Sublingual glyceryl trinitrate (GTN)

**Background**
GTN is a vasodilator. It acts on vascular smooth muscle to cause venous and arterial vasodilation, with the predominant effect being on veins.

The mechanism of action is not clear, but it appears that GTN results in the formation of nitric oxide which is a vasodilator. GTN causes:

- A reduction in venous return (preload) to the heart. This reduces ventricular filling and cardiac output which reduces myocardial oxygen demand.
- Arterial dilation which reduces peripheral resistance (afterload). This reduces the force the left ventricle must overcome to eject blood into the arteries which reduces myocardial oxygen demand.
- Dilation of the coronary arteries which may increase coronary blood supply, though this is not usually clinically significant.
- This skill sheet refers to the administration of GTN via the sublingual route.

**Indications**
- Myocardial ischaemia.
- Cardiogenic pulmonary oedema.
- Hypertension associated with autonomic dysreflexia.

**Contraindications and cautions**

### Contraindications:
- Systolic blood pressure less than 100 mmHg
- Heart rate less than 40/minute
- Heart rate greater than 130/minute if the primary clinical problem is myocardial ischaemia, STEMI, or cardiogenic pulmonary oedema
- Heart rate greater than 150/minute if the primary clinical problem is autonomic dysreflexia
- Ventricular tachycardia.

### Cautions:
- STEMI, particularly STEMI involving the right ventricle. GTN may cause a significant fall in cardiac output and if there are signs of low cardiac output GTN should be withheld.
- The patient is small, frail, or physiologically unstable.
- Poor perfusion. Poor perfusion is a sign of reduced cardiac output which may fall further with GTN administration.
- Dysrhythmia. Dysrhythmia may cause a reduced cardiac output which may fall further with GTN administration.
- A drug for erectile dysfunction has been taken within the last 24 hours. Severe and/or prolonged hypotension may occur.
- Known aortic or mitral stenosis. With aortic or mitral stenosis, cardiac output may be reduced as a result of the narrowed valve and a fall in preload may cause a further fall in cardiac output.

**Procedure**

1. Explain the procedure and gain informed consent.
2. Check the GTN bottle and ensure the five ‘rights’ (medicine, dose, patient, route, time). If a second clinical person is present show them the bottle and ask them to name it.
3. Determine the dose required for your patient:
   - **Myocardial ischaemia:** 0.4 mg every 3–5 minutes
   - **Cardiogenic pulmonary oedema:** 0.8 mg every 3–5 minutes. Paramedics and ICPs may increase the dose and frequency if the patient is not improving, provided hypotension is not present.
   - **Autonomic dysreflexia:** 0.4–0.8 mg every 3–5 minutes.
4. If a caution is present, ensure the following prior to administration:
   a. The patient should be lying flat.
   b. IV access should have been obtained whenever possible.
   c. The dosing interval should be increased to 10 minutes.
   d. Personnel should be ready to administer 0.9% sodium chloride IV if there is a significant fall in cardiac output or blood pressure.
5 Administer the dose by spraying the GTN under the patient’s tongue. If this cannot be achieved it is acceptable to spray into the mouth.

6 Record the administration of GTN on the ePRF (medicine, dose, route, and time).

Potential complications of the procedure

- Common adverse effects of GTN administration:
  - Hypotension
  - Flushing
  - Headache
  - Tachycardia
  - Light-headedness.

- Side effects of GTN may be prolonged if the patient is taking an anti-hypertensive.

Additional information

- Severe and/or prolonged hypotension may occur if a medicine for erectile dysfunction has been taken within the last 24 hours. There are a range of medicines with different names used for erectile dysfunction and some of them (particularly sildenafil) are also used in the treatment of pulmonary hypotension. All of these medicines are long acting vasodilators and the administration of GTN may cause further vasodilation.

- GTN must be used with caution in the presence of STEMI because the risks may outweigh the benefits:
  - GTN may cause a significant fall in cardiac output
  - GTN has a role in treating symptomatic myocardial ischaemia, but does not usually have a significant role in treating STEMI.

- Caution must be used in the presence of STEMI involving the right ventricle and personnel must have a low threshold for withholding GTN:
  - STEMI involving the right ventricle can result in a significant reduction in right ventricular contractility
  - When the right ventricle is significantly impaired it may provide little in the way of contribution to cardiac output, and blood may be passively flowing down a pressure gradient between the inferior vena cava (IVC), the superior vena cava (SVC), and the left atrium

- This may result in the preload (filling) of the left side of the heart being dependent on the venous pressures within the IVC and SVC

- GTN can result in a significant fall in venous pressure (and thus a fall in preload) which may cause a significant fall in cardiac output.
Use of GTN in pregnancy or when breastfeeding safety has not been demonstrated. The likelihood of a pregnant or breastfeeding woman required GTN is very low, but GTN should be administered if indicated.


**Assessment criteria**

If you are asked to perform GTN administration as part of an assessment, the following table gives you an idea of what the assessor will be expecting.

<table>
<thead>
<tr>
<th>Assessment</th>
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<td>‣ Perform appropriate medicine checks.</td>
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<td><strong>4. Demonstrate administration of GTN</strong>&lt;br&gt;Demonstration should include:</td>
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