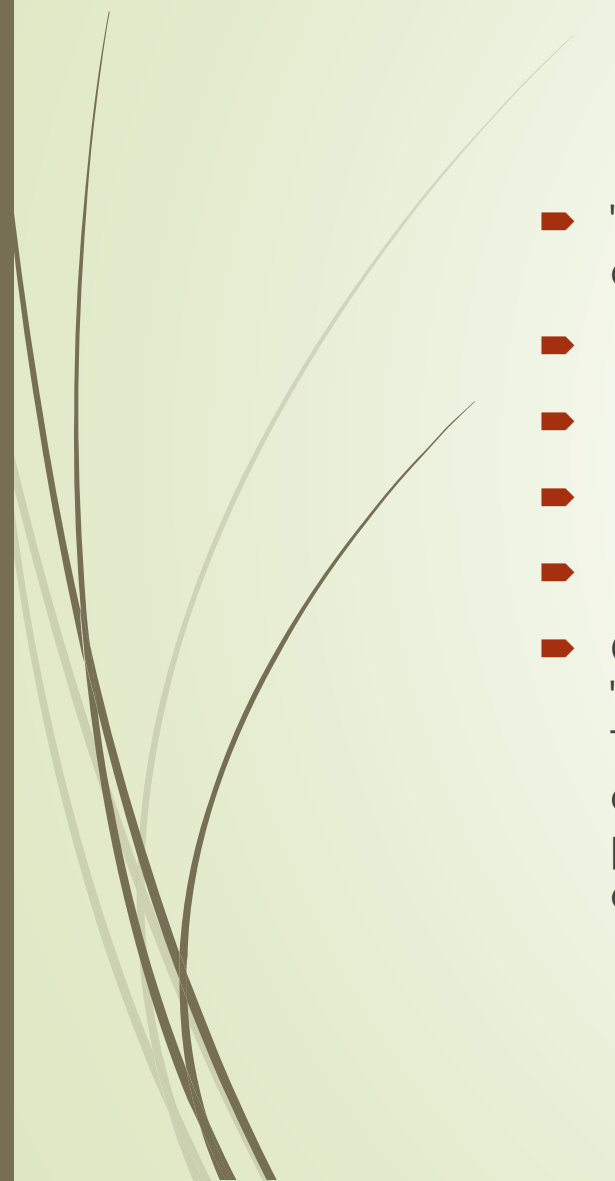
Imaging

- Lower extremity duplex ultrasound to evaluate for deep vein thrombosis
- Chest radiograph might be indicated by specific findings of pulmonary symptoms
- Thoracic/abdominal computed tomographic (CT) scanning
- Ultrasound or CT scan of the surgical site



EVALUATE FOR COMMON CAUSES

- ▶ The febrile postoperative patient should be evaluated systematically depending on the timing of fever , and the initial focus for most patients should be on a limited number of the more common possibilities suggested by the history and physical examination and the timing of fever onset.
- ▶ A useful initial screen for the more common causes of postoperative fever is represented by the following mnemonic (the 5 Ws), the order of which implies the timing of postoperative fever:

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- "Wind" refers to pulmonary causes of fever, including pneumonia, aspiration, and pulmonary embolism (but not atelectasis).
 - "Water" refers to urinary tract infection.
 - "Wound" refers to surgical site infection.
 - "Walking" refers to venous thromboembolism.
 - "Wonder drugs" refers to drug-related fever.
 - Other Ws have been proposed, including "Waves," "Wonky glands," "Withdrawal," and "What did we do?" .
These are reminders to consider cardiac and endocrine causes; alcohol and other substance withdrawal; and other treatments such as medications, blood product transfusions, and intravascular, urethral, nasal, and abdominal catheters as potential causes for a patient's postoperative fever



Atelectasis



- Atelectasis has often been used as an explanation for early postoperative fever.

Both atelectasis and fever occur frequently after surgery, but their concurrence is probably coincidental rather than causal .
Ascribing a postoperative fever to atelectasis probably provides false reassurance and may mislead the clinician from pursuing the true cause of the fever.
- The incidence of atelectasis peaks within the first couple of days after surgery.
- In some studies, there was no association between fever and the presence, or the degree, of atelectasis



Self-limited fever

- Self-limited fever is common following most major surgeries .
 - Fever-associated cytokines are released by tissue trauma and do not necessarily signal infection.
 - The magnitude of the trauma is correlated with the degree of the fever response. For example, laparoscopic cholecystectomy is associated with less tissue trauma and fewer episodes of postoperative fever than is open cholecystectomy .
 - Similarly, there is less postoperative fever when coronary artery grafting is performed without the use of a cardiopulmonary bypass pump .
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Self-limited fever

- Bacterial endotoxins and exotoxins can stimulate cytokine release and cause postoperative fever. Bacteria or fragments of bacteria translocated from the colon (eg, as a consequence of perioperative ileus or hypotension) may be responsible for some episodes of self-limited postoperative fever.
- Genetic factors may influence the magnitude of the cytokine release in response to tissue trauma and thus the magnitude of self-limited postoperative fever. For example, children with osteogenesis imperfecta undergoing orthopedic surgery appear to have a greater and more sustained febrile response than matched controls .
- Fever due to the trauma of surgery usually resolves within two to three days. The severity and duration of these self-limited postoperative fevers depends on the type of surgery but tend to be greater in patients with longer and more extensive surgical procedures .
- Fever caused by severe head trauma can be persistent and may resolve gradually over days or even weeks



Medication reaction

- Febrile drug reactions are a frequent cause of postoperative fever and may be accompanied by hypotension or rash.
- Antimicrobials and heparin are the medications most commonly associated with postoperative fever, at least in part because they are used so frequently in the postoperative period .
Beta-lactam antibiotics and sulfa-containing products are commonly implicated,
but other medications, such as H2-blockers, procainamide, phenytoin, and heparin, should be considered..
- Several medications commonly used in the postoperative period can interact with selective serotonin reuptake inhibitors or other antidepressants to precipitate fever as one manifestation of the serotonin syndrome.



Transfusion reaction

- Transfusion reactions, such as delayed serologic and hemolytic transfusion reactions, are more common in patients previously sensitized to foreign antigens through prior transfusion or multiple pregnancies .
 - Complement activation due to antibody incompatibilities can also cause acute lung injury in the syndrome of transfusion-related acute lung Injury.
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عفونت رحم بعد از سزارین

- روش زایمان مهم‌ترین عامل خطر منفرد برای پیدایش عفونت رحم است
- میزان مرگ و میر مرتبط با عفونت در موارد زایمان سزارین در مقایسه با زایمان واژینال ۲۵ برابر بیشتر است
- عوامل خطر مهم عفونت بدنال جراحی شامل: مدت طولانی لیبر، پارگی پرده ها، معاینات واژینال متعدد، پایش داخلی جنینی است
- سایر عوامل شامل: وضعیت اجتماعی اقتصادی پایین، کولونیزاسیون باکتریایی دستگاه تناسلی تحتانی، بیهوشی جنرال، چندقلویی، سن کم مادر، نولی پاریتی، چاقی، مایع امنیوتیک مکونیومی

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- ▶ تب مهمترین معیار تشخیص متريت بعد از زایمان است
 - ▶ اگر تب با مصرف انتی بیوتیک ظرف ۴۸ تا ۷۲ ساعت بهبود نیابد، بررسی دقیق از نظر علل عفونت مقاوم لگن ضروری است
 - ▶ این علل به شرح زیر هستند:
 - ▶ فلگمون پارامتری، ابرسه لگن، ابرسه محل انسیزیون شکم، هماتوم عفونی شده، ترومبوفلبیت سپتیک لگن

عفونت انسیزیون های شکمی بعد از سزارین

عوامل خطر:

چاقی، دیابت، مصرف کورتون، سرکوب ایمنی، کم خونی، فشارخون، هموستاز ضعیف همراه با تشکیل هماتوم

برای اطمینان از سالم بودن فاشیای شکمی، مشاهده دقیق آن ضرورت دارد

ابسه تخمدان بدنبال سزارین

- این ابسه ها به احتمال زیاد، در اثر تهاجم باکتریایی از طریق منفذی در کپسول تخمدان ایجاد می شوند
- ابسه معمولا یک طرفه است
- زنان مبتلا به طور تیپیک یک تا دو هفته بعد از سزارین مراجعه می کنند

فلگمون پارامتری بدنبال سزارین

- فلگمون ها معمولا یک طرفه هستند

- وجود ناحیه ای از سلولیت شدید

- به طور شایع محدود به ناحیه پارامتر در قاعده رباط پهن هستند

- اگر وواکنش التهابی شدید باشد، سلولیت گسترش میابد



■ در تعدادی از زنان سلولیت شدید انسزیون رحم در نهایت سبب نکروز و گسیختگی می شود

■ از جراحی صرفاً در زنانی استفاده می شود که در آنان بعلت وجود ایلوس و پريتونیت، نکروز محل انسیزیون رحم مورد شک است



Thank you for your attention