Blood Pressure Refresher

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GP SYNERGY
advancing medical training

Australian Government
Department of Health

AGPT

Acknowledgment of Countries

‘As we meet here today on the many nations known as their respective countries and homes, we would like to acknowledge the many traditional custodians of these countries; who have a longstanding cultural heritage and relationship with the rivers, lands and seas.

We would also like to pay our respects to our Elders (past and present) and who may be joining us, remembering those who have gone before us; and the emerging leaders of tomorrow.

We extend our respects to our Aboriginal and Torres Strait Islander brothers and sisters and our non-Aboriginal and Torres Strait Islander brothers and sisters here with us today’

Learning objectives

By the end of this session, you will be able to

1. Recognise the physiological mechanisms controlling blood pressure
2. Describe how to accurately measure BP
3. Confidently assess possible causes and consider management of hypotension and hypertension in ward scenarios
4. Describe basic principles in managing hypertensive emergencies
5. Describe basic principles in chronic hypertension management

GP SYNERGY

Let’s get Physiological

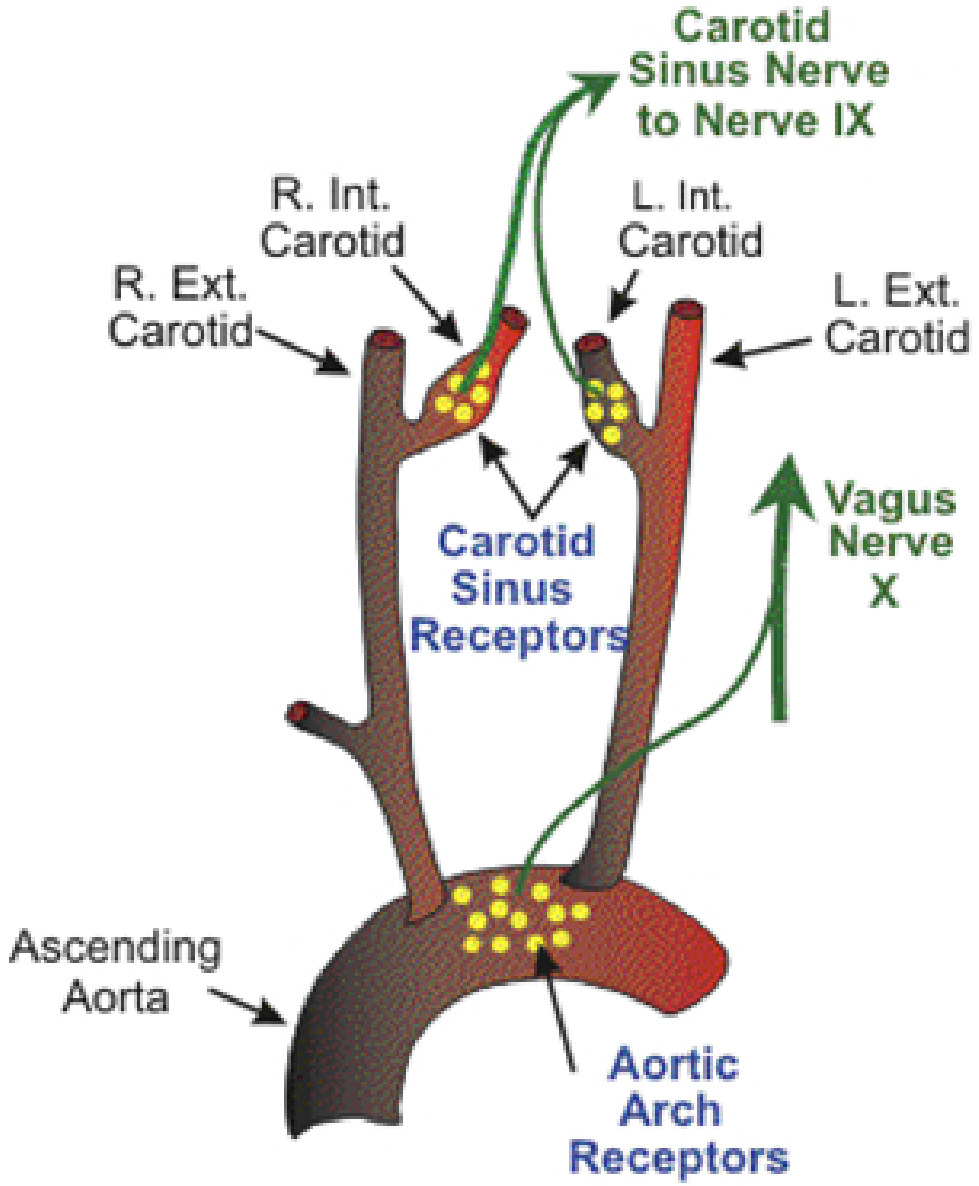


Figure 1. Location and innervation of arterial baroreceptors.

Control of BP

- Short Term
  - Short term drop
    - Barroreceptor v
    - Sympathetic response
  - Short term increase
    - Barroreceptor ^
    - Autonomic nervous system response
- Longer
    - Renin- Angiotensin
    - Aldosterone

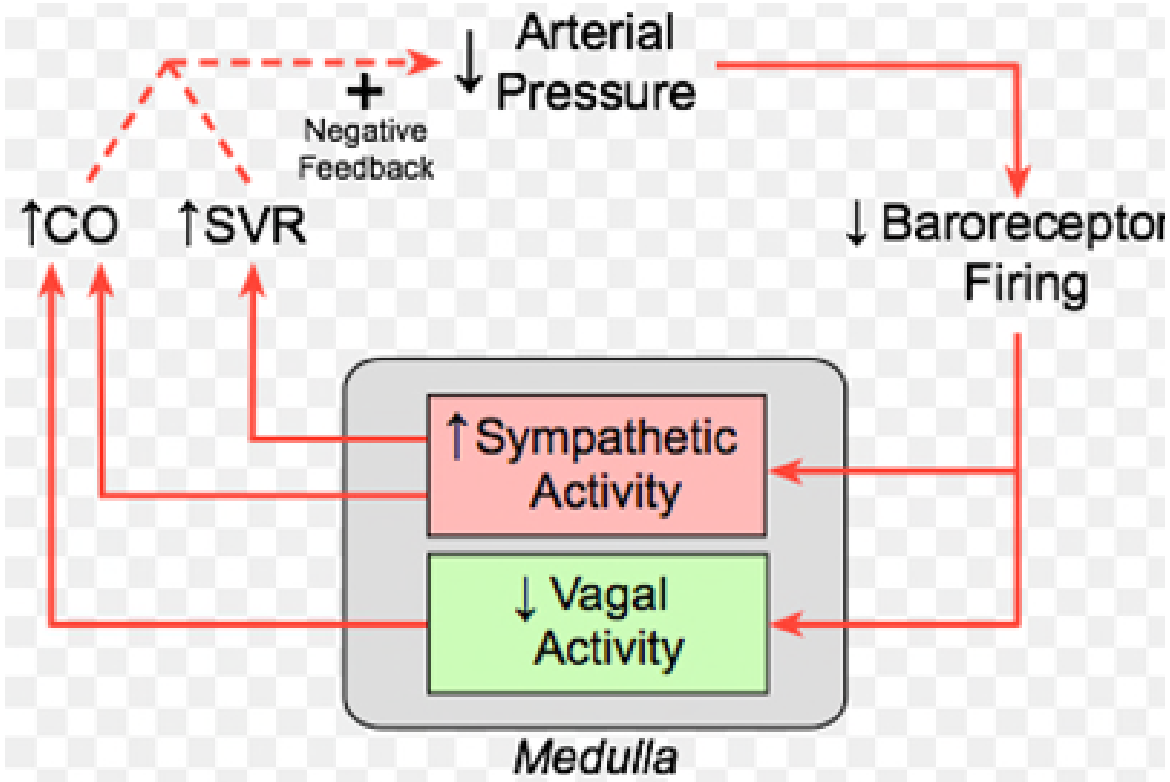


Figure 3. A sudden decrease in arterial pressure decreases baroreceptor firing, which activates sympathetic neurons and inactivates vagal neurons in the medulla. The resulting increases in CO and SVR act as a negative feedback mechanism to attenuate the fall in arterial pressure.

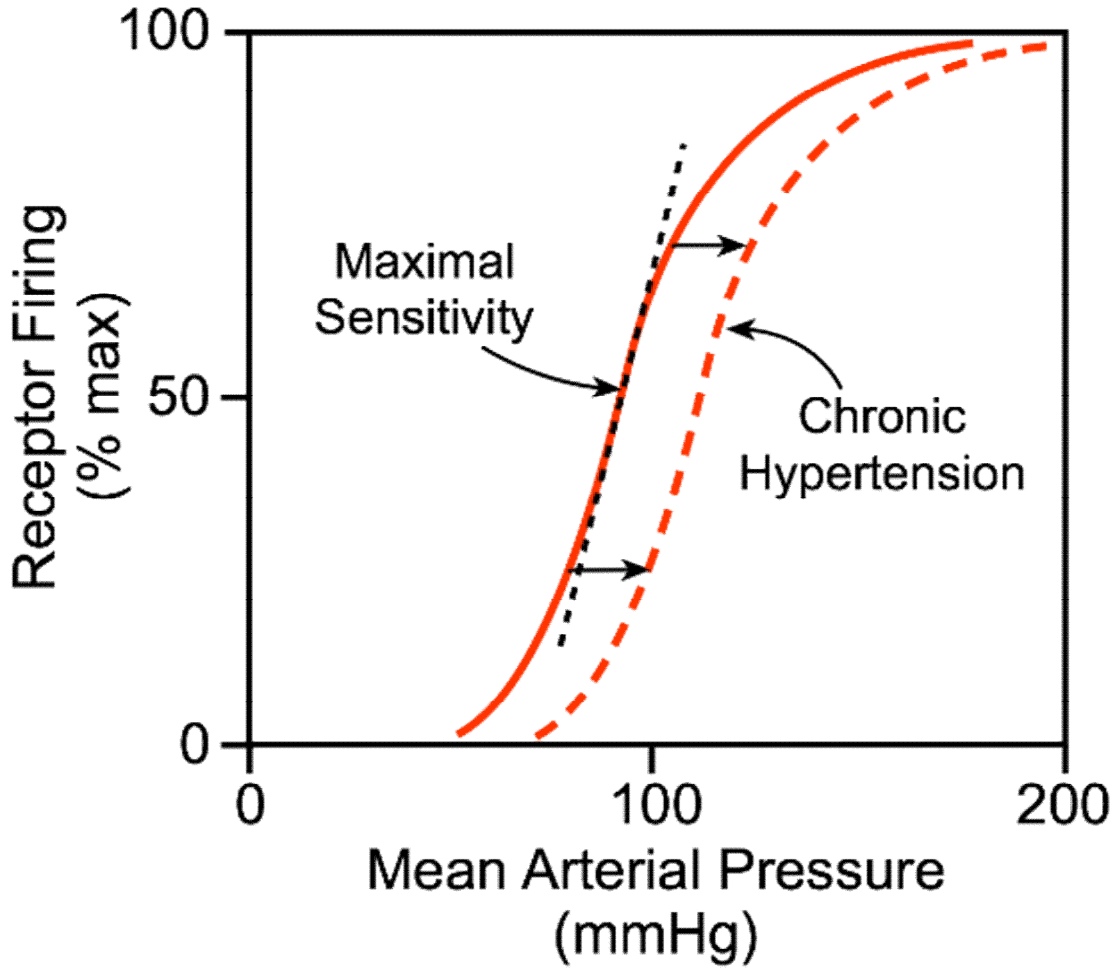
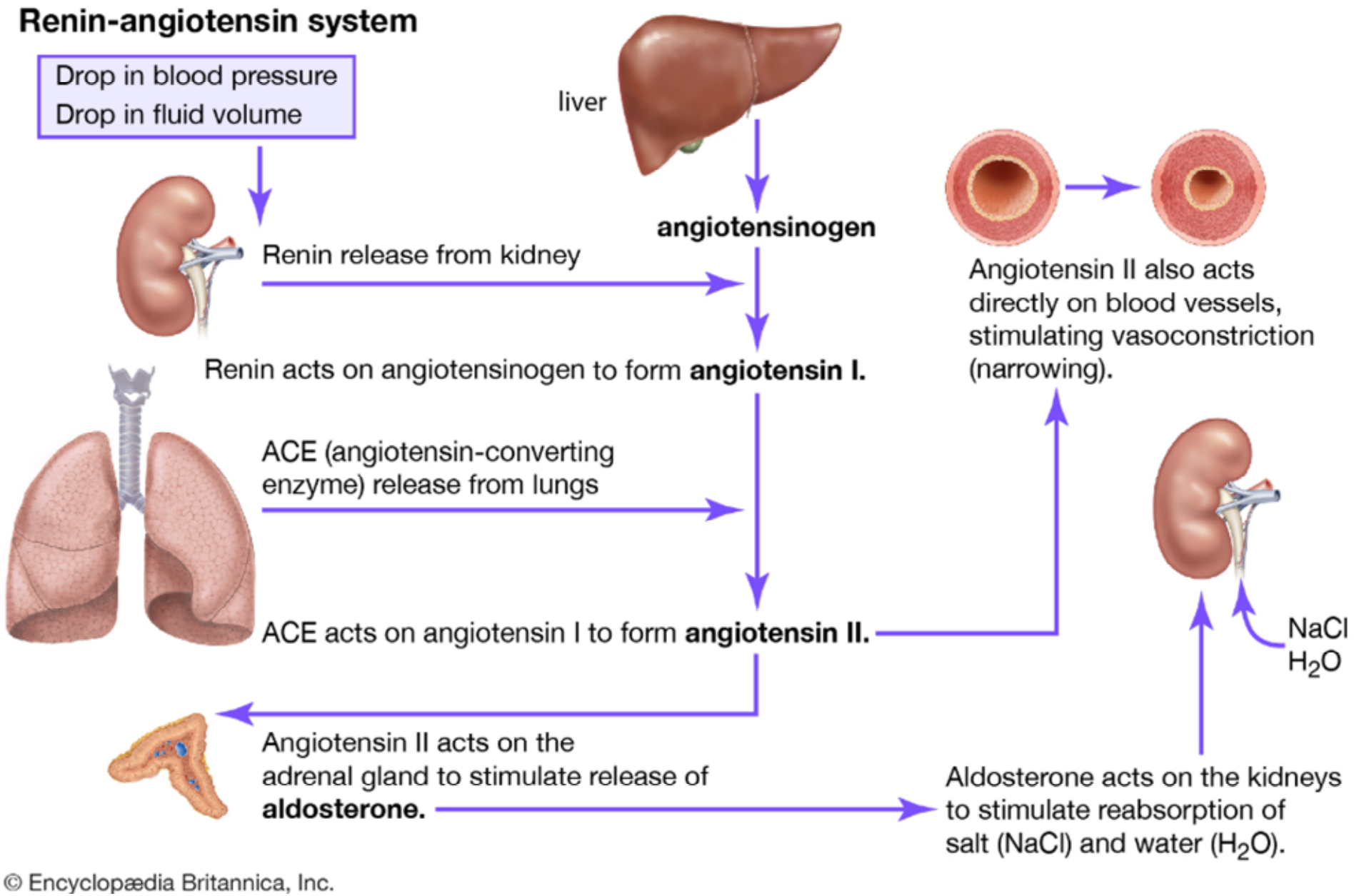


Figure 2. Effects of arterial pressure on carotid sinus firing rate. Maximal baroreceptor sensitivity (dashed black line) occurs near normal mean arterial pressure. Chronic hypertension shifts curve to right (dashed red line).

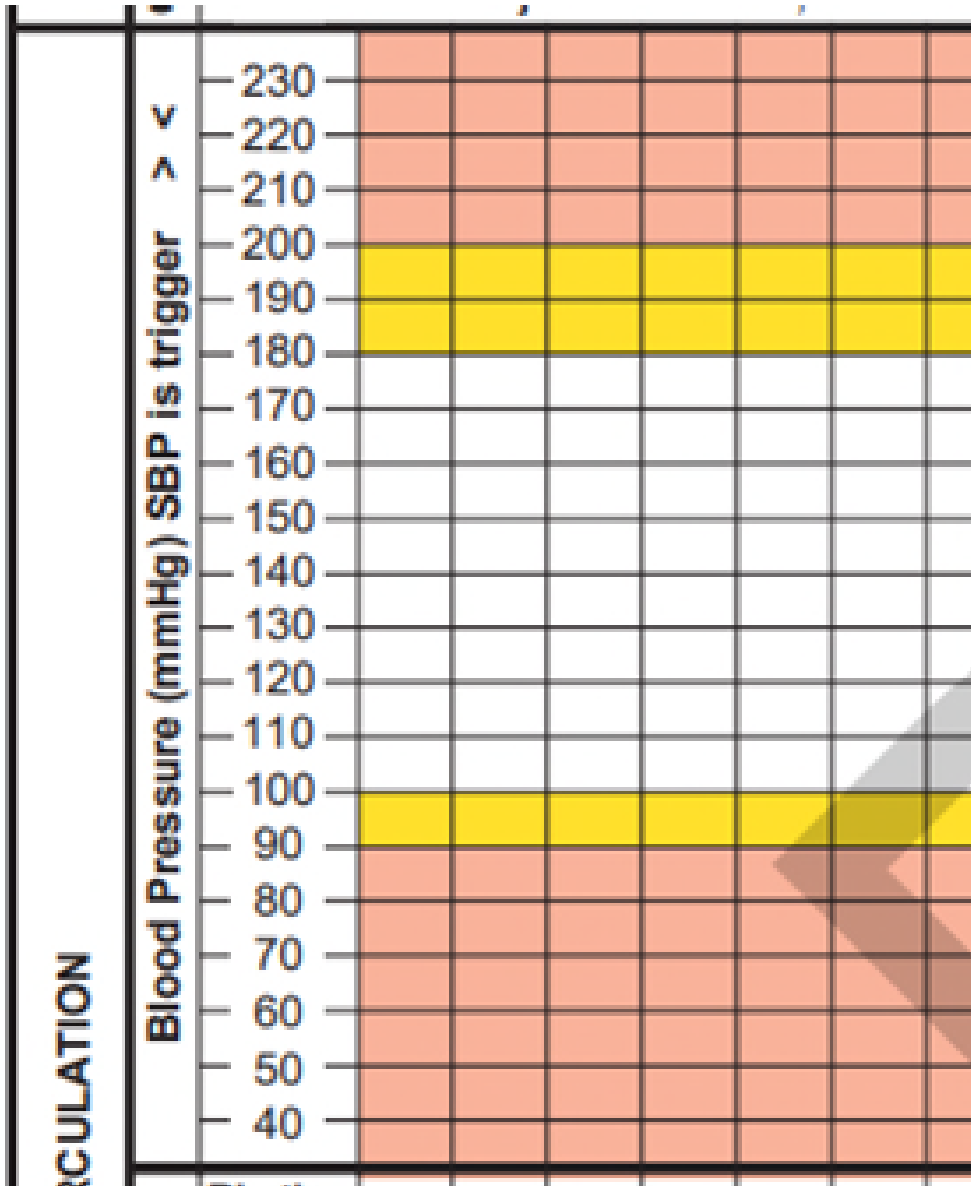


https://www.britannica.com/science/renin-angiotensin-system

Hypotension

Ward Call

- I Nurse Ben from ward 6 calling about Mr JB, 68yo smoker
- S Day 1 post knee washout for septic arthritis, on paracetamol for pain relief
- B Normally well, takes only metformin, no allergies
- A This morning has a BP of 84/40 (repeated reading) Dizzy and unwell
- R Can you please review or recommend a course of action


CULATION
Blood Pressure (mmHg) SBP is trigger > <
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40

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What are the issues / Your initial thoughts

- Are they otherwise stable?
  - Other Obs
  - Why are they in hospital?
- Are they symptomatic
  - Pain?
  - Anxiety
  - Fever
- Have they had any medication changes?
- Do they have a cannula?

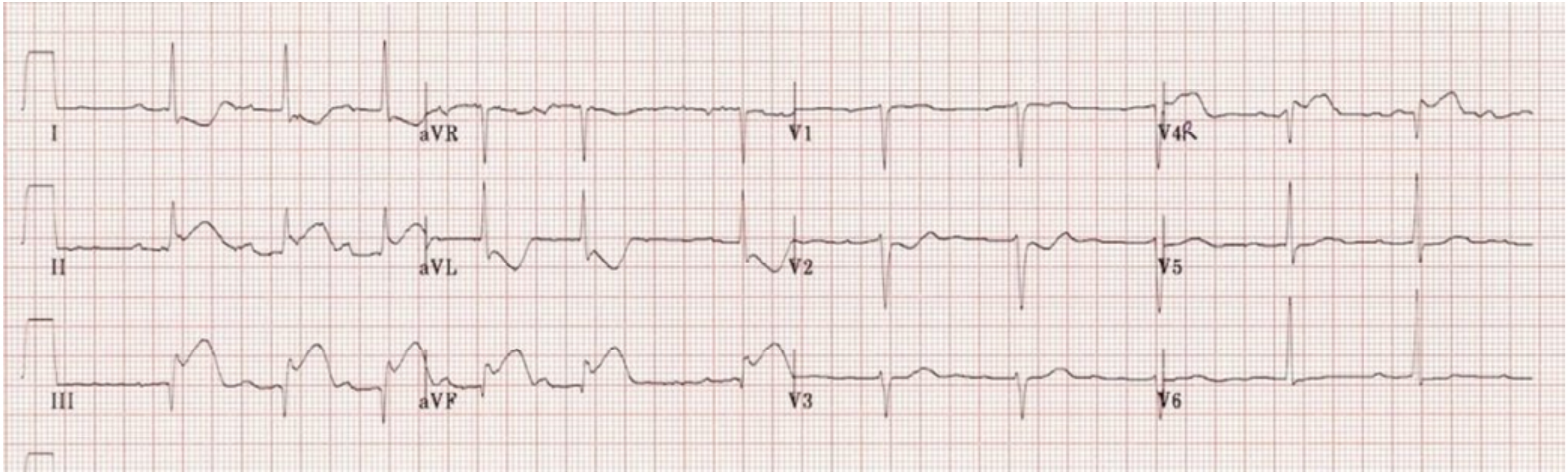
What do you need to know?

- Red flags?
  - LOC
  - Loss of fluid (blood/ vomit)
  - anaphylaxis/sepsis
  - Neurological symptoms/ seizures
  - Chest pain
  - Pregnancy
  - Nausea and vomiting
  - Recent surg

  - Repeat the OBS- Postural

Assessment

- Not well to look at- pale
- Sats 99% RA and HR 115
- Thready pulse ? Irregular
- BSL 10.2
- BP 140/80 normally- now 84/40 (both arms)
- Checked med chart: No meds to cause BP drop
- IV in
- Urine Output stable



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Assessment over the phone

- Position patient for repeat BP and repeat the BP
- What is the definition of Hypotension?
  - Is this MET criteria?
- Look at the chart- what other obs ? What is the trend?
    - UO
    - intake
- Consider ECG and Glucose
- Don’t delay your assessment or calling your registrar

Case 1

- 28 yo woman
- ED
- Abdo pain
- 80/40

Case 2

- 78 yo woman on ward
- Bowel obstruction, vomiting
- 90/40

Other Hypotensive situations…

- 28 yo man
- Multiple fractures post motorbike accident
- Waiting for ORIF R arm on ward
- 80/50, SOB, inc WOB

Principles

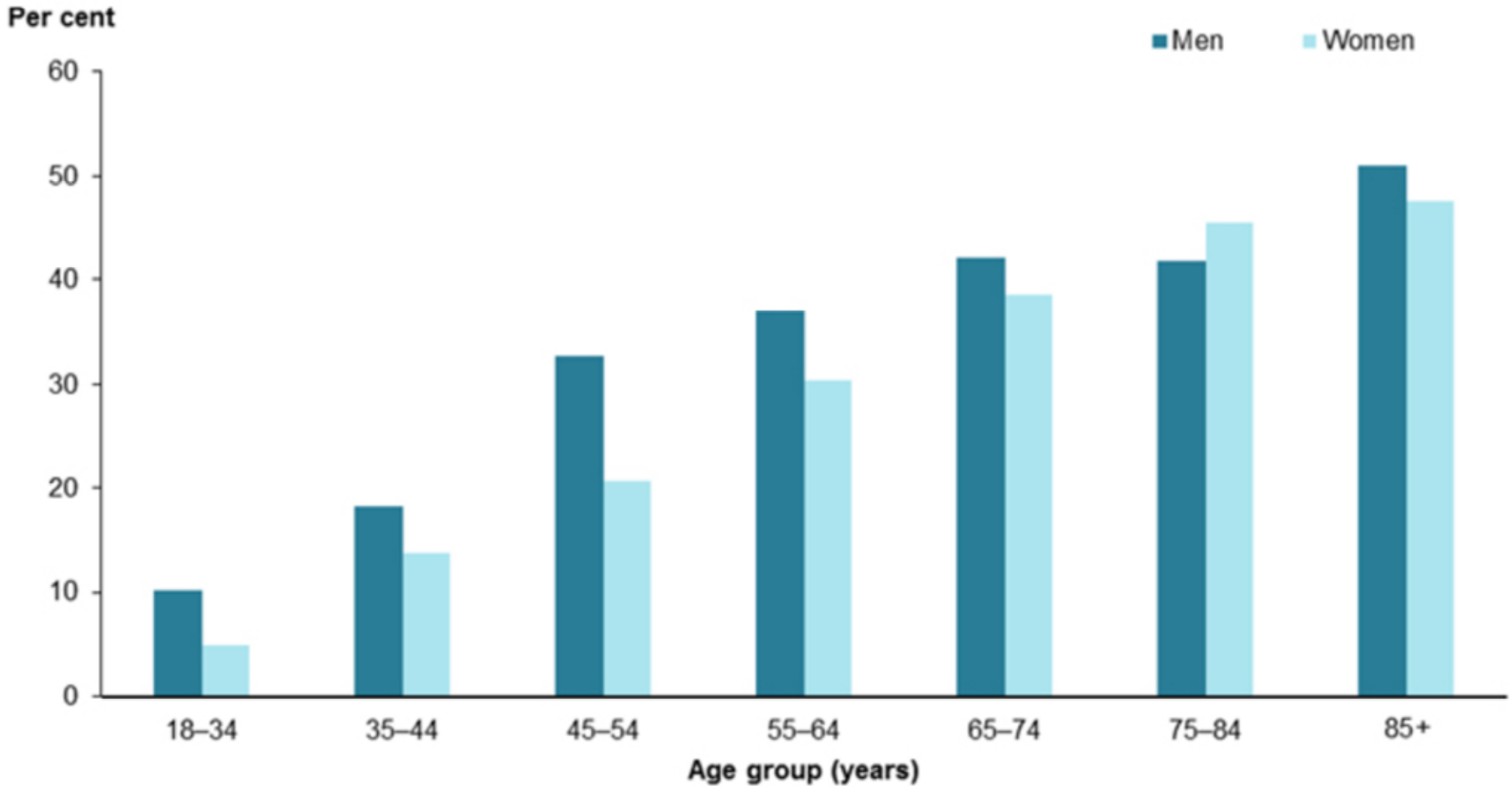
- Look at Obs and pattern
- MET/ clinical escalation team if meet criteria
- Look at the patient!
- ?IV ?glucose
- Med chart
- Call your senior to assist

Hypertension

Hypertension in Australia

- ✓ 6 million Australians
  - ✓ Taking meds
- ✓ 25% Aboriginal and Torres Strait Islander patients have uncontrolled HT

Figure 2: Prevalence of uncontrolled high blood pressure among adults, by age and sex, 2017–18

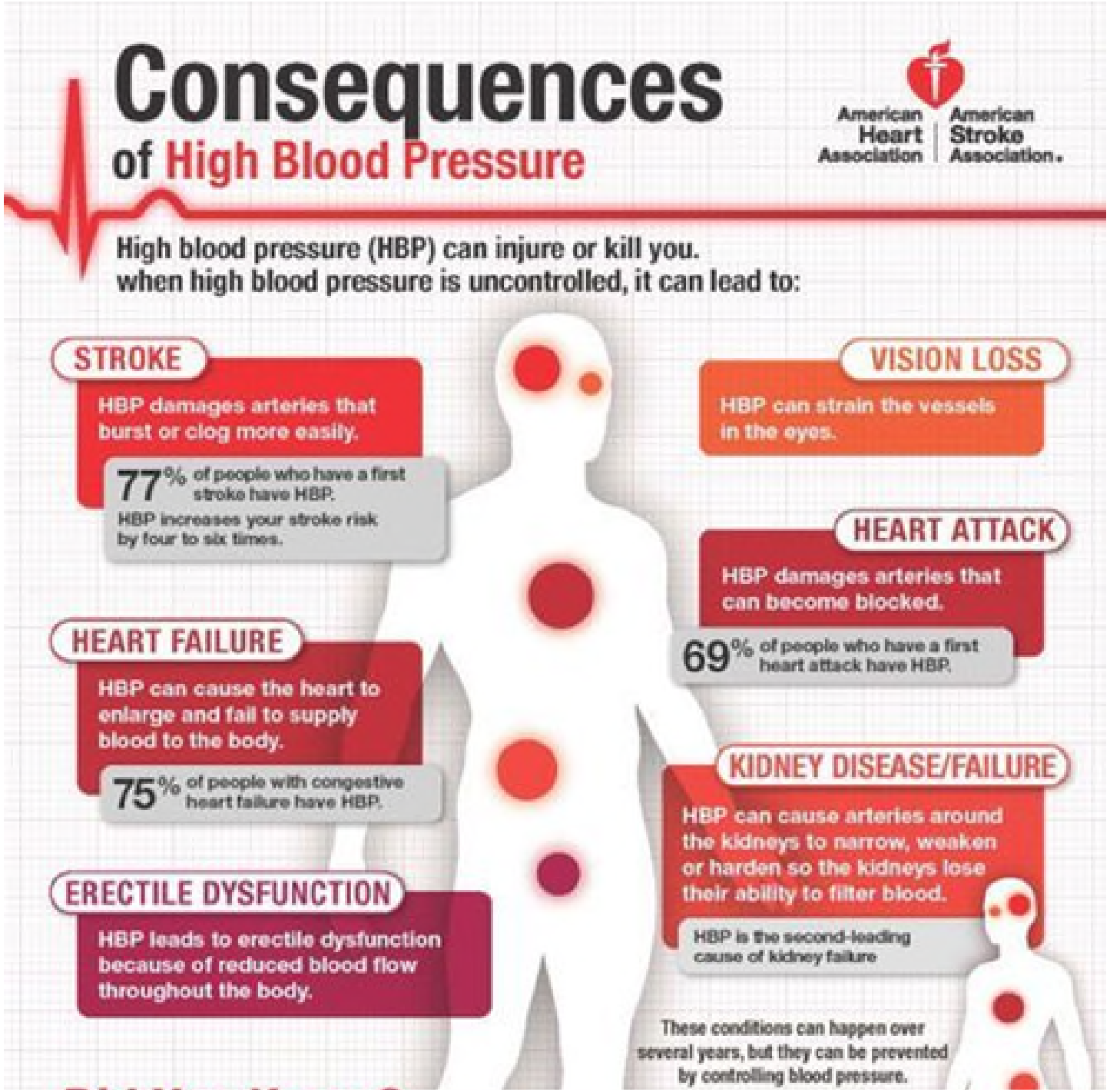


Source: ABS 2018a: AIHW analysis of ABS 2019 (see Table S2 for footnotes).

Hypertension

- Increases with age
- Prevalence in Australia- 1:4 men, 1:5 women
- Low socioeconomic areas had highest rate of BP (24%)

Based on measured data from the 2017–18 Australian Bureau of Statistics National Health Survey, about 1 in 3 people aged 18 and over (34%) have high blood pressure.
https://www.aihw.gov.au/reports/risk-factors/high-blood-pressure/contents/high-blood-pressure


Consequences
of High Blood Pressure
American Heart Association
American Stroke Association
High blood pressure (HBP) can injure or kill you.
when high blood pressure is uncontrolled, it can lead to:
STROKE
HBP damages arteries that burst or clog more easily.
77% of people who have a first stroke have HBP.
HBP increases your stroke risk by four to six times.
VISION LOSS
HBP can strain the vessels in the eyes.
HEART ATTACK
HBP damages arteries that can become blocked.
69% of people who have a first heart attack have HBP.
HEART FAILURE
HBP can cause the heart to enlarge and fail to supply blood to the body.
75% of people with congestive heart failure have HBP.
KIDNEY DISEASE/FAILURE
HBP can cause arteries around the kidneys to narrow, weaken or harden so the kidneys lose their ability to filter blood.
HBP is the second-leading cause of kidney failure
ERECTILE DYSFUNCTION
HBP leads to erectile dysfunction because of reduced blood flow throughout the body.
These conditions can happen over several years, but they can be prevented by controlling blood pressure.

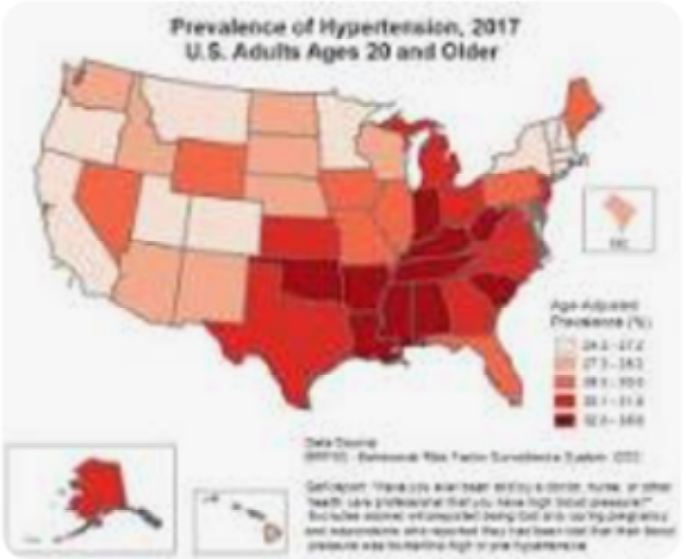
What is the definition of Hypertension ?

Australian definition vs US definition

Definitions>140/90

- Australia:
  - **>140/90**
  - Mortality doubles with every increment 20/10mm Hg from 115/75
  - >130/80 if diabetic with proteinuria (or end organ effects)

Nearly half of adults in the **United States** (108 million, or 45%) have **hypertension defined** as a systolic **blood pressure** ≥ 130 mm Hg or a diastolic **blood pressure** ≥ 80 mm Hg or are taking medication for **hypertension**. Sep 8, 2020



https://www.cdc.gov › bloodpressure › facts

Facts About Hypertension | cdc.gov

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What’s in a name?

- -pril = ACEi e.g. Ramipril, Captopril
- -edipine = CCB e.g. Amlopidine, Nifedipine
- -artan = ARB e.g. Candesartan, valsartan
- -olol = Beta Blocker e.g. Bisoprolol, metoprolol

Ward Call

- I Nurse Ben from ward 6 calling about JB, 58yo
- S D3 post knee washout for septic arthritis, on paracetamol for pain relief
- B Normally well, takes only citalopram, no allergies
- A This morning has a BP of 184/110 (repeated reading)
- R Can you please review or recommend a course of action

What are the issues / Your initial thoughts

- Are they otherwise stable?
  - What are the other obs
  - Why are they in hospital?
- Are they symptomatic- headache?
  - Pain?
  - Anxiety
- Have they had any medication changes?

What are the issues / Your initial thoughts

- Red flags?
  - Headache
  - Head injury
  - Neurological symptoms/ seizures
  - Signs of stroke
  - Chest pain
  - Pregnancy
  - Nausea and vomiting

Assessment 184/110

- Position patient and repeat the BP
  - Back support
  - No talking
  - Complete rest
- Look at the chart- what is the trend?
- Chest – chest pain, pul odema, vision, neurological function
- ?Anxiety? Pain? Missed med? Reading inaccurate
- May be ok to recheck of they look well and are asymptomatic

BP remains high 181/101

- How urgent is urgent?
- Definitions of hypertensive urgency verse emergency?
- Specific scenarios
  - Neurosurg
  - Ophthal

BP remains high 181/101

- How urgent is urgent?

- Specific scenarios
  - Neurosurg
  - ophthal

Rapid reduction of an elevated blood pressure may cause more harm than good.

Goal

- BP reduction hours to days
- Aim: Below 160/100
- Check ECG, UA, LFTS, EUCs to exclude end organ damage
- Can give normal medication if they haven't had their antihypertensives
- Stay low, avoid falls!

	Severely elevated BP without symptoms
Typical blood pressure (mmHg)	180/110 or higher
Symptoms [NB3]	not present
End-organ damage or dysfunction [NB4]	not present
Immediate threat to life	no [NB5]
Timeframe to achieve initial BP reduction	1 to 2 days [NB5]
Initial management goals	reduce BP to a safe level, usually below 180 mmHg systolic
Drug delivery route	oral
Management setting	primary care, with follow-up within days [NB5]

Medications for hypertensive urgency BP >180/110

1	nifedipine immediate-release 10 mg orally [Note 1]	
	OR	
2	captopril 12.5 mg orally	
	OR	
2	clonidine 100 micrograms orally	
	OR	
2	prazosin 2 mg orally.	

Where you may deviate from guidelines…

Factors to consider in the management of severe hypertension (Table 3.7)

The following factors may increase the risk of complications in a patient with severe hypertension:

- extreme blood pressure elevation (eg higher than 280 mmHg systolic)
- coagulopathy
- anticoagulant or antiplatelet therapy
- recent or imminent fibrinolysis
- previous or current left ventricular failure
- kidney impairment
- aneurysm (particularly aortic or intracranial)
- aortic dissection
- recent vascular or surgical procedure that required strict periprocedural control of blood pressure
- pregnancy

In this patient

- Pain relief
- Recheck
- Discuss with senior
  - Keep them in until resolved, depending on risk of complications

Hypertensive emergency

- Ambulance (if in community)- inpatient management
- BP >180/110 with end organ damage OR 220/140+
  - End organ changes (Encephalopathy, APO, papilledema, CVA, renal injury or Aortic dissection)
- Reduce by no more than 25% in first 2 hours
- Insert art line for invasive BP monitoring. Principle is short acting and rapid onset, until the infusion is ready, consider bolus in the interim:

1. hydralazine 1 mg intravenous bolus, repeated every minute as required up to a maximum total dose of 5 mg

   OR

2. metoprolol tartrate 1 mg intravenous bolus, repeated every minute as required up to a maximum total dose of 5 mg.

How to accurately measure BP

Measuring Blood Pressure properly takes 10 minutes

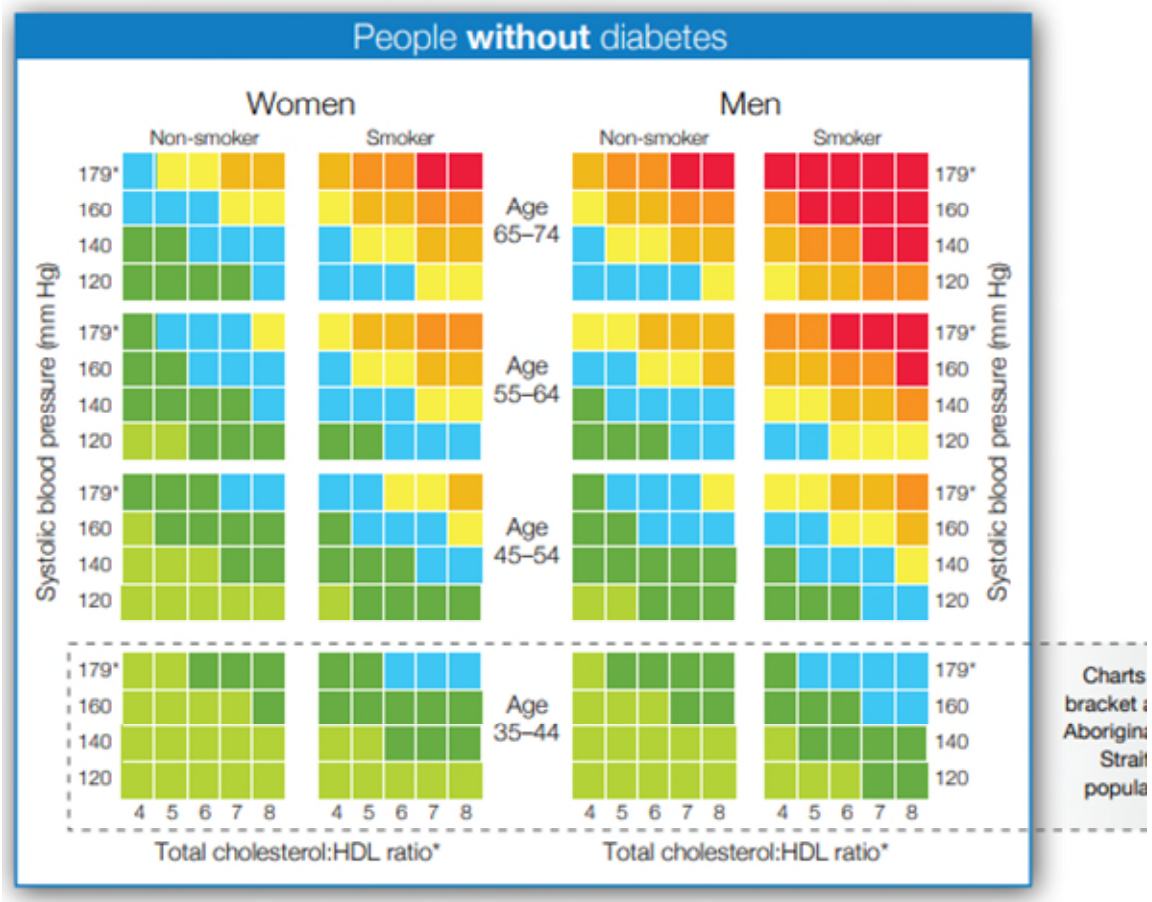
- Seated patient
- Back support
- Feet flat on floor (legs crossed- 5-8mmHg)
- Empty bladder
- No caffeine/exercise/cigarette 30 mins
- NO TALKING
- No clothing on the arm, support it on a table
- Cuff size and position
- ?Doctor leaves the room

Readings

- Average more than 2 readings
- More than 2 occasions- at least 1 minute apart
- Manual BP on the ward
- Role for ambulatory monitoring?

Medications that raise BP

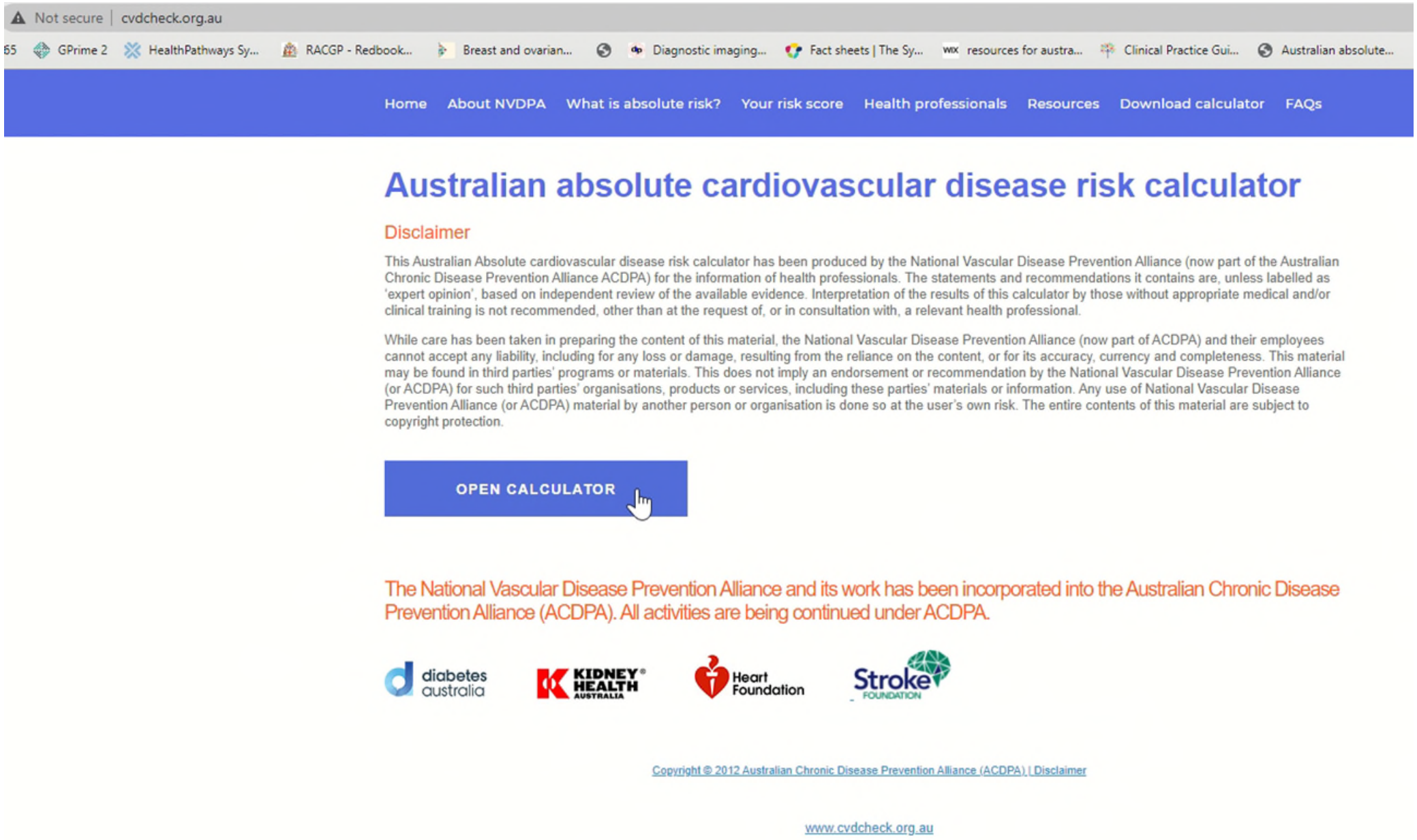
- Alcohol
- Amphetamines
- Antidepressants (TCA)
- Clozapine/olanzapine
- Caffeine
- Decongestants
- OCP
- NSAIDs
- Steroids



* In accordance with Australian guidelines, patients with systolic blood pressure ≥180 mm Hg, or a total cholesterol of >7.5 mmol/L, should be considered at clinically determined high absolute risk of CVD.

Risk level for 5-year cardiovascular (CVD) risk

High risk	Moderate risk	Low risk
≥30%	10–15%	5–9%
25–29%		< 5%
20–24%		
16–19%		


Not secure | cvdcheck.org.au
GPrime 2
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For specific population groups, additional recommendations include:

1. Commence assessment in **Aboriginal and Torres Strait Islander adults** at 35 years (rather than 45 years). Although the Framingham Risk Equation might underestimate risk in this population, available evidence suggests that this approach will provide an estimate of minimum cardiovascular risk.
2. Conduct assessments in **adults with diabetes** aged 45—60 years (rather than 45—74 years). Although the Framingham Risk Equation might underestimate risk in this population, available evidence suggests that this approach will provide an estimate of minimum cardiovascular risk.
3. In adults who are **overweight or obese**, the results of the assessment should be interpreted with the awareness that its predictive value has not been specifically assessed in this population.
4. In adults with **atrial fibrillation** (particularly those aged over 65 years), an increased risk of cardiovascular events and all-cause mortality, in addition to thromboembolic disease and stroke, should be taken into account. While cardiovascular disease risk is known to be elevated for this population, it is not possible to quantify the degree of additional cardiovascular disease risk in an individual. Clinical judgement is necessary when assessing overall cardiovascular risk.

When to initiate Medication

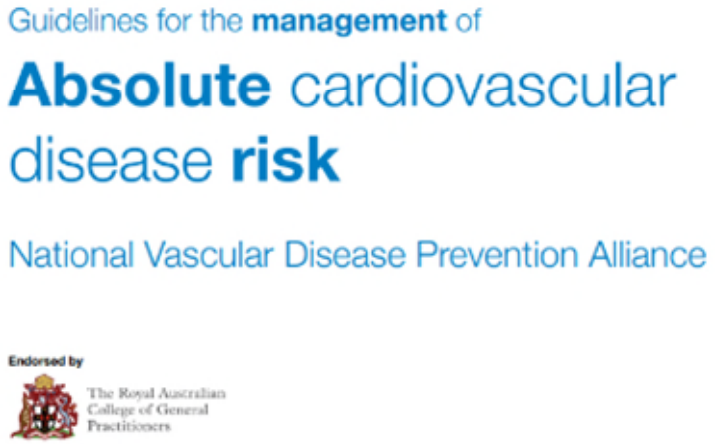
- Automatically high risk
  - >180/110
  - Renal disease GFR <45
  - CVS/Neuro vasc disease
  - LVH
  - Albuminuria
  - Chol 7.5 +
  - Diabetic patients older than 60y
    - Targets in diabetes are lower- <130/80

When to initiate

- High Risk (15% in 5 years)

- Moderate risk
  - Plus fam Hx
  - BP 160/100
  - Or ATSI

- Low risk
  - 160/100 +



Choice of BP Medication

- Usually ACE/ ARB (don’t combine these 2!)
  - Then Ca blocker /thiazide
  - Thiazides effective in elderly
    - Assoc w T2DM onset in age <65yo
  - Consider combination treatment if persistently over 20/10mmHg
  - Follow up with GP!

Non Drug/ Lifestyle Modifications to lower BP

- Healthy eating
  - DASH (Dietary Approaches to Stop Hypertension) diet full of grains/vegetables
  - SBP 11mmHg
- Drop alcohol consumption
  - 4mmHg
- Exercise (cardio/dynamic/isometric)
  - Up to 15mmHg
- Na restriction
  - About 21% of high blood pressure burden in Australia in 2015 is due to a diet high in sodium—higher for men (23%) than women (17%)—based on unpublished estimates from the Australian Burden of Disease Study (ABDS) (see Burden of disease)
- Weight Loss (1mmHg for 1kg)

Tips

- Know common options/ doses

- Ramipril
- Frusemide
- Amlodipine

- Start low and go slow

- a) The main benefits of BP-lowering therapies are due to the reduction of BP and are largely independent of the drugs employed; b) Thiazide diuretics, calcium channel blockers (CCB), angiotensin-converting enzyme (ACE) inhibitors, and angiotensin receptor blockers (ARBs) have similar BP-lowering outcomes and significantly reduce cardiovascular morbidity and mortality

Escalation

- Expect a 10mmHg change
- **Add a second agent** from a different class if ruled out:

- non-adherence
- undiagnosed secondary causes of raised blood pressure
- hypertensive effects of other drugs
- treatment resistance due to sleep apnoea
- undisclosed use of alcohol or recreational drugs
- unrecognised high salt intake (particularly in patients taking ACE
- 'white coat' raised blood pressure
- technical factors affecting measurement
- volume overload, especially with CKD

Escalation

- **Adding a low dose of a second drug is more effective than increasing the dose of the initial drug**

The following combinations are effective and pharmacologically complementary:

- a thiazide or thiazide-like diuretic with an ACEI, ARB or beta blocker
- an ACEI or ARB with a calcium channel blocker
- a beta blocker with a dihydropyridine calcium channel blocker
- an ACEI or ARB with a dihydropyridine calcium channel blocker and a thiazide or thiazide-like diuretic.

Etg complete, cardiovascular (accessed online June 2020)

Ward Call

- I Nurse Ben from ward 6 calling about JB, 58yo
- S D3 post knee washout for septic arthritis, on paracetamol for pain relief
- B Normally well, takes only citalopram, no allergies
- A This morning has a BP of 184/110 (repeated reading)
- R Can you please review or recommend a course of action

- 2 hours after further paracetamol and 50mg tramadol, JB BP has fallen to 142/75
- You write a path form for urine, EUC for tomorrow

The older patient (80y+)- Diuretics

- Target can be adjusted as per cardiologist
  - <150mmgHg is better
- Some pts symptomatic and dizzy at 140/90

The HYVET trial examined the effects of a diuretic on people aged 80 or over with raised BP. This randomised trial found that treatment with a diuretic reduced the relative risk of fatal and non-fatal stroke, but not significantly (hazard ratio 0.70, 95% CI 0.49–01.01, p=0.06). The same study demonstrated significant reductions in all cause mortality (hazard ratio 0.79, 95% CI 0.65–0.95, p=0.02) and CVD events (hazard ratio 0.79, 95% CI 0.69–0.90, p=0.0004).[194]

Choice of medication…

- 44 yo man with PTSD
- Persistent BP 165/100
- Unable to modify lifestyle

The role of prazosin in treating PTSD

- Sx of PTSD, nightmares (intrusion) and sleep disturbance (alteration in arousal), are often resistant to pharmacological treatment.
- The mechanism for these symptoms appears to be enhanced postsynaptic adrenoceptor responsiveness to central nervous system (CNS) noradrenaline.
- RCT evidence: that the off-label use of prazosin, a brain-active alpha-1 adrenoceptor antagonist is effective and safe in the treatment of nightmares and sleep disturbance associated with PTSD

Choice of medication

- Jess, 29 yrs
- Wants to fall pregnant
- HT since age 24
- Currently on 10mg amlodipine

- What is safe ?

Table 5. Guidelines for selecting antihypertensive drug treatment in pregnancy

Drug	Dose	Action	Contraindications	Practise Points
Methyl dopa	250-750mg tds	Central	Depression	Slow onset of action over 24 hours, dry mouth, sedation, depression, blurred vision
Clonidine	75-300µg tds			Withdrawal effects: rebound hypertension
Labetalol	100-400mg q8h	β Blocker with mild alpha vasodilator effect	Asthma, chronic airways limitation	Bradycardia, bronchospasm, headache, nausea, scalp tingling (labetalol only) which usually resolves within 24 hours
Oxprenolol	20-160 mg q8h	β Blocker with intrinsic sympathomimetic activity		
Nifedipine	20mg -60 mg slow release bd	Ca channel antagonist	Aortic stenosis	Severe headache in first 24 hours Flushing, tachycardia, peripheral oedema, constipation
Prazosin	0.5-5 mg q8h	α blocker		Orthostatic hypotension especially after first dose
Hydralazine	25-50 mg q8h	Vasodilator		Flushing, headache, nausea, lupus-like syndrome

Clonidine B3, Methydopa category A

Hydralazine, amlodopine and nifedipine prazosin are C

https://ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/SOMANZ-Hypertension-Pregnancy-Guideline-April-2014.pdf?ext=.pdf

What if the HT starts in pregnancy?

Investigations- new onset HT at 20/40 + gest

- Spot urine PCR
  - Dipstick
- Full blood count
  - plt
- Creatinine, electrolytes, urate
- Liver function tests
- Ultrasound assessment- doppler, IUGR, AFI

HT in Pregnancy vs Pre-eclampsia

- Preeclampsia is a multi-system disorder unique to human pregnancy characterised by hypertension and involvement of one or more other organ systems and/or the fetus.
  - Renal
  - Haematological
  - Neurological
  - Liver involvement
  - Pulmonary odema
  - Delivery is definitive management, BP resolution days mostly, sometimes much longer

- Gestational hypertension is characterised by the new onset of hypertension after 20 weeks gestation without any maternal or fetal features of preeclampsia, followed by return of blood pressure to normal within 3 months post-partum

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https://ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/SOMANZ-Hypertension-Pregnancy-Guideline-April-2014.pdf?ext=.pdf

Jess swapped to labetolol 100mg tds

- Addition of prazosin 0.5mg tds to keep BP 130/80
- Healthy baby
- Bad dreams post partum due to labetolol
- Slowly weaned and swapped back to amlodipine on cessation of breastfeeding

Clinical Handover

- If patient has HT measured on the wards on a few occasions, and you would like the GP to follow up (which is reasonable in most cases)
    - Write to/ call GP
    - Put in clinical handover/ DC summary
        - Measurements and ranges (highs and lows)
        - Any new meds or stat doses on the wards
        - Renal function
        - Urine dipstick
        - ECG results if you have any of these
- For some people, you may be the only doctor they will see until their next ED presentation, so you may need to take action!

In Summary

- Hypertension is an important common problem
- Ensuring an accurate reading is important both in acute and chronic management
- Consider and ECG/ bloods/ registrar advice if on the wards
- Hand back HT management to GPs with appropriate information in the D/C summary or clinical handover

- In poorly controlled chronic HT in hospital, consider using the Absolute cardiovascular risk calculator to guide your management

Questions

Questions?

GP Synergy (NSW & ACT)

- Request GP Synergy Applicant Pack
  - www.gpsynergy.com.au
  - applicant@gpsynergy.com.au

RACGP:

- www.racgp.org.au
- racgp@racgp.org.au

ACRRM:

- www.acrrm.org.au
- training@acrrm.org.au

Interested in applying to GP training?

Apply to the colleges!

2022 applications will open 22 March and close 20 April 2021

- RACGP
- ACRRM