

# How to start an intravenous glyceryl trinitrate (GTN) infusion

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An understanding of how to start and setup an intravenous infusion of [glyceryl trinitrate](#) (GTN) is a rather useful skill. Unfortunately, setting up a GTN infusion is sufficiently complicated that it can't be worked out in an emergency situation. In a nutshell:

**Start with glyceryl trinitrate 5 mcg/min**

*then*

**increase infusion rate by 5 mcg/min every 3-5 minutes if needed**

*when infusion rate is GTN 20 mcg/min or more*

**increase infusion rate by 10 mcg/min every 3-5 minutes if needed**

GTN infusions are not trivial. Call for help. It should best be performed under the supervision of someone who has experience with them (e.g., a medical registrar or emergency medicine registrar).

## Step One: Indications

GTN infusions can be used in the following (1) (2):

- hypertensive emergency / malignant hypertension
- congestive cardiac failure with acute myocardial infarction
- treatment of angina pectoris not responding to oral nitrates and/or beta blockers
- control of perioperative hypertension

In hypertensive encephalopathy, aim to reduce the blood pressure slowly (3). There are substantial risks in reducing it quickly.

- reduce the mean arterial pressure by 10% per hour;
- by no more than 25% of the original value.

**mean arterial pressure = diastolic + 1/3 (systolic - diastolic)**

## Step Two: Contraindications

Avoid in the following (1) (2):

- hypotension or uncorrected hypovolaemia
- raised intracranial pressure or cerebral haemorrhage
- constrictive pericarditis or pericardial tamponade
- severe anaemia and arterial hypoxaemia
- concurrent use of phosphodiesterase-5 inhibitors, i.e., [sildenafil](#) (Viagra), [tadalafil](#) (Cialis) and [vardenafil](#) (Levitra)

## Step Three: Initial stabilisation

Remember your "ABCs" of emergency management (3):

Position:

- Comfortably;
- in a monitored bed.

Airway:

- Keep patent.

Breathing:

- Administer high flow (i.e., > 6 L/min) via a Hudson mask or non-rebreather mask;
- consider using CPAP if severe pulmonary oedema is present;
- assess respiratory rate and effort (if inadequate, assist with ventilation, e.g., bag-valve-mask with oxygen).

Circulation:

- Measure pulse rate, blood pressure (both arms if thoracic aortic dissection is suspected) and capillary refill;
- attach cardiac monitoring equipment and correct any immediate life threatening arrhythmia;
- insert intravenous cannulae x 2;
- take bloods (FBC, UEC).

Perform a 12-lead ECG

Disability:

- Measure Glasgow Coma Score (GCS); if less than or equal to 8 then consider endotracheal intubation to protect the airway.

**Step Four: Draw up and dilute the GTN**

GTN is absorbed into many plastics, especially PVC (2). Hence it is important to minimise the amount of tubing / filters in the giving sets and aim to use a glass bottle for dilution.

In Australia, GTN for injection comes in 50 mg/10 mL ampoules.

**glyceryl trinitrate 50 mg in 500 mL of 0.9% NaCl solution (glass infusion bottle)**

- This yields a concentration of GTN of 100 mcg/mL;
- a solution of 5% dextrose (D-glucose) can be used as an alternative.

**Step Five: Start infusion**

The dose of GTN needs to be carefully titrated for the patient according to response. The starting dose is low:

**glyceryl trinitrate 5 mcg/min**

*which is*

**3 mL/h of the dilution (glyceryl trinitrate 100 mcg/mL)**

**Step Six: Upward titration**

Start with small increases up to GTN 20 mcg/mL:

**Increase infusion rate by glyceryl trinitrate 5 mcg/min every 3-5 minutes.**

*which is*

**3 mL/h of the dilution (glyceryl trinitrate 100 mcg/mL) every 3-5 minutes**

When the infusion rate of GTN is greater than or equal to 20 mcg/mL (i.e., from the *forth* upward titration and beyond):

**Increase infusion rate by glyceryl trinitrate 10 mcg/min every 3-5 minutes.**

*which is*

**6 mL/h of the dilution (glyceryl trinitrate 100 mcg/mL) every 3-5 minutes**

- There is no real maximum dose and the infusion rate should be adjusted to effect;
- GTN has a wide therapeutic range;
- it is suggested by McCowan and Shapiro (2006) (1) that the maximum rate to be GTN 200 mcg/min.

### **Step Seven: Arrange for definitive care**

Once the patient has been stabilised, definitive care should be arranged. For a patient who requires a GTN infusion, this will be a monitored bed (i.e., a coronary care unit, intensive care unit or at least, a monitored bed).

### **Discussion**

- Beware in severe hypertension following head injury, intracranial bleed or cerebrovascular accident. The hypertension is in part the body's response to maintain cerebral perfusion.
- Some patients may respond fully to even the starting infusion rate of GTN (5 mcg/min) so careful titration and monitoring is required.
- For patients requiring a high infusion dose of GTN, it can be helpful to increase the concentration of the infusion solution and then use the appropriate rate.

### **Reference articles**

(1) McCowan C., Shapiro N. Hypertensive Emergencies. *Emedicine*. Last updated 13 April 2006.

[\[Link\]](#)

(2) Glyceryl Trinitrate Concentrate Injection (DBL). *MIMS Online*. Last updated 13 September 2005.

(3) Hypertensive Emergencies, Treatment. *Emergency Life Support (ELS) Course Manual*. Second Edition. 2002.

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