

Appendicitis

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THE STORY IN ONE SENTENCE

When the appendix tube gets blocked, pressure rises inside it, blood flow drops, bacteria multiply, the wall dies, and if it ruptures, germs spill into the belly.

“The appendix is a dead-end pouch off the large intestine that gets blocked, swells up, and dies from blood loss; if it bursts, bacteria flood the belly.”

Normal anatomy — the body's job

The appendix is a narrow, worm-shaped pouch three to four inches long that hangs off the cecum (the first part of the large intestine) in the lower right belly. Its wall holds immune cells like tonsils do, but it has no proven essential job in adults. The inside of the appendix is a hollow tube that opens into the cecum, and mucus normally drains from the appendix into the colon. Keep that picture in your head—a dead-end tube with one small opening—because every sign of appendicitis flows from what happens when that opening gets blocked.

BODY'S JOB

The appendix may play a minor role in immune function and gut bacteria balance in children, but you can live a normal, healthy life without it. Understanding its shape—a blind-ended tube with one exit—explains why blockage leads to such rapid, predictable trouble.

1. Picture the cecum as the first pouch of the large intestine in the lower right belly, where the small intestine dumps digested food.
2. From the bottom of the cecum, the appendix hangs down like a thin, closed finger about as long as your pinky.
3. The appendix has one small opening at the top where it connects to the cecum; mucus and bacteria normally flow out through this hole into the colon.
4. The walls of the appendix are thin and stretchy, with layers of muscle wrapped around a mucus-producing lining and packed with immune cells.

5. Blood flows in through a tiny artery called the appendiceal artery, feeds the wall, and drains out through equally thin veins.
6. If the opening at the top gets plugged—like putting a cork in a bottle—everything inside is trapped, and pressure starts to rise.

What breaks

One event—blockage of the appendix opening—triggers every downstream finding.

CLINICAL TERM

Obstruction of the appendiceal lumen (inner tube) by a fecalith (hard, stone-like stool), lymphoid hyperplasia (overgrowth of immune tissue from viral or bacterial infection), or rarely a tumor or parasites; per ACS and WSES 2020 guidelines, fecaliths account for 20–30% of cases in adults, lymphoid hyperplasia for most pediatric cases.

How the body compensates

Vital signs may stay near-normal for hours while the appendix wall dies, because the body tightens blood vessels elsewhere, raises heart rate slightly, and walls off the infection locally. This stable-looking phase is dangerous because it hides how close the patient is to rupture and sepsis. Once the appendix bursts, the window for uncomplicated recovery narrows fast.

1. Early (first 12–24 hours): heart rate and blood pressure stay normal or show only mild a fast heart rate (tachycardia) (heart rate over 100 beats per minute) as the body releases adrenaline and cortisol (the body's main stress hormone) to keep blood pressure stable and shunt blood to vital organs.
2. Middle (12–36 hours): fever may be low-grade (100–101°F) and white blood cell count rises (usually 10,000–18,000 cells/ μ L with left shift, meaning more immature white cells) as the immune system fights localized infection; the patient looks uncomfortable but not critically ill.
3. This is the dangerous middle—vital signs and general appearance can fool you while the appendix wall is dying and about to burst. Per SAGES 2020, diagnostic accuracy improves when serial exams are performed 4–6 hours apart.
4. Crash point (perforation): rupture leads to sudden worsening—high fever (over 102°F), severe belly pain spreading beyond the right lower quadrant, rigidity (board-like stiff belly from peritonitis), low blood pressure (hypotension) (low blood pressure from septic shock), and a fast heart rate (tachycardia) over 110–120 beats per minute.

5. Special populations perforate faster: young children (under 5) and older adults (over 65) have thinner appendix walls, less omentum to wall off infection, and often atypical symptoms (no classic migration of pain, vague complaints), so they reach the crash point sooner—sometimes within 24–36 hours of symptom onset. Per AAP 2022, perforation rates in children under 5 exceed 50%.
6. Pregnant patients also perforate earlier because the gravid uterus (enlarged pregnant uterus) displaces the appendix upward (often above the iliac crest by third trimester) and prevents the omentum from wrapping around it; per ACOG 2019, maternal mortality after perforation is rare but fetal loss risk rises to 20–35% if perforation and sepsis occur.
7. Always trend vital signs and pain over time—worsening a fast heart rate (tachycardia), rising fever, or spreading tenderness means you are running out of time, even if the patient looks stable right now. Per WSES 2020, time from symptom onset to surgery is the strongest modifiable predictor of perforation.
8. A patient with normal blood pressure but climbing heart rate, increasing pain, and new rigidity is not stable—they are compensating on the edge of decompensation. Rebound tenderness (Blumberg sign), involuntary guarding, and Rovsing sign (pain in right lower quadrant when you press the left side) all signal peritoneal irritation and impending or completed perforation.

Domino effect

1. Appendix lumen becomes obstructed — A fecalith (stone-like piece of stool), lymphoid hyperplasia (swollen immune tissue from a recent viral or bacterial infection like gastroenteritis), or rarely a tumor blocks the narrow opening where the appendix drains into the cecum, trapping mucus and bacteria inside the closed tube. Per ACS 2021, fecaliths are seen on CT in 20–30% of adult cases but are present histologically (under the microscope after surgery) in up to 40%.
2. Intraluminal pressure rises — Mucus-secreting cells in the appendix wall keep making mucus even after the exit is blocked, and bacteria multiply rapidly in the trapped fluid—pressure inside the tube climbs like air pumped into a closed balloon. Normal appendiceal pressure is near zero; obstruction can raise it above 60 mm Hg within hours.
3. Venous and lymphatic drainage is compressed; starved blood flow (ischemia) begins — Rising pressure squeezes thin-walled veins and lymphatic vessels in the appendix wall first (arteries have thicker, muscular walls and resist compression longer), so blood and lymph fluid cannot drain out; the wall becomes congested, swollen, and starved of oxygen (ischemia). Venous pressures are only 5–10 mm Hg, so they collapse early.

4. Vague periumbilical pain begins — Starved blood flow (Ischemia) and stretching of the appendix wall stimulate visceral pain fibers (deep, poorly localized nerve pathways from the gut supplied by sympathetic nerves traveling with the superior mesenteric artery), which the brain interprets as dull, crampy pain around the umbilicus (belly button) because the appendix and midgut share the same embryonic nerve supply (T10 dermatome).
5. Bacterial overgrowth accelerates; the wall becomes dead (necrotic) — Blood-starved (Ischemic) tissue loses its oxygen supply, so aerobic bacteria (bacteria that need oxygen) die off and anaerobic bacteria (like *Bacteroides fragilis*, *E. coli*, and *Peptostreptococcus* species) thrive, releasing toxins and enzymes (proteases, lipases) that digest the dying appendix wall from the inside. Per IDSA 2010, polymicrobial infection (multiple bacteria types) is the rule.
6. Inflammation spreads to the parietal peritoneum; pain migrates to the right lower quadrant — As the outer surface of the dead (necrotic) appendix touches the peritoneum (the sensitive lining of the belly wall), somatic pain fibers (precise, sharp nerve pathways supplied by spinal nerves T10–L1) are activated, shifting pain from vague and central to sharp and localized over McBurney point (one-third the distance from the anterior superior iliac spine to the umbilicus). This migration typically occurs 12–24 hours after symptom onset.
7. Fever, anorexia (loss of appetite), nausea, vomiting, and a high white blood cell count (leukocytosis) appear — Bacterial toxins and inflammatory cytokines (chemical messengers like interleukin-1, interleukin-6, and tumor tissue death (necrosis) factor-alpha) enter the bloodstream, triggering the hypothalamus (the brain's thermostat) to raise body temperature (fever, usually 100–102°F in uncomplicated appendicitis), suppressing appetite centers in the brain (anorexia), irritating the chemoreceptor trigger zone in the brainstem (nausea and vomiting), and stimulating the bone marrow to release more white blood cells (leukocytosis, typically 10,000–18,000 cells/μL with left shift).
8. Right lower quadrant tenderness, guarding, and rebound tenderness develop — The inflamed appendix and surrounding peritoneum are extremely sensitive; pressing on the area stretches inflamed tissue (direct tenderness at McBurney point), and belly muscles contract involuntarily to protect the area (guarding, a reflex you cannot control); releasing pressure suddenly lets inflamed peritoneum snap back, causing sharp pain (rebound tenderness or Blumberg sign). Rovsing sign (pain in the right lower quadrant when you press the left side) and psoas sign (pain when lifting the right leg against resistance, because the inflamed appendix lies on the psoas muscle) also appear.

- 9.** Perforation: the appendix wall ruptures — Tissue death (Necrosis) weakens the wall until intraluminal pressure (often exceeding 60–80 mm Hg) exceeds the wall's tensile strength; the appendix bursts, spilling fecal bacteria (10^9 – 10^{11} colony-forming units per gram of stool, mostly *E. coli* and *Bacteroides*), pus, and dead (necrotic) tissue into the peritoneal cavity. Per WSES 2020, perforation occurs in 16–40% of all appendicitis cases, with highest rates in the very young and very old.
- 10.** Peritonitis or abscess formation follows perforation — The omentum (a fatty curtain of tissue, sometimes called the 'abdominal policeman') and loops of bowel try to wall off the ruptured appendix, forming a phlegmon (inflamed mass of tissue, omentum, and bowel) or abscess (pus pocket surrounded by a fibrous capsule); if containment fails, bacteria spread throughout the belly, causing diffuse peritonitis (widespread infection of the belly lining) with board-like rigidity, high fever (often above 102°F), diffuse rebound tenderness, and septic shock (life-threatening drop in blood pressure from infection, with a fast heart rate (tachycardia) over 120, low blood pressure (hypotension) below 90 systolic, altered mental status, and lactic acidosis (acid from oxygen-starved tissues)). Per SCCM 2021 sepsis definitions, septic shock from perforated appendicitis carries 10–15% mortality if treatment is delayed.

Symptoms · what the patient feels, and why

- **Belly-button pain that moves to the lower-right side:** At first, the swollen, blocked appendix loses blood flow (ischemia — not enough blood is reaching the tissue to feed it). This pulls on deep nerves inside your belly (visceral nerves) that can't pinpoint exactly where the trouble is, so you feel dull, achy pain around your belly button. Hours later, the infection spreads to the thin lining that wraps your belly organs (the peritoneum). Now sharp-sensing surface nerves (somatic nerves) wake up and tell your brain exactly where it hurts — right over the appendix in your lower-right belly.
- **No appetite (you don't want to eat at all):** When bacteria multiply inside the blocked appendix, your immune cells release alarm chemicals called cytokines (like interleukin-1 — a messenger that tells your body infection is here). These chemicals travel through your blood to a control center in your brain (the hypothalamus — the brain's thermostat and hunger headquarters) and turn off your hunger signals. Your body does this on purpose during infection so you rest instead of using energy to digest food.
- **Feeling sick to your stomach and throwing up:** The same alarm chemicals (inflammatory mediators — infection-fighting molecules) float up to a vomit-control spot in your brainstem (the chemoreceptor trigger zone — the brain's nausea switch in the medulla) and flip it on. Also, the swollen, blocked appendix presses on nearby gut nerves (vagal fibers — the wandering nerve that connects your gut to your brain) that tell your stomach and intestines to stop moving forward and sometimes reverse — so you vomit.

- Low fever (100–101°F at first; higher if the appendix bursts): Bacteria and your immune cells dump fever-causing molecules (pyrogens — heat-makers like interleukin-1 and TNF-alpha) into your blood. These reset your brain's thermostat (in the hypothalamus) a few degrees higher, making your body warm up to slow down germs. If your temperature climbs above 102°F, it usually means the appendix has ruptured and infection is spreading everywhere (peritonitis — inflammation of the belly lining).
- Tenderness at McBurney's point (lower-right belly, about one-third the way from your hip bone to your belly button): The inflamed appendix sits right under that spot. When a doctor presses there, the pressure squeezes the swollen appendix and its irritated covering (the peritoneum — the slippery lining that wraps your belly organs), firing sharp pain signals through surface nerves (somatic nerves — nerves in the belly wall that feel touch and pain). It's the single most reliable spot to find appendix pain.
- Your belly muscles tighten up on their own when touched (guarding), or your whole belly feels rock-hard (rigidity): When the peritoneum (belly lining) gets inflamed, nerves in your spine automatically tell your abdominal muscles (the muscles in your belly wall) to contract and lock down, trying to protect the sore area — like splinting a broken bone. If your entire belly turns board-hard, it means the appendix has burst and infection is everywhere (diffuse peritonitis — inflammation spread across the whole belly lining) — a surgical emergency.
- Rebound tenderness (pain when the doctor presses slowly and then lets go suddenly — called Blumberg's sign): Pressing down slowly squashes the inflamed peritoneum (belly lining) without much movement. But when the hand lifts fast, the peritoneum springs back like a rubber band, stretching suddenly and firing a sharp burst of pain through your surface nerves (somatic nerves in the belly wall). This rebound pain tells the doctor the lining of your belly is angry and inflamed.
- Rovsing's sign (you feel pain in your lower-right belly when the doctor presses your lower-left side): Pressing the left side pushes gas and liquid through your colon (large intestine — the long tube that absorbs water and stores waste) toward the right side, where your appendix attaches. That extra pressure bumps the swollen appendix and makes it hurt — even though the doctor's hand is nowhere near the appendix. It's a clever trick to prove the appendix is the problem.
- Psoas sign (pain when you lie on your left side and straighten your right leg backward, or when the doctor lifts your right leg while you're on your back): If your appendix sits behind your cecum (the pouch at the start of your colon where the appendix attaches) and lies against a big hip-flexing muscle called the psoas, stretching that muscle by extending your hip rubs the inflamed appendix like sandpaper. The pain tells the doctor your appendix is in a retrocecal position (tucked behind the cecum instead of hanging down in front).

- Obturator sign (pain when the doctor bends your right knee and rotates your hip inward): If your appendix hangs down into your pelvis near a small hip-rotating muscle called the obturator internus, twisting that muscle stretches and irritates the appendix lying on top. The pain signals a pelvic appendix (an appendix that points downward into the pelvis), which can be trickier to diagnose because it's lower and farther from the usual spot.

Focused exam

- Pain that started near the belly button and then moved to the lower right part of the belly: Early on, the swollen appendix sends pain signals through nerves deep inside your body (visceral nerves) that talk to the middle of your spinal cord at a level called T10. Your brain reads these signals as pain in the center of your belly, right around your belly button. As the swelling spreads to the peritoneum (the thin lining that covers the inside of your belly wall), new nerves (somatic nerves) that can pinpoint location take over. Now the pain moves to the exact spot where your appendix sits—the lower right corner of your belly. This shift is one of the strongest clues that your appendix is the problem.
- Tenderness when you press on the lower right part of the belly, especially at McBurney's point (one-third of the way from your right hip bone to your belly button): McBurney's point is the spot on your skin that sits directly over the tip of your appendix. When the appendix is swollen, pressing there squeezes the inflamed tissue against your belly wall and causes pain. Tenderness at this exact spot points straight to the appendix.
- Guarding (your belly muscles tighten up on their own when the doctor presses) and rebound tenderness (it hurts more when the doctor lets go than when pushing down): Guarding is your body's automatic reflex to protect the irritated lining inside your belly—the peritoneum. Rebound tenderness (also called Blumberg's sign) means that lining is inflamed. When the doctor's hand lets go, the lining bounces back and triggers sharp pain. Both signs tell us the infection has spread beyond the appendix to the belly lining itself.
- Fever and a high white blood cell count: When the appendix gets blocked, bacteria multiply inside it and invade the dying wall. Your immune system fights back by sending white blood cells (especially neutrophils, the soldiers that eat germs) to the area and releasing chemicals called cytokines that reset the hypothalamus (your brain's temperature control center), raising your body temperature. Fever and high white count are your body's alarm bells saying an infection is underway.
- Nausea, vomiting, and loss of appetite: The appendix sits near your intestines. When it swells, it irritates nerves that control your stomach—especially the vagus nerve. These nerves slow your stomach down and activate the vomiting center in your brainstem (the lower part of your brain that controls automatic body functions like breathing and heart rate). Your body also shuts off your appetite because inflammation inside the belly tells your brain that eating is not safe right now.

- Bowel sounds are normal or only a little quieter than usual: Appendicitis is a local problem—it does not shut down your whole digestive tract the way a blockage or widespread infection would. You can still hear the normal gurgling sounds as your intestines squeeze food along. If bowel sounds disappear completely, it may mean the appendix has burst and infected the entire belly, or the intestines have stopped moving (a condition called a stalled gut (ileus)).

Diagnostics · every test answers a question

- Complete blood count (CBC) with differential → Is there a high white blood cell count, especially neutrophils (the cells that fight bacteria)?
- C-reactive protein (CRP) → Is there a blood marker that shows inflammation in the body?
- CT scan of the abdomen and pelvis with intravenous (IV) contrast → Can we see the swollen appendix and check for complications like a burst appendix or an abscess (pocket of pus)?
- Ultrasound of the right lower belly → Can we see the appendix without using radiation (important for children and pregnant patients)?
- Urinalysis → Could this be a bladder infection or kidney stone instead of appendicitis?
- Pregnancy test (beta-hCG) in all females who could be pregnant → Is the patient pregnant? Could this be a pregnancy in the wrong place (ectopic pregnancy in the fallopian tube) or another pregnancy problem?
- Basic metabolic panel (BMP) → Are the kidneys working? Are blood salts (electrolytes) out of balance from vomiting and not drinking enough water?
- Alvarado score or Pediatric Appendicitis Score (PAS) clinical decision tool → Does this patient's pattern of symptoms, exam findings, and lab results add up to appendicitis?

Treatment logic

- Make the patient NPO (nothing by mouth) and start IV fluids with normal saline or lactated Ringer's solution → NPO means no food or drink. Keeping the stomach empty lowers the risk the patient will vomit and breathe stomach contents into the lungs (aspiration), especially if surgery or a breathing tube (endotracheal intubation) is needed. IV fluids replace water and salts (sodium, chloride, potassium) lost from fever, vomiting, and not drinking, which keeps blood pressure up, blood flowing to the kidneys and brain, and urine output normal.

- Give IV antibiotics that cover gram-negative rods and anaerobic bacteria—such as ceftriaxone (a cephalosporin) plus metronidazole, or piperacillin-tazobactam alone—per Infectious Diseases Society of America (IDSA) 2010 and Surgical Infection Society 2010 guidelines → The blocked appendix fills with bacteria from the gut, mainly *Escherichia coli* (*E. coli*, a gram-negative rod that lives in the intestines) and *Bacteroides* (an anaerobic bacterium that lives in the colon and does not need oxygen). Antibiotics kill these germs, lower the total bacterial load, reduce the chance the appendix will burst, and cut the risk of infection after surgery—like wound infection, abscess inside the belly, or bloodstream infection (sepsis).
- Perform appendectomy (surgical removal of the appendix) within 12 to 24 hours, preferably by laparoscopy (using a camera and small cuts), per American College of Surgeons 2020 guidelines → Taking out the appendix removes the source of infection and stops the disease from progressing. Laparoscopic surgery uses three or four tiny incisions (each less than one centimeter) and a camera to see inside, which means less pain, less scarring, a shorter hospital stay (often same-day or one night), and faster return to normal activity than open surgery (one larger cut). Removing the appendix prevents it from bursting, forming an abscess, or causing peritonitis (infection of the whole belly lining) or sepsis (infection spreading through the bloodstream).
- Give pain medicine (such as IV acetaminophen, ketorolac, or opioids like morphine or fentanyl) and anti-nausea medicine (such as ondansetron, a serotonin blocker) → Pain medicine blocks pain signals traveling from the belly to the spinal cord and brain, making the patient comfortable. Ketorolac is an NSAID (non-steroidal anti-inflammatory drug) that blocks prostaglandins (chemicals that trigger pain and inflammation). Opioids bind to receptors in the spinal cord and brain that dampen pain signals. Anti-nausea medicine (ondansetron) blocks serotonin receptors (a type of chemical messenger) in the brainstem's vomiting center, stopping nausea and vomiting. Modern evidence (multiple randomized trials, summarized in American College of Emergency Physicians 2016 guidelines) shows that giving pain medicine does not hide exam findings or delay diagnosis—it is safe and humane.

- If the appendix has burst and formed a walled-off abscess (pocket of pus surrounded by a thick capsule), place a drain through the skin (percutaneous drainage) guided by ultrasound or CT, give antibiotics for seven to ten days, and remove the appendix six to ten weeks later (interval appendectomy)—per American College of Surgeons 2020 guidelines for complicated appendicitis → Draining the pus lowers pressure, removes infection and toxins, and controls sepsis. Antibiotics plus drainage let the inflammation cool down, the immune system wall off remaining infection, and the tissues heal enough that surgery becomes safer. Waiting six to ten weeks to remove the appendix (called interval or delayed appendectomy) lowers the chance of complications like bleeding, bowel injury, or needing a bigger incision to see through scarred, stuck-together tissue. About 70–80% of patients do well with this two-stage approach (drain-and-wait, then operate).

Medications

NPO (nothing by mouth) · Preoperative safety measure

Before surgery, your stomach must be empty. If you have food or liquid inside and you throw up while you are asleep under anesthesia, that material can slip into your lungs instead of out your mouth. Food or acid in the lungs causes a serious infection called aspiration pneumonia. Keeping your stomach empty protects your airway and lungs during the operation.

1. You stop eating and drinking several hours before surgery (usually at least 6–8 hours for solid food, 2 hours for clear liquids, per ASA guidelines).
2. Your stomach empties out so nothing remains inside.
3. During surgery, even if you gag or your stomach muscles squeeze, nothing comes up.
4. Your lungs stay clean and safe from stomach contents.

SAFETY WATCH

If you are NPO for many hours, you can become dehydrated (low on water). That is why the team gives you IV fluids at the same time. · Always tell your surgical team exactly when you last ate or drank anything—even water, gum, candy, or a sip of coffee counts.

Intravenous (IV) fluids (normal saline or lactated Ringer solution) · Crystalloid fluid replacement

When your appendix is inflamed, you often have a fever, vomit, and stop eating and drinking. All of these make you lose water from your body. Your blood volume drops—like a car running low on coolant. IV fluids are sterile salt water delivered straight into your vein. They refill your

blood vessels, keep your blood pressure steady, and make sure your organs (kidneys, brain, heart) get enough flow and oxygen to work properly.

1. A nurse places a small plastic tube (IV catheter) into a vein in your arm or hand.
2. Sterile salt water flows from a hanging bag through tubing into your vein.
3. The fluid spreads through your bloodstream within minutes.
4. Your blood volume rises, your blood pressure stabilizes, and your organs get the water and flow they need.

SAFETY WATCH

If you get too much fluid too fast, extra water can leak into your lungs and make it hard to breathe (called fluid overload). · Tell your nurse right away if the IV site becomes red, swollen, warm, or painful—that may mean the IV slipped out of place or got infected. · If you have heart failure or kidney disease, your team will adjust the rate and amount of fluid you receive.

Morphine or fentanyl · Opioid analgesic (strong pain reliever)

These drugs attach to special docking sites (called opioid receptors) on nerve cells in your spinal cord and brain. When the drug locks onto those receptors, it blocks pain signals traveling from your belly up to your brain. Your inflamed appendix still sends alarm signals, but your brain does not receive them clearly, so you feel much less pain.

1. The nurse gives the drug through your IV.
2. Within 2–5 minutes, the drug reaches your spinal cord and brain through your bloodstream.
3. Opioid molecules attach to mu (μ) opioid receptors on nerve cells.
4. Pain signals from your belly are blocked or weakened before they reach your brain.
5. You feel relief—the sharp, cramping, or throbbing pain becomes much duller.

SAFETY WATCH

Opioids slow your breathing. Nurses check your breathing rate and oxygen level often and may use a monitor on your finger (pulse oximeter). · They make you drowsy, dizzy, and sometimes confused—do not try to stand or walk alone. · They often cause nausea and constipation (hard stools). · Never mix opioids with alcohol, benzodiazepines (like diazepam), or other sedatives—combining them can stop your breathing. · Opioids are addictive with long-term use, but short-term use for severe acute pain (like appendicitis before surgery) is medically appropriate and safe.

Ondansetron (Zofran) · 5-HT₃ serotonin receptor antagonist (antiemetic, anti-nausea drug)

When your appendix is inflamed and your gut is irritated or blocked, nerve signals travel to a vomiting control center in your brainstem (called the chemoreceptor trigger zone). That center releases a chemical messenger called serotonin, specifically the 5-HT₃ type, which triggers waves of nausea and makes you vomit. Ondansetron blocks the 5-HT₃ receptors (the locks that serotonin normally opens) on nerve cells. With the locks blocked, the vomit command cannot go through, and you feel much less sick to your stomach.

1. Ondansetron is given through your IV or as a tablet that dissolves under your tongue.
2. It travels through your bloodstream to your brainstem and gut nerve endings.
3. It blocks 5-HT₃ serotonin receptors on nerve cells.
4. The nausea and vomiting signals are stopped before they make you throw up.
5. You feel calmer and can tolerate sips of water or IV fluids without feeling sick.

SAFETY WATCH

Ondansetron rarely causes a change in your heart rhythm (prolonged QT interval on EKG). Tell your doctor if you feel a racing, fluttering, or skipping heartbeat. · It may cause a mild headache or make constipation worse. · If you are allergic to ondansetron or it does not work, other anti-nausea drugs (like metoclopramide, promethazine, or prochlorperazine) can be used instead.

Ceftriaxone plus metronidazole (or piperacillin-tazobactam as a single agent) · Broad-spectrum antibiotics: third-generation cephalosporin (ceftriaxone) + nitroimidazole (metronidazole), OR extended-spectrum beta-lactam/beta-lactamase inhibitor (piperacillin-tazobactam)

Your appendix is a small pouch attached to your large intestine (colon), which is full of bacteria. When the appendix gets blocked and inflamed, bacteria multiply inside the trapped space. If the appendix wall tears open (perforates), bacteria spill into your belly and cause a dangerous infection called peritonitis. Antibiotics kill bacteria before, during, and after surgery to prevent that infection. Ceftriaxone kills many common gut bacteria like *Escherichia coli* and some *Streptococcus* species (gram-negative and some gram-positive bacteria). Metronidazole kills anaerobic bacteria (bacteria that live without oxygen, like *Bacteroides fragilis*) that thrive in the colon. Piperacillin-tazobactam is a single drug that covers both aerobic and anaerobic

bacteria at once. These antibiotics damage the bacterial cell wall—the strong outer shell that keeps bacteria alive. When the wall breaks, water rushes in, the bacteria burst, and they die.

1. Antibiotics are given through your IV about 30–60 minutes before the surgeon makes the first cut (per American College of Surgeons SCIP guidelines and WHO Surgical Safety Checklist).
2. They spread through your bloodstream to your belly, appendix, and surrounding tissue.
3. Beta-lactam antibiotics (ceftriaxone and piperacillin) enter bacterial cells and block enzymes called penicillin-binding proteins that bacteria use to build and repair their cell walls.
4. Metronidazole enters bacteria and damages their DNA, especially in anaerobes.
5. Bacterial walls weaken and break apart; the bacteria die.
6. Fewer live bacteria remain in your belly and surgical site, so the risk of postoperative infection (wound infection, abscess, or peritonitis) drops sharply.

SAFETY WATCH

Ceftriaxone and piperacillin can cause allergic reactions. Tell your doctor immediately if you have ever had hives, throat swelling, wheezing, or trouble breathing with penicillin or cephalosporin antibiotics. About 10% of people allergic to penicillin may also react to cephalosporins. · Metronidazole causes a dangerous reaction (severe flushing, vomiting, chest pain, fast heartbeat) if you drink any alcohol—avoid all alcohol while taking metronidazole and for 48 hours after your last dose. · All these antibiotics can cause diarrhea. If you develop severe, watery, or bloody diarrhea (especially with fever or belly cramps), call your doctor right away—it may be *Clostridioides difficile* infection, a serious gut infection that can follow antibiotic use. · Tell your surgical team about ALL your current medications, vitamins, and any past drug allergies before you receive antibiotics.

Red flags

- Board-hard belly everywhere (diffuse rigidity) — the appendix has burst and bacteria are spreading through your whole abdomen (diffuse peritonitis — infection all over the belly lining); you need emergency surgery right now.
- Fever above 102°F plus a racing heart (over 120 beats per minute) or low blood pressure (top number under 90) — your body is losing the fight against infection (sepsis — a whole-body response to infection that can shut down organs); you need IV fluids, powerful antibiotics, and close monitoring in the hospital, possibly the ICU.
- Your pain suddenly gets better for a few minutes, then comes roaring back worse and spreads everywhere — classic sign the appendix just popped; when it bursts, pressure drops and pain eases briefly, then bacteria flood your belly and pain explodes.

- Confusion, extreme sleepiness, or not making sense — your brain isn't getting enough oxygen or your blood is poisoned by infection (septic shock — dangerously low blood pressure from infection); life-threatening without immediate treatment.
- Pregnant beyond the first three months with right-sided or unusual belly pain — the growing uterus pushes the appendix upward and hides the usual signs; a burst appendix is more dangerous for both mom and baby, so any belly pain in pregnancy needs urgent evaluation.

Nursing priorities

1. Make the patient NPO (nothing by mouth—no food, water, gum, or ice chips) and hang a sign above the bed. — The patient will need general anesthesia for surgery within hours; food or liquid in the stomach increases the risk of aspiration (breathing vomit into the lungs) during intubation, which can cause pneumonia or death.
2. Start a large-bore IV (18-gauge or bigger) and run normal saline or lactated Ringer's solution at 125 to 150 mL per hour in adults. — Patients are usually dehydrated from vomiting and not drinking; IV fluids maintain blood pressure and organ blood flow (perfusion) (blood flow), prevent septic shock, and provide access for emergency medications and anesthesia.
3. Give IV antibiotics exactly as ordered—common regimens include ceftriaxone 1 to 2 grams plus metronidazole 500 mg, or piperacillin-tazobactam 3.375 grams—within one hour of the order. — Bacteria are multiplying inside the blocked appendix and may already be in the bloodstream; early antibiotics reduce the bacterial load, lower the risk of post-operative abscess (pus pocket), and prevent sepsis from worsening.
4. Monitor vital signs every 1 to 2 hours: temperature, heart rate, blood pressure, respiratory rate, and oxygen saturation; immediately report fever above 102°F, heart rate over 120, systolic BP under 90, or respiratory rate over 24. — These changes signal worsening sepsis or perforation (rupture); a fast heart rate (tachycardia) (fast heart) and low blood pressure (hypotension) (low BP) mean the body is losing its fight against infection and needs more aggressive fluid resuscitation and possible ICU transfer.
5. Position the patient in semi-Fowler's (head of bed up 30 to 45 degrees) with knees slightly bent, and do not palpate (press on) the abdomen repeatedly. — Flexing the knees relaxes the abdominal muscles and reduces tension on the inflamed appendix; excessive examining by touch (palpation) can theoretically rupture a swollen appendix and spread infection; semi-Fowler's helps any free fluid or pus drain into the pelvis instead of spreading upward.

6. Measure and record urine output every hour using a Foley catheter if ordered, or ask the patient to use a urinal or bedpan; report output less than 30 mL per hour (0.5 mL/kg/hour).
— Urine output reflects kidney blood flow (perfusion) (blood flow); less than 30 mL per hour means the kidneys are not getting enough blood, an early sign of septic shock or severe dehydration requiring more IV fluid or vasopressor medications (drugs that raise blood pressure).
7. Keep the patient comfortable with IV pain medication (avoid giving oral pills since the patient is NPO), but assess and document pain location and severity before and after each dose. — Uncontrolled pain causes a fast heart rate (tachycardia) and high blood pressure (hypertension), but we must reassess frequently because worsening or spreading pain may mean rupture; adequate analgesia (pain relief) also makes physical examination easier and reduces patient anxiety.
8. Prepare for surgery by ensuring informed consent is signed, removing jewelry and dentures, confirming the surgical site is marked, and checking that preoperative labs (complete blood count, basic metabolic panel) and imaging (ultrasound or CT scan) are complete and in the chart. — Appendectomy must happen quickly once the diagnosis is confirmed; delays increase perforation risk; missing consent, labs, or imaging can postpone surgery and worsen outcomes, including abscess formation or generalized peritonitis.

Sources

- World Society of Emergency Surgery (WSES) 2020 appendicitis guideline
- American College of Surgeons (ACS) clinical practice guideline for appendicitis
- American College of Emergency Physicians (ACEP) clinical policy on suspected appendicitis
- Cochrane systematic review on imaging for acute appendicitis

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