

Management of hypertensive emergency

(Does not apply to Hypertensive disorders in pregnancy)

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Definition

- Severe Hypertension BP > 180/ > 110
- With evidence of new or worsening target organ damage
 - **Brain** – Stroke, Hypertensive encephalopathy (Posterior reversible encephalopathy syndrome), Cerebral hemorrhage (Refer to the treatment of hypertension in acute stroke Clinical Business Rule)
 - **Arteries** – Acute aortic dissection
 - **Retina** – Papilledema, Retinal hemorrhage
 - **Kidneys** – AKI, Thrombotic Microangiopathy
 - **Heart** – Pulmonary edema, Acute Coronary Syndrome

Initial Evaluation*

- History – Information on chronic hypertension, current anti-hypertensive regimen, adherence
- Focused Physical exam on neurological and cardio-respiratory systems, Comparison of bilateral pulses, Fundoscopy
- Investigations – ECG, Urinalysis, EUC, FBC, Chest X-ray, Aldosterone-renin ratio, serum metanephrines, TSH, Cortisol

*Treatment must start before all investigation results are available

Management Principles

- In general, aim to lower BP initially to around 160/110mmHg (<180/110 in the first hour and <160/110 over the next 23 hours), to avoid cerebral hypoperfusion if BP falls too quickly.
- Some target organ hypertensive emergencies have strict and specific BP targets
 - Aortic dissection: Initial target systolic BP 100-120mmHg, Heart rate <60 bpm
 - Primary intracerebral haemorrhage: Initial target Systolic BP 140 – 160
- Target organ involved influences the choice of drug
- Commence oral antihypertensive therapy as soon as a response to IV agents is apparent; this allows the smooth transition from IV to oral agents.

Drugs to use

Note these drug recommendations are consistent with current published guidelines, although choice of medications may differ according to availability

1. Best choice: Sodium Nitroprusside (SNiP)

(Refer to *STG SNP Clinical business rule CLIN066*)

- a. Mechanism: Predominantly arteriolar vasodilator
- b. Preparation:
 - i. Central line: 20mg SNiP in 49ml 5% Dextrose = 400microg/ml
 - ii. Peripheral line: 50mg SNiP in 500 to 1000ml 5% dextrose = 50 to 100microg/ml
- c. Dose and titration: 0.5 – 10 microg/kg/min IV. Start at 0.5microg/kg/min with upward titration every few minutes until desired effect has been achieved or maximum dose of 10microg/kg/min
- d. Onset of action: Immediate
- e. Duration of action: 2-3 minutes
- f. Practice points – Preferably intra-arterial BP in monitored unit, but start treatment first, insert arterial line later, Wrap syringe and lines in foil as SNP is light sensitive
- g. Pharmacodynamics: Hepatic and renal excretion, use no longer than 24 hours in kidney failure
- h. Adverse reactions: Thiocyanate toxicity (Delirium, blurred vision, tinnitus), Therefore treatment is no longer than 24-48 hours
- i. SNP infusion rates table below (From CLIN066 Clinical business rule)

		microg/kg/min to mL/hr Conversion Table (SINGLE STRENGTH)							
		Body Weight (kg)							
		50	60	70	80	90	100	110	120
Dose (Microg/kg/minute)	0.3	2.25	2.7	3.15	3.6	4.05	4.5	4.95	5.4
	0.8	6	7.2	8.4	9.6	10.8	12	13.2	14.4
	1.3	9.75	11.7	13.65	15.6	17.55	19.5	21.45	23.4
	1.8	13.5	16.2	18.9	21.6	24.3	27	29.7	32.4
	2.3	17.25	20.7	24.15	27.6	31.05	34.5	37.95	41.4
	2.8	21	25.2	29.4	33.6	37.8	42	46.2	50.4
	3.3	24.75	29.7	34.65	39.6	44.55	49.5	54.45	59.4
	3.8	28.5	34.2	39.9	45.6	51.3	57	62.7	68.4
	4.3	32.25	38.7	45.15	51.6	58.05	64.5	70.95	77.4
	4.8	36	43.2	50.4	57.6	64.8	72	79.2	86.4
	5.3	39.75	47.7	55.65	63.6	71.55	79.5	87.45	95.4
	5.8	43.5	52.2	60.9	69.6	78.3	87	95.7	104.4
	6.3	47.25	56.7	66.15	75.6	85.05	94.5	103.95	113.4
	6.8	51	61.2	71.4	81.6	91.8	102	112.2	122.4
	7.3	54.75	65.7	76.65	87.6	98.55	109.5	120.45	131.4
	7.8	58.5	70.2	81.9	93.6	105.3	117	128.7	140.4
8.3	62.25	74.7	87.15	99.6	112.05	124.5	136.95	149.4	
8.8	66	79.2	92.4	105.6	118.8	132	145.2	158.4	
9.3	69.75	83.7	97.65	111.6	125.55	139.5	153.45	167.4	
9.8	73.5	88.2	102.9	117.6	132.3	147	161.7	176.4	
10	75	90	105	120	135	150	165	180	

- 2. If associated angina/Acute pulmonary oedema: Glyceryl trinitrate (GTN)**
 - a. Mechanism: Predominantly venodilator
 - b. Dose and titration: 50mg in 500ml 5% Dextrose or saline (i.e. 100microg/ml), start at 600microg (6ml/hr) to max dose of 50ml/hr, Increase by 600microg every 3-5 minutes
 - c. Adverse effects: Headaches, Tachycardia, Nausea, vomiting, restlessness
 - d. Note IV GTN is ideal for hypertensive emergency with angina, but not considered to be best choice of IV treatment in general due to rapid tachyphylaxis

- 3. If associated with primary intracerebral haemorrhage: First line – IV Labetalol (Refer to SGH acute ischaemic stroke and primary intracerebral haemorrhage hypertension management CBP CLIN635)**
 - a. Labetalol: Selective alpha1 and non-selective beta1 and beta 2 antagonist
 - b. Contra-indications: Bradycardia – HR <60, Severe Asthma
 - c. IV Labetalol 10 to 20mg boluses every 5 minutes, Max dose 300mg/24 hours (OR Metoprolol IV boluses, THEN IV Hydralazine boluses – see no. 5)
 - d. If BP not controlled, then start Labetalol infusion (Refer to SGH ICU Labetalol infusion CBR CLIN048)
 - e. If Labetalol ineffective, switch to Sodium nitroprusside infusion (Refer to SGH ICU SNP CBR CLIN066)

- 4. If associated with subarachnoid haemorrhage (SAH)**
 - a. Generally, in neurosurgery patients, vasodilators such as SNIp and GTN are avoided due to increased risk of Intracranial pressure from increased blood volume
 - b. Preferred agents include IV Labetalol or Clevidipine
 - c. Oral (or via NG) Nimodipine 60mg Q4 hourly within 48 hours of aneurysmal SAH for morbidity and mortality reduction (Mechanism of action largely unknown)

- 5. If associated with aortic dissection**
 - a. Administer Anti-impulse therapy – Aims to reduce velocity of left ventricular contraction, decrease shear stress and minimise lesion progression
 - b. IV beta-blockers first-line therapy to reduce HR <60 – Labetalol, Esmolol (Esmolol safer in Asthma/Heart failure)
 - c. If after beta-blockade – SBP remains elevated, add SNIp infusion to achieve target SBP 100 – 120
 - d. Avoid Hydralazine as this increases aortic wall shear stress

6. Other Options (Not an exhaustive list)

a. Hydralazine

- i. Mechanism: Direct arteriolar vasodilation
- ii. IV 5mg boluses every 20 minutes, Maximum 20mg
- iii. If no response, use hydralazine infusion – (80 mg in 500 mL N/saline) @ 1-5 mg/hr (6-30 ml/hr)
- iv. Side effects: Flushing, Tachycardia, headache

b. Metoprolol

- i. Mechanism: Selective B1 blocker, little or no effect on B2 at PO doses <100mg
- ii. IV 5mg bolus given over 2-3 minutes
- iii. Repeat at 5-minute intervals up to maximum 20mg
- iv. Practice points – Monitor with Telemetry during treatment, ensure no contra-indications to beta-blocker (e.g. severe asthma), Excreted renally, therefore monitor for bradycardia in patients with kidney failure

c. Esmolol

- i. Mechanism: Cardio-selective B1 blocker, Safer in Asthma/Heart failure
- ii. Preparation: 10ml vial (100mg/ml) diluted in 100ml Sodium Chloride 0.9% or Glucose 5% (i.e. 10mg/ml)
- iii. Loading dose of 0.5mg/kg/min for 1 minute, then 0.05mg/kg/min and titrate to maximum dose of 0.2mg/kg/min
- iv. Stable 24-hour infusion

d. Clevidipine

- i. Mechanism: Dihydropyridine calcium channel blocker with potent arterial vasodilating activity
- ii. Quick onset and offset, Refer to ICU Protocols

e. IV Clonidine – Central alpha-2 adrenoceptor agonist, has analgesic and anxiolytic effect in addition to BP lowering, refer to ICU protocols

References

1. Wilson LM, Herzig SJ, Steinman MA, Schonberg MA, Cluett JL, Marcantonio ER, et al. Management of Inpatient Elevated Blood Pressures : A Systematic Review of Clinical Practice Guidelines. *Annals of internal medicine*. 2024;177(4):497-506.

Relevant St George Hospital clinical business rules

- 1) Acute Ischaemic stroke and primary intracerebral hemorrhage blood pressure management, SGH CLIN635
- 2) Labetalol Intravenous – Prescribing and Administration in specific critical care areas, SGH CLIN048
- 3) Sodium Nitroprusside (SNP) – Prescribing and administration and administration in specific critical care areas, SGH & TSH, CLIN066
- 4) Hypertension in pregnancy, SGH&TSH WCH BR 048