# Guidance for PERIPHERAL Noradrenaline

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| **TARGET AUDIENCE** | Secondary Care patients in level 1 or 2 care |
| **PATIENT GROUP** | Patients with septic shock requiring peripheral vasopressors for blood pressure support |

## Clinical Guidelines Summary

The purpose of this guideline is to provide information for those staff caring for patients with septic shock to safely commence peripheral noradrenaline and support the blood pressure and organ perfusion following a decision by a senior clinician and discussion with the Medical High Dependency/Critical care teams. The guideline provides direction on the administration of a standard concentration of noradrenaline via a peripheral venous cannula to adult patients. It will be used primarily as a bridging measure in level 1 and level 2 care areas, including the Emergency Department resuscitation bays, concurrently with the optimal management of sepsis as per guidelines, until central venous access is obtained. There will be certain circumstances where peripheral noradrenaline is used when the senior decision maker has deemed that an internal jugular/femoral vein central line (otherwise known as Central Venous Catheter or “CVC”) is not in the best interest of patients or it is for short term post-operative use.

# Guidance for PERIPHERAL Noradrenaline

- Patient is identified as having septic shock
- Patient has been discussed with ITU/HDU
- Patient is adjudged by senior decision maker to need Peripheral Noradrenaline as bridging therapy to jugular/femoral line or in specified circumstances

- Remove 4ml fluid from 250ml 0.9% Sodium Chloride bag prior to drug being added - 4mg/4ml of Noradrenaline (one vial) is drawn up and added to bag - making concentration 1/5th of that used centrally
- bag inverted several times to mix and labelled appropriately
- drug is prescribed on HEPMA
- clinical review timeframe decided on

- Patient needs two 20gauge Cannulae located proximal to wrist and avoiding flexion sites
- second cannula is a contingency due to the limited half-life of Noradrenaline and hypotension risk that occurs if infusion via first cannula is interrupted

- Via an octopus and with nothing else running through it, the infusion is started in millilitres per hour as per the infusion chart weight table.
- If weight is unknown start at 13.1ml/hr and titrate
- Infusion shouldn't be continued beyond 24 hours

- Ensure blood pressure checked every 5-10minutes if arterial line is not placed and noradrenaline titrated as per infusion table on chart.
- Ensure 3 lead ECG monitoring and oxygen saturations are monitored
- Monitor for extravastation - see details below





| Lead Author | Dr Nicholas Holt | Date approved | Dec 2025 |
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# Guideline Body

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## BACKGROUND

Noradrenaline is a sympathetic agent with both alpha- and beta-adrenergic activity, however at the concentrations used in clinical practice, its main affect is on alpha receptors causing a vasoconstriction effect and thus increasing blood pressure by increasing afterload and systemic vascular resistance. The half-life is limited and the effects on blood pressure cease 1-2 minutes after discontinuation of the infusion. The concentration of the drug given peripherally is 1/5 of that used centrally.

This document aims to provide guidance to the staff involved in the administration of vasopressor agents via a peripheral venous cannula (PVC) to adult patients in critical care and to set out safe principles and standard concentrations.




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| **Lead Author** | **Dr Nicholas Holt** | **Date approved** | **Dec 2025** |
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Previously, vasopressor agents have routinely been administered via a central venous route, with the risks of peripheral extravasation often being cited as the reason for this.[1] The administration of vasopressor agents peripherally is occurring more frequently and a recent systematic review of over 1300 patients highlighted that the risk of extravasation is lower than is anecdotally cited[2] and was actually an uncommon occurrence, happening in approximately 3.4% of cases, with no reported incidents of tissue necrosis or limb ischaemia. The most common alternative to a peripheral cannula is the insertion of a central venous cannula (CVC)[3,4], which carries clinically significant risks such as pneumothorax, arterial injury, arrhythmias and catheter-related infection. Although the use of ultrasound-guided insertion aims to reduce the incidence of such risks, it does not negate it and therefore, it is only prudent to consider administration via a PVC in situations where this may be preferable. Such situations might include, but are not limited to, stabilisation of critically unwell patients awaiting transfer to a critical care area; short term post-operative use; patient preference; or where central venous access would prove problematic and not in the patient's best interests. The decision will ultimately come down to the responsible senior decision-maker at the time and whether this is an appropriate treatment option for the patient in front of them.

Through the production of this guideline, NHS Lanarkshire will ensure that the Intensive care society standards are met.[1]

1. Through the pre-printed infusion chart that has been created alongside this document, critical care units will have clear policies detailing the use of vasopressor agents administered by peripheral intravenous infusion. These documents include details on concentration, dose and infusion of selected vasopressor agents and highlight that these concentrations may differ from the recommended standard concentrations for administration via a CVC.

2. Critical care units will have clear guidelines on the choice of peripheral venous access devices and their siting for the administration of vasopressor agents by peripheral intravenous infusion.

3. Critical care units will have a protocol for regular assessment of indwelling intravascular catheters and the documentation of that assessment.

4. Critical care units will use an infusion pump for the administration of vasopressor agents by peripheral intravenous infusion.

5. Critical care units will have clear guidance for the management of extravasation events relating to vasopressor agents administered by peripheral intravenous infusion.

6. Vasopressor agents must only be administered by professionals trained in their use and competent to do so

## CIRCUMSTANCES FOR COMMENCING

- The patient will have septic shock, which is defined as a persisting serum lactate >2 mmol/L and a vasopressor requirement to maintain a mean arterial pressure ≥65 mmHg, despite adequate fluid resuscitation. Without it, circulatory, cellular, and metabolic abnormalities occur which are associated with a greater risk of mortality than with sepsis alone.[5]
- In most circumstances, peripheral nordrenaline will be used as a bridging measure as an adjunct to optimal patient management, until such a time that a central venous cannula is inserted; or used for a short term, under specific stated circumstances.
- Peripheral noradrenaline should not be used for patients with acute heart failure or cardiogenic shock

## RECONSTITUTION, ADMINISTRATION AND PRESCRIBING

- Use the pre-printed infusion chart and weight table below for dosing guidance
- Noradrenaline is presented as a 1mg/ml solution in a 4ml ampoule. Total dose per ampoule is 4mg.
- 4mg (1 ampoule) of noradrenaline in 246ml of 0.9% Sodium Chloride (5% glucose can be used) to give a final concentration of 16 micrograms per

millilitre (16 µg/ml) – commence as per weight table below/on the infusion chart.

- Invert the bag several times to thoroughly mix
- Label the bag appropriately, prime the giving set
- If body weight unknown start infusion at 13ml/hr (dose for a 70kg patient) until weight can be measured. If the patient weighs over 120kg use the 120kg dosing as there is no added effect to increasing rates above this.
- Prescribe on HEPMA as **Noradrenaline as per chart** if in medical HDU (mHDU) or **ICU Noradrenaline 16 micrograms/ml (peripheral)** if in an Intensive Care Unit.
- Administer via an infusion pump at a starting dose of 0.05microgram/kg/min (see weight table) and titrate to desired effect.
- Increase the rate every 5 to 15 minutes depending on urgency. Increase the infusion by the rates in the infusion table until the maximum dose of 0.15micrograms/kg/min is reached. A decision is to be made as to whether stronger concentrations via a CVC is required, or this is the maximum treatment the patient will receive, or treatment is withdrawn.
- Infusion bags can be changed without stopping the infusion. Note the maximum duration of peripheral noradrenaline is 24 hours which is less than the standard maximum duration of use of a single giving set (72 hours). This means that once the patient is established on the critical care infusion pump, the same giving set can be used for the duration of therapy.
- It is best practice to have the air trap of the giving set filled to the line on the chamber. This increases the safety when changing a bag. It is also important to make sure the air trap is not inverted to avoid air entrainment
- With the air chamber filled to the line there will be over four minutes' worth of fluid (5ml) in the chamber, even if the infusion is running at the maximum rate. The new bag should be ready to swap over and hanging on the drip stand
- If the patient is transferred into a critical care area with peripheral noradrenaline running, it is best practice to attach a new infusion to the second cannula, start the new infusion and then stop the original infusion

once the new infusion has been established. The cannula that no longer has noradrenaline running should now be flushed with 0.9% Sodium Chloride (NaCl) at 5ml/hr for one hour. The original pump can be returned to the area that it came from.

- Please note that these concentrations differ from the standard concentrations administered via a central line and are 1/5 of the strength of that administered centrally.

| | **Weight based infusion rate** (ml/hr)** If at maximum dose consider ICU referral, if appropriate & not already done so (source intensive care society) | | |
|---|---|---|---|
| **Weight (Kg)*** | Starting dose of 0.05 micrograms / kg / min | 0.10 micrograms / kg / min | Maximum dose of 0.15 micrograms / kg / min |
| ≤40kg | Seek Expert consultant advice for dosing | | |
| 40 | 7.5 | 15.0 | 22.5 |
| 50 | 9.4 | 18.8 | 28.1 |
| 60 | 11.3 | 22.5 | 33.8 |
| 70 | 13.1 | 26.3 | 39.4 |
| 80 | 15.0 | 30 | 45.0 |
| 90 | 16.9 | 33.8 | 50.6 |
| 100 | 18.8 | 37.5 | 56.3 |
| 110 | 20.6 | 41.3 | 61.9 |
| ≥120^ | 22.5 | 45 | 67.5 |

*round to nearest 10kg for dosing purposes
**Round to nearest whole ml if infusion pumps cannot accommodate 1 decimal place
^ even if patient weighs more than 120kg, this is the rate that should be used

## PRACTICALITIES

- Senior decision maker is involved in the care of the patient early and parent team consultant is aware of patient
- Patient has been referred to the High Dependency and/or Critical Care teams for a bed to provide ongoing treatment, ***prior to starting infusion,*** and it is deemed appropriate for vasopressor agents to be used. A treatment and escalation plan is in place and this will specify whether the patient is for full escalation to the intensive care unit and for multiorgan support, the patient is for peripheral vasopressors as a trial for a specified time period before withdrawal if unsuccessful, the patient is for a trial of peripheral vasopressors until central access is achieved or requires stronger concentrations to be

administered to maintain blood pressure. If patients are not suitable for peripheral vasopressors due to frailty, comorbidities and significant risk of harm, then the protocol should not be considered/started

- Once started, there needs to be an agreed review timeframe from the critical care team to assess efficacy and for improvement of the patient. Peripheral noradrenaline should not be continued beyond 24 hours. At this point the infusion should be stopped and/or the patient transitioned onto central (CVC) dosing noradrenaline if appropriate.
- Invasive blood pressure monitoring is recommended but it may not be considered appropriate in all cases. In these cases, regular interval non-invasive blood pressure monitoring must be carried out every 5-10 minutes until blood pressure is stable before monitoring every 30-60mins.
- If extravasation occurs (see guidance below) an InPhase incident report is required to be completed and investigated using the local sites governance procedures and all learning should be disseminated.
- After discontinuation, flush the peripheral cannula with sodium chloride 0.9% at the same rate the medicine was infused through at to avoid adverse haemodynamic effects

## SPECIAL CONSIDERATIONS

Whilst the Early vasopressors in Sepsis trial (EVIS) is recruiting, should anyone be recruited to the control arm of the trial (i.e. standard fluids and/or central access arm) but then subsequently require Nor-Adrenaline, if it is not given centrally, that patient is required to be removed from the trial when given Peripheral vasopressors instead.

## PERIPHERAL VENOUS ACCESS

- Peripheral venous access should ideally be of size 20G or more and be sited proximal to the wrist in the arm, i.e. forearm and above.
- Sites of flexion in awake patients should be avoided.
- Avoid sites requiring more than one venepuncture

- If peripheral intravenous (IV) access is difficult or unreliable, peripheral noradrenaline should not be started through this line.
- There should be a return of blood following insertion and flush easily with 5-10mL of 0.9% sodium chloride.
- A second peripheral venous cannula should be sited as a contingency in case of a primary site failure due to the limited half-life of Noradrenaline and hypotension risk that occurs if infusion is interrupted.
- Under no circumstances should anything else be run through same cannula to avoid a bolus effect
- Best practice is to connect a single lumen Needle Free Access Device (NFAD) or an “octopus” to the cannula and then connect the infusion to this. **Nothing else** should run through this cannula under any circumstances.
- Monitor cannula site regularly (minimum every hour) for signs of extravasation

## PRE-CONNECTION CHECKLIST AND MONITORING

- Confirm patient identity
- Check and flush cannula to ensure patency prior to connection. The cannula should be checked every 60 minutes for the duration of the infusion.
- Ensure monitoring is in place
    - Oxygen saturation probe
    - 3 lead continuous ECG
    - Ideally, invasive blood pressure (BP) monitoring via an arterial line should be undertaken. However, if circumstances arise where this is not feasible/in best interests of the patient, Non-invasive blood pressure monitoring via a cuff is sufficient. BP should be checked every 5-10 minutes following initial connection and every rate change, then every 30-60 minutes once BP is stable
- Peripheral Noradrenaline should not be continued for more than 24 hours
- After discontinuation, flush the cannula with sodium chloride 0.9% at the same rate the noradrenaline was being infused to avoid haemodynamic effects

## EXTRAVASATION

- Extravasation describes the leakage of any drug into surrounding tissues and is a rare complication of peripheral vasopressor infusion.
- Regular monitoring of the infusion site is essential to enable early recognition and management of extravasation events and should be recorded on the observation chart every hour while the infusion is running. Utilise Peripheral venous cannula (PVC) bundle that is currently available and include visual phlebitis scores for this. This may move to patient track as part of ePVC bundle
- Extravasation should be suspected if there is any of the following:
    - pain or itching at infusion site.
    - Pallor, oedema / swelling, or erythema of skin at intravenous cannula site.
- If extravasation is suspected, follow the NIVAS Extravasation toolkit available on first port. *(if link not working, see references for full address to search)*
- The following actions are recommended:
    - Stop the infusion immediately and disconnect the line from the peripheral venous cannula (PVC). Connect the line to the second PVC in order to continue the vasopressor infusion.
    - Attempt to aspirate 3 to 5ml from the PVC if able.
    - Remove the cannula and apply a warm compress and then dressing to the removal site.
    - Mark the extravasation area if possible, in order to allow monitoring of any developing injury.
    - Elevate the affected limb if able to do so to reduce swelling.
    - Consider application of a topical vasoactive agent to encourage local blood flow (e.g. Glyceryl trinitrate [GTN] patch). Consider the use of Phentolamine mesylate 5mg s/c injection to site
    - Administer analgesia if required.
- Seek advice from a surgeon or your local tissue viability service if concerned and consider seeking advice from plastics at Glasgow Royal Infirmary

## TROUBLESHOOTING

- Desired blood pressure not achieved – escalate infusion rate
- Significant hypertension – stop infusion and request urgent medical review
- Cannula dislodged or tissued – stop infusion and request urgent medical review





| Lead Author | Dr Nicholas Holt | Date approved | Dec 2025 |
|---|---|---|---|
| Version | 1 | Review Date | Dec 2028 |

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Last name ..... Sex: ☐ M ☐ F
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*or attach addressograph label here*

Ward: .....
Patient weight (Kg): .....

University Hospital:
☐ Hairmyres ☐ Monklands ☐ Wishaw Other: .....

NHS Lanarkshire

# Critical care PERIPHERAL Noradrenaline infusion chart

Date: ...../...../..... Time: ..... : ..... (24 hour)

| Target Mean arterial pressure (MAP) in mmHg (ideally via Arterial line) ..... | • 20g Cannula minimum above the wrist and not in flexion areas, attach octopus, monitor regularly and watch for extravasation.<br>• 2nd cannula required in case of failure of first cannula<br>• Do not run anything else through same cannula to avoid bolus effect<br>• After discontinuation, flush the peripheral cannula with sodium chloride 0.9% at the same rate the medicine was infused to avoid adverse haemodynamic effects |
|---|---|

A peripheral vasoconstrictor used in septic shock and should only be started following senior clinician guidance & discussion with ICU/HDU – move patient to a critical care area for ongoing infusion and BP measured every 5-10mins until stable and then every 30-60 mins thereafter.

**Section A - Prescription details (to be completed by prescriber) - prescribe concurrently on HEPMA ☐**

| Drug name | Total amount of drug in syringe | Diluent | Total volume of drug and diluent | Drug concentration | Route | Prescriber print and sign |
|---|---|---|---|---|---|---|
| **Noradrenaline** | **4mg (4ml)** | **sodium chloride 0.9%** | **250ml** (remove 4ml fluid from bag prior to adding drug) | **16 micrograms/ml (0.016mg/ml)** | **Peripheral Intravenous Cannula** | |

**Section B - Flow rate details to be verified by prescriber - (see weight based chart overleaf)**

| | Date | Drug dose per hour | Flow rate setting per hour | Drug dose (mcg/kg/min) | Prescriber print & sign |
|---|---|---|---|---|---|
| Initial rate | | | | | |
| Change 1 | | | | | |
| Change 2 | | | | | |
| Change 3 | | | | | |
| Change 4 | | | | | |

**Section C - Preparation details**

| | Date | Time infusion prepared | Prepared by | Checked by |
|---|---|---|---|---|
| Initial preparation | | | | |
| Repeat 1 | | | | |
| Repeat 2 | | | | |
| Repeat 3 | | | | |
| Repeat 4 | | | | |

**Section D - Infusion measurement checks**

| Actual time infusion commenced | Flow rate setting (ml/hr) | Started by | Checked by | Volume on syringe at start of infusion (ml) |
|---|---|---|---|---|
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NMAHP.PNADIC.25_19777L

 Created and designed by N Holt, UHM & reviewed by Jennifer Murphy UHW

Pub. date: Dec. 2025 | Review date: Nov. 2028 | Issue No: 06

| Patient name: | CHI number: |
|---|---|

**Administration checks**

| Date | Time | Volume remaining | Total volume infused | Rate setting (ml/hr) | Checked by | Comments | Date | Time | Volume remaining | Total volume infused | Rate setting (ml/hr) | Checked by | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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**Weight based infusion rate** (ml/hr)** If at maximum dose consider ICU referral, if appropriate & not already done so (source intensive care society)

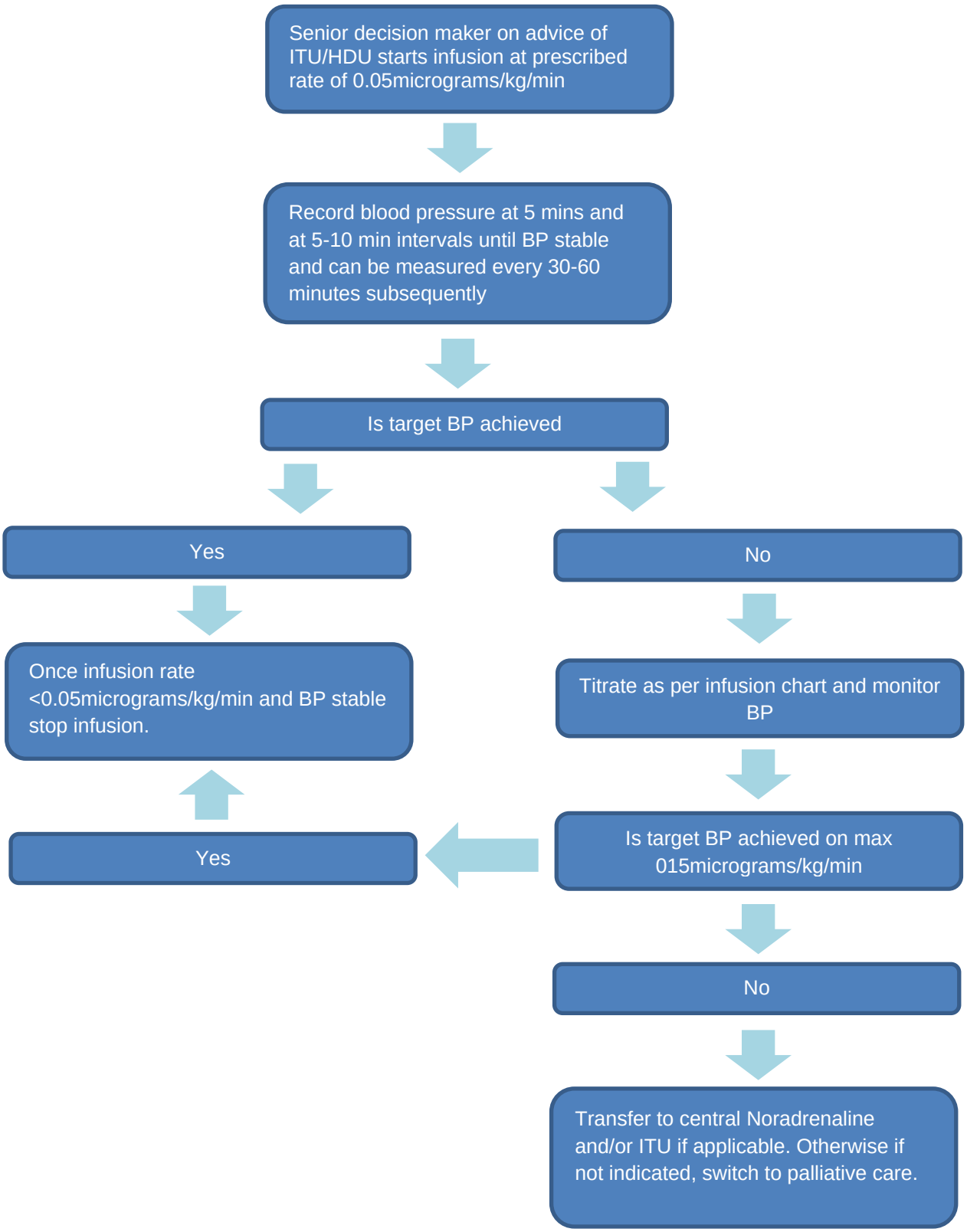
| Weight* (Kg) | Starting dose of 0.05 micrograms / kg / min | 0.10 micrograms / kg / min | Maximum dose of 0.15 micrograms / kg / min |
|---|---|---|---|
| less than 40 | please seek specialist/ critical care consultant advice | | |
| 40 | 7.5 | 15.0 | 22.5 |
| 50 | 9.4 | 18.8 | 28.1 |
| 60 | 11.3 | 22.5 | 33.8 |
| 70 | 13.1 | 26.3 | 39.4 |
| 80 | 15.0 | 30 | 45.0 |
| 90 | 16.9 | 33.8 | 50.6 |
| 100 | 18.8 | 37.5 | 56.3 |
| 110 | 20.6 | 41.3 | 61.9 |
| 120 or greater | 22.5 | 45 | 67.5 |

*round to nearest 10kg for dosing purposes **Round to nearest whole ml if pumps cannot accommodate 1 decimal place

**Section E - Discontinuation**

| Print | Sign | Designation | Date |
|---|---|---|---|
| | | | |

# Peripheral noradrenaline titration flow chart



## References/Evidence

1) Guidance For: The use of Vasopressor Agents by Peripheral Intravenous Infusion in Adult Critical Care Patients, version 1.1, Intensive Care society, Nov 2023

2) D. H. Tian, C. Smyth, G. Keijzers, S. P. Macdonald, S. Peake, A. Udy and A. Delaney, "Safety of peripheral administration of vasopressor medications: A systematic review," Emergency Medicine Australasia, vol. 32, no. 2, pp. 220-227, 2020.

3) S. Hodzic, D. Golic, J. Smajic, S. Sijercic, S. Umihanic and S. Umihanic, "Complications Related to Insertion and Use of Central Venous Catheters (CVC)," Medical Archives, vol. 68, no. 5, pp. 300-303, 2014

4) The Association of Anaesthetists of Great Britain & Ireland, "Safe vascular access 2016," The Association of Anaesthetists of Great Britain & Ireland, London, 2016.

5) Society of Critical Care medicine Critical Care Medicine surviving sepsis campaign 2021
https://journals.lww.com/ccmjournal/fulltext/2021/11000/surviving_sepsis_campaign__international.21.aspx

6) Right decisions Royal Alexandra Hospital, clinical guideline peripheral Nor-Adrenaline 2023, 1092-peripheral-noradrenaline.pdf

7) Cardenas-Garcia, J., Schaub, K.F., Belchikov, Y.G., Narasimhan, M., Koenig, S.J. and Mayo, P.H. (2015), Safety of peripheral intravenous administration of vasoactive medication. J. Hosp. Med., 10: 581-585. https://doi.org/10.1002/jhm.2394

8) NIVAS – National infusion and vascular access guidance on extravasation management - https://vascular-access.files.svdcdn.com/production/images/NIVAS-Infiltration-and-Extravasation-toolkit-version-1-Feb-2024b.pdf?dm=1734439180

# Appendices

## 1. Governance information for Guidance document

| | |
|---|---|
| **Lead Author(s):** | Dr Nicholas Holt, Consultant Physician Acute and General Medicine, Acute Clinical Lead, Clinical Lead Trainer, FAMUS supervisor, Honorary Clinical Lecturer University of Glasgow, University Hospital Monklands |
| **Endorsing Body:** | NHSL ADTC |
| **Version Number:** | 1 |
| **Approval date** | **17th Dec 2025** |
| **Review Date:** | Dec 2028 |
| **Responsible Person (if different from lead author)** | Nick Holt lead author |

| **CONSULTATION AND DISTRIBUTION RECORD** | |
|---|---|
| **Contributing Author / Authors** | Jennifer Murphy, Senior Pharmacist University Hospital Wishaw |
| **Consultation Process / Stakeholders:** | Monklands Site and Lanarkshire Critical Care Delivery groups, Acute Medicine HDU MDT at Monklands, ED consultants on Monklands, Hairmyres & Wishaw Sites, ITU UHM & UWH MDT, UHH ITU leads. NHSL Pharmacy Departments, UHM HMT, Kirklands Med Ed & Training Centre |

| | |
|---|---|
| **Distribution** | Lanarkshire wide |

**CHANGE RECORD**

| Date | Lead Author | Change | Version No. |
|---|---|---|---|
| 15/10/25 | N Holt | *Made the adjustments required from ADTC meeting in expanding abbreviations and clarifying stake holders.* | 1 |
| 26/11/25 | N Holt | Put in dosing for <40kg, added letter to chloride, adjusted box in infusion chart to allow sentence to be complete, changed review date to 3 years | 2 |
| 3/12/25 | N Holt | Adjusted infusion chart as per recommendations i.e. bold lines separating section C and D and administration table, review date, asterix for weight to correspond to below table info, change wording of measurement to volume, on syringe and add guidance on dosing for those patients under 40kg | 3 |
| 24/12/25 | N Holt | Changed the word policy to guideline | 4 |
| | | | 5 |
| | | | |
| | | | |
| | | | |

**2.You can include additional appendices with complimentary information that doesn't fit into the main text of your guideline, but is crucial and supports its understanding.**

e.g. supporting documents for implementation of guideline, patient information, specific monitoring requirements for secondary and primary care clinicians, dosing regimen/considerations according to weight and/or creatinine clearance