

# 5 Easy Ways to Improve Your IV Fluid Protocols

Fluid therapy looks simple and harmless, yet it is fraught with misconceptions and controversies. Let's go over five easy ways to improve your IV fluid protocols, and therefore improve your patient care.

## 1. Adjust Maintenance Rates to Your Patient's Size

Many of us tend to use simple recipes such as "30 ml/kg/day" or "1 ml/lb/hour" or "twice maintenance." This works fairly well for most healthy patients. However universal formulas may not work so well for patients with kidney or heart disease.

Worse, linear formulas tend to overdose large patients and under-dose small patients.

Small patients (under 10 lbs or about 5 kg) and large dogs (over 80 lbs or about 40 kg) are better off when you calculate their actual fluid needs. You can do that by using a maintenance chart or the more accurate following formula:

$$70 \times (\text{weight in kg}) \text{ to the power } 0.75$$

Does that sound intimidating? You can actually do this with any calculator that has a square root function: multiply the weight (in kg) by itself twice, then hit equal, and calculate the square root twice. Then multiply that number by 70.

Alternatively, you can use this simplified formula:

$$[30 \times (\text{weight in kg})] + 70$$

Both formulas give you the volume (in ml) to be administered over 24 hours. Divide by 24, and you have your IV pump setting.

## 2. Improve Your Intraop Fluid Protocol

Similarly, blindly giving IV fluids at 10–15 ml/kg/hour during surgery is becoming a concept of the past. There is actually little scientific data to justify such high rates.

In humans, high fluids rates have been shown to cause tissue edema, hypothermia and coagulopathies. They can also delay wound healing and impair pulmonary gas exchanges.

High fluid rates may be less harmful in a healthy patient undergoing a quick procedure, but they very well may harm an unhealthy patient undergoing a longer procedure.

Many anesthesiologists and surgeons now use intraop rates that are closer to maintenance, such as 2–3 ml/kg/hour. Again, this should not be a one-size-fits-all recipe. It should be adjusted based on patient needs, blood loss, blood pressure, etc.

## 3. Dare to Use Colloids

Hypotension is one of the most common anesthetic complications, which is the reason why patients' blood pressure should be monitored intra-operatively. There are multiple reasons for hypotension, including vasodilatation related to drugs and inhalant gas.

If decreasing the gas setting does not correct hypotension enough, fluid therapy is usually next in line. A crystalloid bolus may help increase blood pressure.

Colloids such as Hetastach or Vetstarch are great adjuncts to your crystalloid fluid therapy protocols. They are helpful to fight hypotension and decrease the risk of fluid overload and tissue edema when giving large amounts of IV crystalloid fluids.

Again, instead of using a recipe (e.g., 5–10 ml/kg/hour), consider using small boluses which can be titrated to effect based on the individual patient's needs. Give a small bolus, such as 5 ml/kg and reevaluate. Depending on the patient's response, you can repeat the bolus.

Colloids can affect the patient's coagulation capabilities by diluting their coagulation factor ("dilutional coagulopathy"). In addition, colloids can change platelets' ability to form a blood clot, so we should not give over 20 ml/kg/day.

As a reminder, colloids should only be used in a well hydrated patient.

## 4. Improve Fluid Therapy in Blocked Cats

Urethral blockage is a common condition in male cats. "Blocked" cats are often denied IV fluids because of the perceived notion that giving fluids will make bladder distension worse.

This is a misconception. The cat's kidneys will produce urine even if we withhold IV fluids. Yet fluids are important to decrease acidemia and dilute potassium.

So instead of debating the need to give fluids, we should give them on presentation, then unblock the patient.

The next common misconception is to give 0.9% sodium chloride to "blocked" cats, with the idea that potassium-containing fluids will worsen hyperkalemia. Two issues with saline are that it has a low pH, which can worsen the cat's

metabolic acidosis, and it is devoid of potassium, which can become an issue during the diuresis phase that follows unblocking the cat. Therefore, balanced or buffered fluids like LRS or Normosol® are better choices than saline.

## 5. Use the Correct Type of Fluid

Fluids should not be used interchangeably. The main reason we tend to get away with it, is that healthy kidneys sort things out and correct fluid, sodium and potassium imbalances. However a sick patient, or a patient with kidney disease, or a hospitalized patient who stays on IV fluids for several days, may not fare as well.

Here are a few simple guidelines:

- Saline (0.9% NaCl) is an acidic solution that is not buffered so it is inappropriate for patients with metabolic acidosis. It is devoid of potassium, so it should be avoided in hypokalemic patients as stated above.
- Saline is not appropriate as a maintenance solution because of its high sodium concentration. LRS is a better choice as a maintenance fluid since it contains less sodium.
- LRS is hypo-osmotic and should not be given to hypo-proteinemic patients.
- Plasmalyte® 56 and Normosol®-M are considered true maintenance fluids.
- Normosol®-R is not the best choice for fluid resuscitation of a shock patient because of the acetate buffer. In addition, the magnesium it contains can worsen vasodilatation and therefore hypotension.

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As a profession, we tend to like recipes, and this certainly applies to fluid therapy. Yet our patients would be better off if we switched from recipe-based fluid therapy protocols to goal-directed regimens. This means that setting a fluid pump and forgetting about the fluid rate should be a habit of the past. We would serve our patients better by asking ourselves what our goals or end-points are.

Spend a few minutes to think about the best fluid type, rate and volume to be infused. Regularly reassess your patients' mucous membrane moisture and color, skin turgor, capillary refill time, pulse quality, blood pressure, urine output and heart rate. By getting a better feel for their hydration and perfusion, you will help your patients get back to their owners quicker.

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**ADDED VALUE:**

*For more information, visit [www.catvets.com/uploads/Fluid Therapy Guidelines.pdf](http://www.catvets.com/uploads/Fluid%20Therapy%20Guidelines.pdf) where you will find the new guidelines on fluid therapy by the American Animal Hospital Association (AAHA) and the American Association of Feline Practitioners (AAFP).*