

When good lines go bad

Your Helpful Guide to Infiltration and Extravasation



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A well-placed line can literally be a lifeline, but medications and fluids that miss the mark, even by a little, can cause complications that range from mild swelling to serious tissue damage. That's why it's important to understand the differences between infiltration and extravasation. This guide walks you through the nuances, the risk factors, and treatment recommendations.

Infiltration vs. extravasation: what's the difference?

The word “infiltrate” describes the process of fluid or medication that leaks from the vascular space into the tissue space.⁴ Extravasation and infiltration are both forms of infiltrates but they're very different. Extravasation is a fluid or medication that can cause damage to the tissue, while infiltrations are considered relatively harmless, unless left undetected.^{1,4,5,10,11}

The usual suspects—common risk factors

Common risk factors for an infiltrate include patient characteristics, insertion technique, venous access device, and medication or fluids. Patient characteristics include fragile veins (seen commonly in pediatrics, the elderly, intravenous drug users, and high steroid/chemotherapy use), past venous access experience and co-morbidities.^{1,4} Patients with difficult vascular access are at high risk of infiltrate complications. These patients should be referred to a vascular access specialist. The specialist can recommend device choice based on venous options as well as optimally place the device using vein visualization technology.

Insertion technique: some helpful tips

The inserter's experience and education can determine proper catheter placement, including the technique plus angle and area of insertion. It's not uncommon for inexperienced clinicians to have to make multiple attempts. One recommendation is to stay away from areas of flexion and use the largest vessel.^{1,2} However, during an emergent situation, when the need for high-pressure contrast dye or high-risk medication arises, the antecubital fossa is commonly chosen.^{1,4,6,7}

Tools matter

When it comes to failure, it's easy to overlook the device itself. It's ideal for vessel health to have a device that's the appropriate size (smallest diameter possible) and adequate length (to allow at least half of the catheter in the vein). Needle sharpness, bevel, and size can impact the amount of trauma to the vessel and subsequent complications. A tapered tip prevents the catheter from tearing the vessel wall during insertion. The modern polyurethane material softens at body temperature, is more biocompatible, and is less prone to vessel injury due to increased flexibility.

Chemistry matters, too

The pH, osmolality, or pressure of the infusion can also contribute to an infiltrate.^{1,4} Agents that are acidic or alkalotic (pH <5 or >9) can damage venous endothelium, increasing the risk of vessel rupture. Alkaline medications (Magnesium) that infiltrate can be more damaging as they penetrate deeper into the tissue. Hyper-/hypo-osmolality (<600 or >900) forces fluid shifts into or out of the cells. This can lead to swelling and compartment syndrome—which in turn can lead to

hypoperfusion and ischemia. It can even cause edema which can lead to necrosis.

Stuff happens: some first steps to take when it does

In the case of infiltration, the line should be removed and a loose gauze dressing applied so fluid can escape. With extravasation, you may need to keep the catheter in the tissue to dilute or attempt to withdraw any medication. Antidotes should be considered when skin blanching occurs.^{1,11} The limb should be elevated, and depending on the infusion, heat or cooling should be applied to the skin. Heat enhances vasodilation, increasing blood flow, dispersion, and reabsorption of the infusate to decrease drug accumulation in the tissue. Cooling causes vasoconstriction, which limits the infusate's dispersion. Document the site, amount of infusate given, frequent assessment of sensation, motor function, and circulation of the affected extremity. Photographing the site can be helpful with follow-up care.

Note that Vesicant Task Force published an article in 2024 that reviewed studies to direct how we categorize commonly used medications into high, moderate, and low risk peripherally infused medications/fluids.¹⁰ This article notes that commonly

used drugs (Lasix and morphine) may be discussed among colleagues, but the research is not published to support the outcome of these infiltrates.

Knowledge is power—and better care

Education has always been the best practice for improving care! How often should we be educating and reinforcing this education is the unknown. Annual competencies are done, but is that enough to maintain best practice? Should we only be educating our medical staff, or should we be including not only the patient, but also the family? Are our policies up to date on the latest evidence-based practice? Do these policies require a patient safety event to be written with every infiltrate? Should we be tracking our infiltrates and conducting educational opportunities/case reviews from our findings? Are staff photographing these infiltrates to provide initial findings and show improvement? Educators need to make sure their education is performed in fun, creative, and exciting ways. Know your audience and encourage them to want to be the champions to support better care. Use INS Standards,¹² Magic Guidelines,¹³ and other available recommendations before placing a vascular device to prevent an infiltrate and support vessel health.

Key takeaway

Infiltration and extravasation may sound similar, but knowing the differences can make all the difference. Especially when you can recognize the early warning signs. The best prevention starts with skilled insertion, smart device choices, and an awareness of risk factors such as patient anatomy and medication pH. If an issue does happen, prompt treatment and clear documentation are key. And never underestimate the power of education—for yourself, for your staff, even for patients and families. When everyone's in the loop, it can improve outcomes—and isn't that what good vascular health is all about?

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