

Blood in urine

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THE STORY IN ONE SENTENCE

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“Blood in urine — sometimes you can see it, sometimes only a test finds it — but either way, you have to hunt down the cause, because it might be cancer.”

Normal anatomy — the body's job

Your kidneys filter waste out of your blood to make urine, but they keep blood cells inside the vessels so urine stays clear and blood-free.

BODY'S JOB

Each kidney has about a million tiny filters called nephrons. Each nephron has a bundle of capillaries (the glomerulus) wrapped in a cup (Bowman's capsule). Blood flows into the glomerulus under pressure, and water, salt, and waste squeeze through tiny pores into the cup, but red blood cells and big proteins are too large to fit through, so they stay in the blood. The filtered fluid travels down a long tube (the nephron tubule), where the body takes back the water and salt it needs, and the leftover waste becomes urine. That urine drains into a collecting area in the kidney (the renal pelvis), then down a muscular tube called the ureter, into the bladder (a stretchy balloon that stores urine), and finally out through the urethra when you pee. At every step — kidney filter, ureter lining, bladder wall, urethra — the lining is smooth and the blood vessels are sealed tight, so no blood leaks into the urine stream.

1. Blood enters the kidney through the renal artery, carrying oxygen, nutrients, salt, and waste all mixed together.
2. Inside each nephron, blood flows into the glomerulus, a tight knot of capillaries that acts like a sieve.
3. Water, salt, sugar, and waste squeeze through tiny pores in the capillary walls into Bowman's capsule, but red blood cells and large proteins are too big to pass, so they stay in the bloodstream.

4. The filtered fluid flows down the nephron tubule, and the body reabsorbs most of the water and salt back into nearby capillaries, leaving concentrated waste behind.
5. The leftover waste (now called urine) drips into the renal pelvis, a funnel at the center of the kidney.
6. Urine flows down the ureter, a muscular tube that uses squeezing waves to push urine toward the bladder.
7. The bladder stores urine until you decide to pee, then squeezes it out through the urethra, a tube that opens to the outside.
8. Because every wall and vessel lining is intact, no blood mixes with the urine, so urine stays clear yellow with no red or brown color.

What breaks

Blood shows up in urine when something breaks the seal between blood vessels and the urine stream, or when the kidney filter itself gets leaky and lets blood cells slip through.

CLINICAL TERM

Blood in the urine (Hematuria) (blood in the urine) happens when red blood cells cross from the bloodstream into the urinary tract. The break can occur at the glomerulus (glomerulonephritis, thin basement membrane disease, or polycystic kidney disease makes the filter pores too large or the walls too fragile), in the kidney tissue (pyelonephritis or kidney tissue death from blocked blood flow (infarction) damages vessels), in the renal pelvis or ureter (a kidney stone scrapes the lining, or a tumor bleeds as it grows), in the bladder (cystitis from infection or interstitial cystitis inflames and erodes the wall; bladder cancer grows new fragile vessels that bleed easily), in the prostate (benign prostatic hyperplasia squeezes the urethra and causes small tears; prostate cancer invades nearby tissue), or in the urethra (trauma, catheter injury, or urethritis). Systemic causes include impaired blood clotting (coagulopathy) (blood thinners like warfarin, aspirin, or direct oral anticoagulants reduce clotting so any tiny break bleeds visibly), a low platelet count (thrombocytopenia) (low platelets from bone marrow disease or immune destruction), sickle cell disease or trait (sickled red cells clog small kidney vessels and cause infarcts that bleed), strenuous exercise (temporary glomerular microtrauma from sustained high cardiac output, called exercise-induced blood in the urine), or recent procedures (kidney biopsy, lithotripsy, or catheterization create small wounds that bleed for days). The downstream signal is visible blood (gross blood in the urine, when urine looks pink, red, tea-colored, or cola-colored) or microscopic blood in the urine (urine looks normal but dipstick or microscopy finds ≥ 3 red blood cells per high-power field). Painless visible blood in the urine, especially in adults over 35, raises concern for bladder or kidney cancer until proven otherwise. Painful blood in the urine with burning with urination (dysuria) and frequency suggests infection or stone.

How the body compensates

The body does not have a direct way to stop blood from leaking into urine, so it keeps making urine and pushing it out, hoping the broken vessel will clot on its own. Vital signs can stay normal for days while the bleeding continues, which is why you cannot rely on symptoms alone to tell you how serious it is.

1. {'what': 'The kidneys keep filtering and making urine even while blood is leaking into it, because stopping urine production would cause waste and toxins to build up in the blood.', 'why': 'This means the bleeding can go on for days or weeks, especially if it is slow or intermittent, and the person may feel fine the whole time, which is why painless blood in the urine (hematuria) is so dangerous — there are no alarms going off, but cancer might be growing silently.'}

2. {'what': 'The liver makes clotting factors and platelets travel to any torn vessel and try to form a plug, so small breaks (like a scraped bladder lining from infection or a tiny tear from a blood thinner) often stop bleeding on their own within hours to days.', 'why': 'This is why blood in the urine (hematuria) from infection or stone usually clears up once the infection is treated or the stone passes — the body repairs the tear. But if the bleeding keeps coming back, or if it never stops, it means the break is too big to seal (like a tumor that keeps growing new fragile vessels) or the blood is too thin to clot (blood thinner overdose, clotting disorder).'} }
3. {'what': 'The bladder can hold a lot of blood mixed with urine before it becomes a problem, because blood is liquid and drains out when you pee.', 'why': 'But if bleeding is heavy and fast, clots can form in the bladder (clot retention), blocking the urethra and making it impossible to pee (acute urinary retention), which is a medical emergency that needs a catheter or sometimes surgery to wash the clots out.'} }
4. {'what': 'The bone marrow steps up red blood cell production if bleeding is ongoing, releasing reticulocytes (young red cells) to replace the ones lost in the urine.', 'why': 'This compensation works if the bleeding is slow, but if it is heavy or chronic, the person becomes anemic (low red blood cell count), feeling tired, weak, dizzy, and short of breath, and the skin and inside of the eyelids look pale. A CBC (complete blood count) shows low hemoglobin and hematocrit, and a high reticulocyte count tells you the marrow is trying to keep up.'} }
5. {'what': 'The body tries to keep blood pressure steady by squeezing blood vessels (vasoconstriction) and holding onto salt and water (the kidneys release renin, which triggers aldosterone, which tells the kidney tubules to reabsorb sodium and water).', 'why': 'This keeps the vital signs looking okay even if the person is losing blood, which is the dangerous middle — they seem stable, but they are on a downhill slope. Once compensation fails, blood pressure drops suddenly (hypotension, shock), and the window to reverse it narrows fast.'} }
6. {'what': 'If blood in the urine (hematuria) is from a blocked ureter (stone or tumor), the kidney upstream swells with trapped urine (hydronephrosis), and pressure builds inside the kidney.', 'why': 'At first, the other kidney compensates by filtering more, so total urine output stays normal and creatinine (kidney function test) stays normal. But if both kidneys are blocked, or if the one working kidney fails, waste builds up in the blood (azotemia, severe waste buildup in the blood (uremia)), causing nausea, confusion, and eventually seizures or coma if untreated.'} }

7. {'what': 'The crash point to watch for is uncontrolled bleeding causing clot retention (cannot pee, bladder painfully distended), severe anemia (hemoglobin drops below 7 g/dL, heart struggles to deliver oxygen), obstructive pyelonephritis (infected urine trapped upstream of a stone, leading to sepsis), or missed cancer that spreads (metastasizes) while the team thinks it is just a simple infection or stone.', 'why': 'Once bleeding becomes severe enough to cause shock or clots block the bladder, or once cancer spreads beyond the bladder or kidney, the treatment options narrow and the chance of full recovery drops. That is why every case of blood in the urine (hematuria) — visible or microscopic, painful or painless — needs a clear diagnosis before assuming it is benign.'}

Domino effect

1. Blood appears in the urine, either visible to the eye (gross blood in the urine (hematuria), making urine pink, red, tea-colored, or brown) or found on dipstick or microscopy (microscopic blood in the urine, ≥ 3 red blood cells per high-power field). — The kidney filter normally keeps red blood cells locked inside blood vessels, so when they show up in urine, it means something upstream is broken — a torn lining (stone, infection, trauma), a leaky filter (kidney disease), a bleeding tumor (cancer), or blood that is too thin to clot (blood thinner, clotting disorder). The kidneys keep making urine and flushing the blood out, so the visible sign is the urine itself changing color or the lab finding cells that should not be there.
2. The amount, color, timing, and associated symptoms give the first clues about where the break is and how serious it is. — Bright red blood or clots suggest bleeding close to the bladder or urethra (because the blood has not had time to mix with urine and change color). Tea-colored or cola-colored urine suggests the blood came from higher up (kidney), where it mixed with acidic urine and turned brown. Painless visible blood, especially if it comes and goes over weeks, is the hallmark of bladder or kidney cancer. Blood plus sudden severe flank pain radiating to the groin means kidney stone. Blood plus burning, frequency, fever, and cloudy urine means infection. Blood in someone on warfarin or aspirin, with no pain, might be from the medicine, but it still needs full work-up because the blood thinner may have simply unmasked a tumor that was bleeding too little to notice before.

3. Initial testing confirms blood in the urine (hematuria) is real (not a false positive from myoglobin, hemoglobin, or menses contaminating the sample) and starts to narrow the cause: urinalysis with microscopy, urine culture if infection is suspected, and often imaging (ultrasound, CT scan, or CT urogram). — Dipstick can be positive from free hemoglobin (muscle breakdown, transfusion reaction) or myoglobin (rhabdomyolysis from crushed muscle), so microscopy is needed to actually see intact red blood cells and confirm it is true blood in the urine (hematuria). Dysmorphic red cells and red cell casts point to glomerular disease (kidney filter break). Normal-shaped red cells point to bleeding somewhere in the urinary tract (bladder, ureter, kidney pelvis, urethra). White cells plus bacteria plus nitrites suggest infection; urine culture grows the germ and guides antibiotic choice. CT scan without contrast finds kidney stones. CT urogram (CT with IV contrast plus delayed images) lights up the kidneys, ureters, and bladder to look for tumors, blockages, or structural problems.
4. If initial work-up does not find infection, stone, or obvious trauma, the next step is cystoscopy (a flexible camera passed through the urethra into the bladder) to look directly at the bladder lining for tumors, inflammation, or other lesions. — Imaging can miss small bladder tumors, especially flat ones (carcinoma in situ), so cystoscopy is the gold standard for ruling out bladder cancer in anyone with unexplained blood in the urine (hematuria), especially adults over 35, smokers, or anyone with occupational exposure to chemicals (dyes, rubber, leather industries are bladder cancer risk factors). If cystoscopy and imaging are both normal, and there are no casts or protein in the urine to suggest glomerular disease, the blood in the urine may be labeled with no known cause (idiopathic) (no cause found), but these patients still need repeat urinalysis every 6–12 months, because small cancers can take time to grow large enough to see.
5. If glomerular disease is suspected (dysmorphic red cells, red cell casts, proteinuria, high blood pressure, or low kidney function), referral to a nephrologist and possibly kidney biopsy is needed to diagnose the specific type of kidney disease. — Glomerulonephritis can be from post-infectious causes (usually resolves on its own), IgA nephropathy (needs monitoring and sometimes immunosuppression), lupus (needs steroids and immunosuppression), or Alport syndrome (genetic, no cure but needs monitoring for hearing loss and eye problems). A kidney biopsy takes a tiny core of kidney tissue with a needle and looks at it under a microscope (including immunofluorescence and electron microscopy) to see exactly what is attacking the filter, which guides treatment and predicts prognosis.

6. Treatment depends entirely on the cause: antibiotics for infection, fluids and pain control for stone (plus lithotripsy or ureteroscopy if the stone is too large to pass), stopping or adjusting the dose of blood thinners if they are the culprit (but still complete the cancer work-up), surgery or immunotherapy for cancer, and monitoring or immunosuppression for glomerular disease. — You cannot treat what you have not diagnosed, and treating the wrong thing wastes time and lets the real problem get worse. For example, giving antibiotics for blood in the urine (hematuria) from bladder cancer does nothing to stop the tumor and delays the surgery that could cure it. Stopping a blood thinner because of blood in the urine without looking for cancer means you might miss a tumor, and restarting the blood thinner later makes it bleed again, and now it is bigger and harder to cure.
7. The most critical risk is missing bladder or kidney cancer, because painless gross blood in the urine (hematuria) is often the only early symptom, and early-stage cancer is curable with surgery, but once it spreads to lymph nodes, bones, liver, or lungs, it is much harder to treat and survival drops sharply. — Bladder cancer (especially transitional cell carcinoma) is the fourth most common cancer in men, and smoking, age over 50, and chemical exposure are the biggest risk factors. Kidney cancer (renal cell carcinoma) often shows no symptoms until it is large or has spread, but blood in the urine (hematuria) is one of the earliest signs. That is why guidelines say that any adult over 35 with unexplained blood in the urine (even one episode, even if it goes away) needs cystoscopy and imaging, because waiting to see if it happens again gives cancer time to grow and spread.
8. Even after the cause is found and treated, follow-up is essential: repeat urinalysis to confirm the blood is gone, repeat imaging if there was a tumor or stone to make sure it has not come back, and long-term monitoring for people with with no known cause (idiopathic) blood in the urine (hematuria) or a history of bladder cancer (because bladder cancer recurs in up to 50% of cases, so surveillance cystoscopy every 3–6 months for years is standard). — Blood in the urine (Hematuria) that clears up completely and stays gone is reassuring, but blood in the urine that comes back, or blood in the urine that never fully resolves, means the underlying problem is still there or has returned, and it needs to be investigated again. The goal is not just to stop the bleeding, but to find and fix the broken part before it causes permanent damage or spreads beyond the point where it can be cured.

Symptoms · what the patient feels, and why

- Blood you can see in the urine (urine looks pink, red, or cola-colored): Red blood cells leak from somewhere along the urinary tract—kidneys, ureters (tubes from kidneys to bladder), bladder, or urethra (tube out)—and mix into the urine, making it visibly colored.
- Blood you cannot see (found only on a urine test): Small numbers of red blood cells leak into urine but not enough to change the color; a dipstick or microscope picks them up during routine testing.

- Pain or burning when you pee: Inflamed or irritated lining of the bladder or urethra (often from infection or a stone scraping the wall) sends pain signals when urine touches it.
- Needing to pee often or urgently: Irritation or inflammation in the bladder makes the bladder wall twitchy and triggers the urge signal even when the bladder isn't full.
- Pain in the side or lower back (flank pain): A kidney stone blocking the ureter or kidney inflammation (glomerulonephritis) stretches the kidney capsule (the thin outer shell), which has pain nerves; you feel it as a steady or sharp ache in your side or back.
- Fever and chills: Infection (such as pyelonephritis—kidney infection) triggers the immune system to release cytokines (alarm proteins) that reset the body's thermostat in the hypothalamus (the brain's temperature-control center) higher, causing fever and shaking chills.
- Swelling in the legs, ankles, or around the eyes: Damaged glomeruli (tiny kidney filters) leak protein into urine; losing protein drops the blood's ability to hold water inside vessels, so fluid seeps into tissues and pools in gravity-dependent areas (legs) and loose tissue (around eyes).
- Trouble peeing or a weak stream (mostly in older men): An enlarged prostate squeezes the urethra where it leaves the bladder, narrowing the channel; urine has to push harder to get through, so the stream becomes weak or stops and starts.

Focused exam

- Look at the urine or check the urinalysis report for red blood cells: Blood in the urine (hematuria) means something in the urinary tract is bleeding—kidney, ureter, bladder, or urethra. The job is to find which part is broken and why, especially to catch cancer early.
- Ask: Can you see the blood with your eyes, or was it only found on a urine test? How long has it been happening?: Blood you can see (gross blood in the urine (hematuria)) or blood that keeps showing up test after test raises the chance of bladder cancer or kidney cancer. Painless blood that won't go away is a red flag—do not assume it is harmless.
- Ask about smoking, age over 35, jobs with chemicals (dyes, rubber, paint), and family history of kidney or bladder cancer: These are the biggest risk factors for bladder cancer and kidney cancer. Smoking is the number-one cause of bladder cancer. Knowing these helps you decide how hard to search for cancer.
- Ask: Do you have pain when you pee, pain in your side or back, fever, or a recent injury?: Pain with urination plus fever often means a urinary tract infection. Sharp side or back pain usually points to a kidney stone cutting the lining as it moves down. Painless blood is more worrying for cancer because tumors bleed quietly.

- In men, feel for an enlarged prostate during rectal exam; press gently over the kidneys in the back to check for tenderness: An enlarged prostate can bleed into the urine. Kidney tenderness suggests kidney infection (pyelonephritis) or a stone stuck in the kidney. These findings help narrow which part of the urinary tract is the source.
- Ask: Are you taking blood thinner medicine like warfarin, apixaban, rivaroxaban, or daily aspirin?: Blood thinners can cause blood in the urine (hematuria) by making it easier for blood to leak into the urine. But blood thinners do NOT protect you from cancer—you still must rule out bladder and kidney cancer even if the patient is on a blood thinner.

Diagnostics · every test answers a question

- Urinalysis with microscopy → Is there really blood in the urine, and are there other clues like bacteria, white blood cells, protein, or casts?
- Urine culture → Is a bacterial infection causing the bleeding?
- Serum creatinine and estimated glomerular filtration rate (eGFR) → Are the kidneys filtering properly, or is kidney disease part of the picture?
- Non-contrast CT scan of the abdomen and pelvis (CT KUB, kidney-ureter-bladder protocol) → Is there a kidney stone blocking or cutting the urinary tract?
- CT urogram (CT with intravenous contrast during kidney-filling phase) or renal ultrasound with bladder scan → Is there a tumor in the kidney, ureter, or bladder? Are the kidney and collecting system normal in shape?
- Cystoscopy (flexible camera passed through the urethra into the bladder) → Is there a tumor, polyp, or bleeding site inside the bladder that imaging missed?
- Urine cytology (looking at urine cells under the microscope for cancer) → Are there cancer cells shedding into the urine from the bladder or upper urinary tract?

Treatment logic

- Treat confirmed urinary tract infection with antibiotics (e.g., nitrofurantoin 100 mg twice daily for 5 days, or ciprofloxacin 500 mg twice daily for 7 days if pyelonephritis) → Kills the bacteria (usually *E. coli*) infecting the bladder or kidney lining. Stops the inflammation and lets the tissue heal so bleeding stops. Blood in the urine (Hematuria) from infection should clear within a few days of starting the antibiotic.
- Pain control and hydration for small kidney stones (<5 mm); plan ureteroscopy or lithotripsy for larger or stuck stones → Helps the stone pass naturally by keeping urine flowing. NSAIDs (like ibuprofen or ketorolac) ease the pain from the ureter spasming around the stone. Once the stone passes or is removed, the bleeding stops because the lining is no longer being cut.

- Adjust or temporarily hold blood thinner (warfarin, apixaban, rivaroxaban, dabigatran) in consultation with the prescribing doctor → Lowers how easily blood leaks through small breaks in the urinary tract lining. Lets minor bleeding stop. Must balance against the risk of stroke or clot if the blood thinner is stopped.
- Refer to urology for cystoscopy and possible biopsy in high-risk patients (age ≥ 35 , smoking history, occupational chemical exposure, gross blood in the urine (hematuria), or microscopic blood in the urine that persists) → Catches bladder cancer, kidney cancer, or upper-tract urothelial cancer early, when cure is still possible. Cystoscopy is the only way to see inside the bladder directly and biopsy suspicious areas. Early-stage bladder cancer (Ta, Tis, T1) has a 5-year survival over 90% if treated promptly.
- Nephrology referral if there are signs of glomerular disease (red cell casts, proteinuria >500 mg/day, low eGFR, high blood pressure) → Identifies and treats inflammatory kidney diseases like IgA nephropathy, lupus nephritis, or post-infectious glomerulonephritis. May start immunosuppression (steroids, cyclophosphamide) if biopsy confirms active inflammation, which can slow kidney damage.
- Transurethral resection of bladder tumor (TURBT) if bladder cancer is found, followed by intravesical chemotherapy or immunotherapy (BCG) for high-grade or recurrent tumors → Removes the tumor from the bladder wall. Intravesical BCG (a live weakened tuberculosis vaccine instilled into the bladder) trains the immune system to attack leftover cancer cells and lowers the chance the cancer comes back.
- Partial or radical nephrectomy (kidney removal) for localized renal cell carcinoma; targeted therapy (sunitinib, pazopanib) or immunotherapy (nivolumab, pembrolizumab) for metastatic disease → Surgery removes the kidney tumor before it spreads. For cancer that has already spread, targeted therapy blocks signals that feed the tumor's blood supply, and immunotherapy helps the body's T cells recognize and kill cancer cells. Median survival for metastatic renal cell carcinoma has doubled with modern combination immunotherapy.

Medications

Trimethoprim-sulfamethoxazole (TMP-SMX) or nitrofurantoin · Antibiotic

These pills kill the bacteria that invaded the bladder or kidney and caused the infection (and the blood). TMP-SMX stops bacteria from building the parts they need to multiply.

Nitrofurantoin damages bacterial DNA so the germs die. Once the infection clears, the inflammation settles and the bleeding stops.

1. The antibiotic travels through your blood to the kidneys.
2. Your kidneys filter it into the urine, so it reaches very high levels in the bladder.
3. The medicine kills the bacteria causing the infection.
4. The lining of the bladder or kidney heals, and bleeding stops.

SAFETY WATCH

TMP-SMX can cause allergic rash (especially if you are allergic to sulfa drugs). · Nitrofurantoin should not be used if kidney function is very low (it will not work and may hurt the lungs). · Always finish the full course (usually 3-7 days) even if you feel better, so the infection does not come back.

Tamsulosin (Flomax) · Alpha-blocker

Relaxes the smooth muscle in the prostate and bladder neck so urine can flow more easily. When the prostate is enlarged it squeezes the urethra (the tube that drains urine), causing strain and sometimes bleeding. Tamsulosin opens that bottleneck. It also helps small kidney stones pass by relaxing the ureter (the tube from kidney to bladder).

1. Tamsulosin blocks alpha-1A receptors (switches on smooth muscle cells).
2. The muscle around the prostate and bladder neck relaxes.
3. Urine flows more freely, reducing pressure and irritation.
4. If a small stone is present, the relaxed ureter lets it slide down more easily.

SAFETY WATCH

Can cause dizziness or lightheadedness, especially when you stand up quickly. · May cause a stuffy nose. · Rarely causes a painful, lasting erection; get help right away if that happens.

Potassium citrate · Urinary alkalinizer

Makes the urine less acidic (more alkaline), which helps dissolve certain types of kidney stones (uric acid and cystine stones) and prevents new ones from forming. When stones shrink or stop forming, the sharp edges that scrape the kidney or ureter and cause bleeding go away.

1. You swallow the potassium citrate pill or powder.
2. It is absorbed in your intestine and travels to the kidneys.
3. The kidneys put citrate and bicarbonate into the urine, raising the pH (making it less acidic).
4. Uric acid and cystine stones dissolve more easily in alkaline urine, and calcium stones are less likely to form.

SAFETY WATCH

Can raise potassium levels in the blood; dangerous if you have kidney disease or take ACE inhibitors or ARBs. · May cause stomach upset or nausea. · Check potassium blood levels regularly if your kidneys do not work well.

Tranexamic acid · Antifibrinolytic

Stops the body from dissolving blood clots too quickly. Normally, after a clot forms to plug a bleeding spot, the body slowly breaks it down with an enzyme called plasmin. Tranexamic acid blocks plasmin, so clots stay in place longer and bleeding stops. Used for severe or persistent blood in urine when other treatments have not worked.

1. Tranexamic acid binds to plasminogen (the inactive form of plasmin).
2. This stops plasminogen from turning into plasmin.
3. Without plasmin, the clot that is plugging the bleeding vessel stays put.
4. The bleeding slows and eventually stops.

SAFETY WATCH

Can increase the risk of dangerous clots in the legs (deep vein clot formation (thrombosis)) or lungs (pulmonary a traveling clot lodging in a vessel (embolism)), especially in people who already have clotting problems. · Should not be used if you have blood clots or a history of stroke. · May cause nausea or diarrhea.

Cisplatin-based chemotherapy (e.g., cisplatin + gemcitabine) · Chemotherapy

Damages the DNA inside cancer cells so they cannot divide and grow. Cisplatin sticks to DNA and twists it; gemcitabine blocks the building blocks needed to copy DNA. Together they kill bladder, kidney, or urothelial (urinary-tract-lining) cancer cells that are causing bleeding. Used for muscle-invasive bladder cancer or advanced kidney cancer.

1. Cisplatin enters cancer cells and binds to DNA, creating crosslinks that stop the cell from reading its genetic instructions.
2. Gemcitabine gets built into new DNA strands as the cancer cell tries to divide, then stops the copying process.
3. The cancer cell cannot repair the damage and dies (apoptosis).
4. The tumor shrinks, blood vessels inside it close, and bleeding stops.

SAFETY WATCH

Cisplatin can damage kidneys; drink lots of fluids before and after each dose, and your doctor will check kidney function regularly. · Can cause severe nausea and vomiting; you will get anti-nausea medicine. · Lowers white blood cells (raising infection risk), red cells (anemia), and platelets (bleeding risk). · May damage hearing (especially high-pitched sounds) and nerves in hands and feet (numbness, tingling). · Gemcitabine can cause flu-like symptoms and rash.

BCG (Bacillus Calmette-Guérin) intravesical therapy · Immunotherapy (live attenuated bacteria)

A weakened live tuberculosis bacterium placed directly into the bladder through a catheter. It wakes up the immune system inside the bladder lining, causing inflammation that kills early-stage bladder cancer cells. Used after surgery to remove non-muscle-invasive bladder cancer, to prevent it from coming back.

1. A nurse places a catheter (thin tube) through the urethra into the bladder and instills liquid BCG.
2. You hold the liquid in your bladder for about two hours, rolling side to side to coat the whole lining.
3. The BCG bacteria stick to the bladder wall and trigger a strong immune response.
4. White blood cells (T cells, macrophages) flood the area, killing both BCG and any remaining cancer cells.
5. The inflammation scars the bladder lining slightly, making it harder for cancer to grow back.

SAFETY WATCH

Causes bladder irritation: burning, frequent urination, and blood in urine for a few days after each treatment. · Rarely, BCG can enter the bloodstream and cause BCG sepsis (a severe infection with fever, low blood pressure, and confusion); get help immediately if you develop high fever or feel very sick after treatment. · Do not use if you have a weakened immune system (HIV, organ transplant, chemotherapy). · Men should wear a condom during sex for one week after each treatment to avoid passing BCG to a partner.

Warfarin dose adjustment or vitamin K · Anticoagulant reversal / adjustment

Warfarin is a blood thinner that blocks vitamin K, which the liver needs to make clotting proteins. Too much warfarin means the blood is too thin, and even tiny breaks in blood vessels (in the bladder, kidney, or anywhere) bleed more than normal. Lowering the warfarin dose or giving vitamin K helps the liver make clotting factors again, so bleeding stops. Used when blood in urine is caused by over-anticoagulation.

1. Vitamin K enters the liver and reactivates the enzyme that recycles vitamin K.
2. The liver uses vitamin K to finish building clotting factors.
3. Clotting factors are released into the blood.
4. The blood clots normally again, and bleeding (including in urine) stops.

SAFETY WATCH

Giving too much vitamin K can make warfarin stop working for days, raising the risk of stroke or clot if the patient needs anticoagulation. · Must balance bleeding risk against clotting risk (e.g., heart valve, atrial fibrillation (an irregular, quivering heartbeat)). · Check INR (a blood test measuring how thin the blood is) frequently during adjustment. · If bleeding is severe, may need fresh frozen plasma or prothrombin complex concentrate (faster reversal).

ACE inhibitor (e.g., lisinopril) or ARB (e.g., losartan) · Renin-angiotensin-aldosterone system (RAAS) blocker

Lowers pressure inside the glomeruli (the tiny filters in the kidneys). High pressure stretches and damages the filter, causing protein and red blood cells to leak into the urine. ACE inhibitors block the enzyme that makes angiotensin II (a hormone that squeezes blood vessels). ARBs block the receptor where angiotensin II works. Either way, the blood vessels relax, pressure drops, and the filter leaks less. Used for blood in urine caused by chronic kidney disease (especially from diabetes or high blood pressure).

1. You swallow the pill; it is absorbed into your bloodstream.
2. The drug blocks angiotensin II from squeezing the blood vessels.
3. The efferent arteriole (the exit pipe from the glomerulus) relaxes more than the afferent arteriole (the entrance pipe).
4. Pressure inside the glomerulus drops.
5. The filter is less stretched and leaks fewer red cells and protein into the urine.

SAFETY WATCH

Can raise potassium levels (hyperkalemia); dangerous if you also take potassium supplements or potassium-sparing diuretics. · May cause a dry cough (ACE inhibitors more than ARBs). · Can slightly worsen kidney function at first; your doctor will check creatinine and potassium one to two weeks after starting. · Rarely causes angioedema (sudden swelling of face, lips, tongue, throat)—stop the drug and get emergency help if this happens. · Do not use during pregnancy (causes severe birth defects).

Red flags

- Visible blood in urine plus fever, severe back or side pain, or shaking chills (may mean kidney infection or blockage)
- Blood in urine plus sudden weakness, dizziness, very pale skin, or fast heart rate (may mean serious bleeding inside)

- New swelling in legs or face along with blood in urine (may mean kidney damage letting protein leak out)
- Blood in urine in someone over 35, especially if they smoke or have smoked, work with chemicals (dyes, rubber, leather), or have lost weight without trying (raises concern for bladder or kidney cancer)

Nursing priorities

1. Check vital signs including temperature, blood pressure, and heart rate every 4 hours — Fever signals infection needing antibiotics. Low blood pressure or fast heart rate suggests significant blood loss causing hypovolemia (low fluid volume in blood vessels). Sepsis (blood infection) from kidney infection causes unstable vitals.
2. Obtain clean-catch midstream urine sample for urinalysis and urine culture before giving antibiotics — Urinalysis detects red blood cells, white blood cells, bacteria, and protein to distinguish infection from stones or cancer. Culture identifies which bacteria is growing and which antibiotic will kill it. Antibiotics before collection give false negative results.
3. Measure and record urine output every shift and describe urine color and any clots — Tracking output monitors kidney function and bleeding severity. Large clots can block the urethra (tube from bladder out) causing urinary retention (cannot empty bladder). Dark or decreasing output suggests worsening bleeding or dehydration.
4. Ask patient to drink 8 to 10 glasses of water daily unless doctor restricts fluids — Hydration dilutes urine and reduces irritation to bladder lining. Increased flow helps flush bacteria in infection and may move small kidney stones through ureters. Dilute urine prevents clots from forming and blocking urinary tract.
5. Hold or verify orders for anticoagulant medications and check INR or PT if patient takes warfarin — Supratherapeutic (too high) anticoagulation worsens bleeding. INR (international normalized ratio) and PT (prothrombin time) measure how thin blood is on warfarin. Doctor may need to lower dose or give vitamin K to reverse excess effect.
6. Assess pain location, quality, and severity using 0 to 10 scale every 2 to 4 hours — Colicky flank pain radiating to groin suggests kidney stone moving through ureter. Suprapubic (lower belly) pain suggests bladder infection or irritation. Severe unrelieved pain may signal obstruction needing emergency urology intervention.
7. Prepare patient for imaging and procedures by ensuring NPO status if needed and explaining cystoscopy or CT scan process — Non-contrast CT scan is gold standard for kidney stones and can see kidney masses. Cystoscopy lets urologist see inside bladder to find tumors or bleeding sources. Patient anxiety decreases when they understand what to expect during camera exam.

8. Document smoking history in pack-years and occupational chemical exposures in detail for urology referral — Pack-years (packs per day times years smoked) quantifies cancer risk. Specific chemical names and exposure duration help urologist decide if cancer screening is needed. Patients over 35 with risk factors need specialist even if bleeding stops after treatment.

Sources

- AUA Hematuria Guidelines 2020
- American College of Physicians
- National Kidney Foundation
- UpToDate Clinical Reference

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