



Intravenous Infusion Drug Administration: Flushing Guidance

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Introduction:

This guidance has been produced in response to recently published concerns about the discarded amount of intravenous medication which is left remaining in an intravenous giving set at the end of an IV Infusion.

This document has been prepared and reviewed by the board of the National Infusion and Vascular Access Society (NIVAS) of the United Kingdom. The NIVAS board membership consists of specialist nurses and doctors who are experts in the field of IV therapy and vascular access. They are all well published and are currently working in clinical practice.

This document is intended to give healthcare professionals guidance on what is considered evidenced based best practice. Where a gap in evidence exists, expert consensus will be offered.

A perceived and theoretical risk of under dosing of intravenous medication has been reported recently in the literature. The literature indicates that between 5% and 20% of intravenous drug is left remaining in the tubing of the intravenous giving set once the infusion bag becomes empty at the end of the administration.

While there is evidence to suggest this occurs and there may be a theoretical risk of under dosing medications, there is no evidence to prove for or against any harm caused to the patient. The following guidance will attempt to outline the current infusion practice and where an issue is thought to exist, we will offer some guidance for alternative clinical practice.

Individual healthcare organisations should have a local policy to outline their position and support this practice which should include pharmacy, injectable medicines guidelines taking into account the existing evidence for the perceived under dosing of medication from a governance position.

Methods of administering intravenous therapy

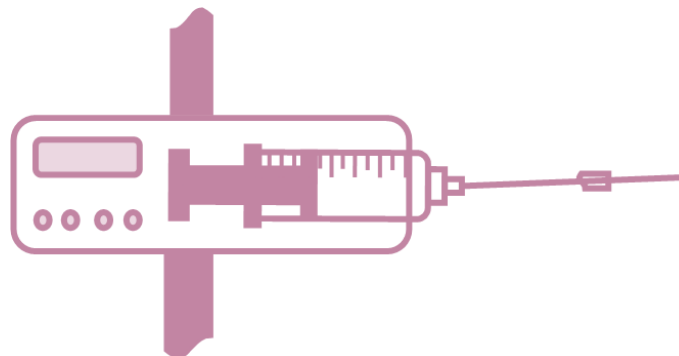
Intravenous bolus injection:



IV Therapy is delivered intravenously via a syringe directly into a vein by means of a vascular access device. A bolus injection can be a once only injection or regular intermittent injections. The mode of injection can be by manually by hand over 3 to 5 minutes depending on the manufacture's guidelines or by an electronic syringe driver over a prescribed time. The manual method is reliant on the practitioner adhering to the recommended administration time as a quick push can incur complications such as drug speed shock or chemical phlebitis. In light of this, where possible a syringe driver can be used to regulate and standardise the rate of the injection.

A simple bolus injection will require a sodium chloride 0.9% flush of the vascular access device before and after administration in line with local policy, there is no risk of under-dosing.

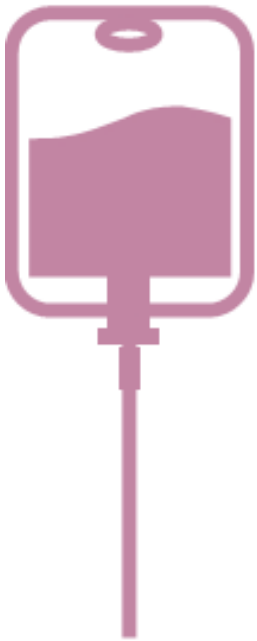
Continuous, variable dose syringe driver injection:



The continuous, variable dose syringe injection method is used via an electronic syringe driver over a 24 hour period or less. An intravenous extension tube is usually attached to connect the patient to the syringe. This extension tube should include a clamp and the extension tubing should be clamped during disconnection from the patient.

The intravenous drug in the extension tubing delivered by a continuous, variable dose syringe driver injection can be wasted at the end of the infusion as the variable rate and dose can be adjusted to ensure a therapeutic level of drug is continuously delivered. When this type of infusion has finished the syringe and tubing can be discarded and the vascular access device flushed directly, with a sodium chloride 0.9% flush in line with local policy.

Intravenous infusion:



IV therapy is delivered intravenously via a bag of fluid to which a drug may have been added. The bag of fluid is connected to the patient's vascular access device via a length of plastic tubing. This type of IV drug delivery ensures that the IV therapy is delivered at a slower rate over a longer period. This allows the pH of the drug to normalise quickly, reducing the risk of chemical phlebitis.

An intravenous infusion can be delivered using gravity however an infusion pump is the preferred and safer way of delivering this type of infusion. Community IV services may use a control flow administration set.

When the infusion bag is empty and disconnected from the patient the infusion giving set tubing will contain a residual quantity of intravenous drug which is then usually discarded.

In this situation it is possible to administer the remaining intravenous drug in the infusion giving set tubing.

There are 3 options available.

Option 1: Discarding the infusion set:

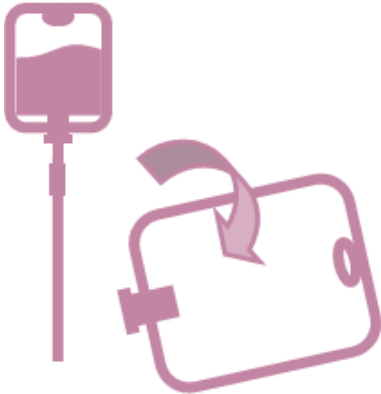


Theoretically there is a risk of under dosing, and this is evident in the literature. However, when an intermittent infusion is administered at regular intervals, the drug contained in the infusion reaches a therapeutic level in the patients' blood which remains until the half-life of the drug is reached. By this time the next infusion is administered which maintains the therapeutic level until the prescribed period of administration ends.

If a one-off infusion of IV medication is being administered, the remaining drug in the IV giving set may need to be administered. In this event option 2 or 3 can be considered.

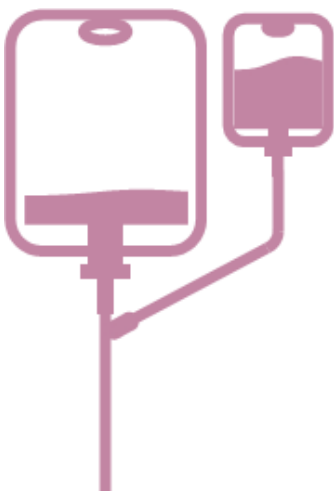
Blood chemistry can be analysed and drug levels taken as appropriate to ensure therapeutic levels are maintained in the patient blood.

Option 2: Flushing the infusion set manually:



1. Hang a new bag of 50mL sodium chloride 0.9% as prescribed, onto the drip stand; remove the safety cap to expose the spike entry point on the bag.
2. Engage the safety clamp on the giving set. Using an aseptic non-touch technique remove the giving set spike from the used infusion bag.
3. Insert the giving set spike into the entry point on the new 50mL bag of sodium chloride 0.9%.
4. Infuse the sodium chloride 0.9% at the same rate as the previous drug infusion.
5. Once the prescribed amount of the 50mls sodium chloride 0.9% has been administered, disconnect the infusion giving set from the vascular access device and dispose of it following the organisation's local policy.

Option 3: Flushing the infusion set with a closed system:



Intravenous giving sets are available which include an additional, fixed needle free connector at the top of the giving set, just under the drip chamber. This allows an additional infusion bag to be attached in order to run additional fluids through the primary giving set, allowing the remaining medication to be administered into the patient.

This type of IV infusion set is currently used in some oncology units for the administration of chemotherapy. The benefit of this system is that it enables a closed system to be maintained.

The drawback is that this type of infusion set is brand specific so might not be compatible with an organisations infusion pumps and there is an increase cost implication because two IV sets are required.

General guidance:

- Infusions of blood and blood products should be discarded without flushing the infusion giving set as blood infusions should not have any diluents added to them.
- If options 2 or 3 are being considered, remember to ensure the flushing fluid is compatible with the primary infusion fluid and prescribed.
- Paediatric and oncology infusions should be administered in line with local and national guidelines which are already well established. Option 2 and 3 can be considered in these patient groups.
- For one off single infusion drug administration, consideration should be made to the remaining medication in the infusion giving set. Option 2 or 3 can be considered.
- In certain patient groups, intravenous fluid administration should be administered with caution. Where possible bolus syringe driver infusions could be considered as this method requires the least amount of additional diluent/infusion fluid.
- For safety, where possible, an infusion pump should be used for continuous intravenous drug and fluid administration.
- A pulsatile flushing technique should be used when manually flushing vascular access devices.

Recommendation:

The evidence points to a theoretical risk of under dosing IV medication when it is discarded within the intravenous giving set. The evidence is limited and no research has been undertaken to investigate the effects of not administering this amount of drug. The NIVAS board agree that the risk to patients is low and that there are only a few situations when it would be advantageous to flush the giving set. Clinical areas who administer chemotherapy and other specialist drug regimens already undertake this practice and use specialised giving sets.

Research into the effects of not administering the remaining medication from the giving set, on blood plasma therapeutic levels is urgently required in order to confirm that this practice is harmful or harmless.

Ultimately it is for the local unit and organisation to decide what is most appropriate for their patient groups.

Related evidence and research in the literature:

Flushing an I.V. line: A simple but potentially costly procedure for both patient and health unit

Wotton, K., Gassner, L.A. and Ingham, E., 2004. Flushing an IV line: a simple but potentially costly procedure for both patient and health unit. *Contemporary nurse*, 17(3), pp.264-273.

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Chan, K.Y., Pinkney, S., Fan, M., Colvin, C., Easty, T. and Trbovich, P., 2013. Mitigating Risks Associated with Secondary Intravenous (IV) Infusions: An Empirical Evaluation of a Technology-Based, A Practice-Based, And a Training-Based Intervention. *CMBES Proceedings*, 36.

Importance of Infusion Volume and Pump Characteristics in Extended Administration of β -Lactam Antibiotics

Claus, B., Buyle, F., Robays, H. and Vogelaers, D., 2010. Importance of infusion volume and pump characteristics in extended administration of β -lactam antibiotics. *Antimicrobial agents and chemotherapy*, 54(11), pp.4950-4950.

Non-flushing of IV administration sets: an under-recognised under-dosing risk

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Procedural and documentation variations in intravenous infusion administration: a mixed methods study of policy and practice across 16 hospital trusts in England

Furniss, D., Lyons, I., Franklin, B.D., Mayer, A., Chumbley, G., Wei, L., Cox, A.L., Vos, J., Galal-Edeen, G. and Blandford, A., 2018. Procedural and documentation variations in intravenous infusion administration: a mixed methods study of policy and practice across 16 hospital trusts in England. *BMC health services research*, 18(1), p.270.

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Using Higher Doses to Compensate for Tubing Residuals in Extended-Infusion Piperacillin-Tazobactam

Lam, W.J., Bhowmick, T., Gross, A., Vanschooneveld, T.C. and Weinstein, M.P., 2013. Using higher doses to compensate for tubing residuals in extended-infusion piperacillin-tazobactam. *Annals of Pharmacotherapy*, 47(6), pp.886-891.

Under dosing: new guidance on small-volume drug infusions is needed

Cousins, D. 2018. *Under dosing: new guidance on small-volume drug infusions is needed*. *Clinical Pharmacist*, 12(10),pp. 356-357.

Flushing and locking of venous catheters: available evidence and evidence deficit

Goossens, G.A., 2015. Flushing and locking of venous catheters: available evidence and evidence deficit. *Nursing research and practice*, 2015.