CHAPTER 2: CARDIOVASCULAR SYSTEM
Updated: February 2022

The following prescribing guidelines are relevant to the cardiovascular system chapter and can be found here

- ACS dual antiplatelet guideline
- Anticoagulation (oral) guideline with warfarin
- Atrial Fibrillation management
- Heart Failure management
- Hypertension (diagnosed with ABPM)
- Orthostatic hypotension (OH)- Advisory guidance on the prescribing of midodrine
- Lipid modification therapy- Familial Hypercholesterolemia & Non-FH
- Low Molecular Weight Heparin prescribing (Enoxaparin & Tinzaparin)

Relevant resources:

- Management of Dental Patients Taking Anticoagulants or Antiplatelet Drugs
- MHRA top tips for measuring blood pressure
- NHS Accelerated Access Collaborative statin intolerance pathway

Patient booklets:

- Atrial Fibrillation (AF) patient information booklet
- Lowering cholesterol to reduce the risk of coronary heart disease and stroke PIL
- Non-vitamin K Antagonist Oral Anticoagulation (NOAC) patient information booklet

Management of Hypertension – see appendix 2 &3
In August 2019 NICE published an updated clinical guideline for the diagnosis and management of hypertension NICE NG136. Ambulatory Blood Pressure Monitoring (ABPM) is the preferred method of diagnosis because of its accuracy.

2.1.1 CARDIAC GLYCOSIDES

Digoxin tabs 62.5, 125, 250micrograms

Digoxin is usually initiated with a loading dose. The use of loading doses of medicines can be complex and error prone. Incorrect use of loading doses or subsequent maintenance regimens may lead to severe harm or death.

2.2 DIURETICS

2.2.1 Thiazides & related diuretics

Bendroflumethiazide tabs 2.5mg

1. Bendroflumethiazide is the preferred first line thiazide diuretic. Thiazide-like diuretics are second-line based on cost.
2. Indapamide is a 2nd line option. The immediate release tablets are more cost-effective than the modified release tablets
3. Bendroflumethiazide should be prescribed at a dose of 2.5mg for hypertension – higher doses only increase the incidence of metabolic and other side effects. See local guideline.
4. Bendroflumethiazide can be added to a loop diuretic in the short term for resistant oedema when higher doses may be required.
5. Metolazone is **GREEN** after consultant/specialist initiation. 2nd line to bendroflumethiazide for heart failure. Prescribe by brand. Recommended brand for new patients is Xaqua. Xaqua is not interchangeable with generic unlicensed metolazone. Primary care patients existing on unlicensed preparations to refer to heart failure specialist for advice. Combination with loop diuretic should be initiated by specialist only. See Heart Failure guidance.

2.2.2 Loop diuretics

Furosemide tabs 20mg, 40mg (1st line)
Bumetanide tabs 1mg

2.2.3 Potassium sparing diuretics and aldosterone antagonists

Spironolactone tabs 25mg, 50mg, 100mg *1st line mineralocorticoid receptor antagonist for Heart Failure with reduced ejection fraction*

Amiloride tabs 5mg

1. These diuretics are weak if given alone, but their effects are additive with thiazides and loop diuretics.
2. Thiazide and loop diuretics cause a fall in potassium during the first few weeks of treatment after which levels remain constant. Patients should be initiated on a plain diuretic and amiloride added only if their potassium falls after the first month, or are at particular risk (e.g., those on digoxin).
3. Spironolactone has more side effects than amiloride and is only indicated for heart failure. Dosage of spironolactone can be started from 12.5mg. For biochemical monitoring of spironolactone see the local heart failure guideline.
4. MHRA Dec 2016 spironolactone- risk of potentially fatal hyperkalaemia. No patient should receive three drugs which block the renin-angiotensin-aldosterone system as hyperkalaemia and renal dysfunction will be common. The safety and efficacy of combining an ACE inhibitor, an ARB and mineralocorticoid receptor antagonist (MRA) is uncertain and the use of these three drugs together is not recommended.

2.2.4 Potassium-sparing diuretics with other diuretics

No drug is recommended for this section

2.2.8 Diuretics with potassium

No drug is recommended for this section

1. They should not be relied upon to prevent or correct hypokalaemia as their potassium content is insufficient (8-10mmol/tab). They are also costly and, in most cases, unnecessary.

2.3 ANTI-ARRYTHMICS - *Follow consultant recommendations*

2.3.2 Drugs for arrhythmias

1. Amiodarone is only initiation by cardiology consultant or specialist as is classified as **AMBER** under shared care. Due to its long half-life, side effects may occur/ persist for up to a year after stopping treatment. TFTs should be monitored for up to 12 months after discontinuation.
2. Amiodarone is initiated with a loading dose. The use of loading doses of medicines can be complex and error prone. Incorrect use of loading doses or subsequent maintenance regimens may lead to severe harm or death.
3. Dronedarone for the maintenance of sinus rhythm after successful cardioversion is classified as **AMBER** under shared care.
4. Mexiletine used in life-threatening ventricular arrhythmias is classified as **RED**

2.4 BETA-ADRENOCEPTOR BLOCKING DRUGS

Atenolol tabs 25mg, 50mg, 100mg (not for heart failure)
Bisoprolol tabs 1.25mg, 2.5mg, 3.75mg, 5mg, 7.5mg, 10mg
Carvedilol tabs 3.125mg, 6.25mg, 12.5mg, 25mg

	Heart failure (target doses of preferred beta-blockers – if tolerated)
Bisoprolol	10mg OD
Carvedilol	25mg-50mg* BD

*The recommended maximum dosage is 25mg twice a day for patients with a body weight of less than 85kg, and 50mg twice a day for patients with a body weight above 85kg, provided that the heart failure is not severe.

1. Myocardial infarction treatment with a beta-blocker: A beta-blocker is normally continued for at least 12 months post-MI in people without left ventricular systolic dysfunction or heart failure. After 12 months treatment, consider whether to continue or stop the beta-blocker taking into account the extent of coronary disease or evidence of ischaemia, concurrent conditions, and any adverse effects. If there is uncertainty, seek specialist cardiological advice. (CKS)
2. Labetalol is a treatment option for hypertension in pregnancy.

2.5 HYPERTENSION AND HEART FAILURE

2.5.1 Vasodilator antihypertensive drugs

See Heart Failure Guidelines

2.5.2 Centrally acting antihypertensive drugs

1. Moxonidine is **GREY** reserved for patients unable to tolerate other treatment recommended in hypertension guideline.
2. Methyldopa is used for the management of hypertension in pregnancy

2.5.4 Alpha-adrenoceptor blocking drugs

Doxazosin tabs 1mg, 2mg, 4mg

1. May be used as fourth line add on therapy
2. Doxazosin MR is classified as **Do Not Prescribe (DNP)** - more costly than immediate release doxazosin (which can be given once daily), with only marginal benefits in relation to side-effects

2.5.5.1 Angiotensin-converting enzyme inhibitors (ACEis)

Lisinopril tabs 2.5mg, 5mg, 10mg, 20mg
Ramipril capsules 1.25mg, 2.5mg, 5mg, 10mg

1. Not for use in pregnancy. Use in women who are planning pregnancy should be avoided unless absolutely necessary. See MHRA December 2014.
2. When choosing antihypertensive drug treatment for adults of black African or African–Caribbean family origin, consider an angiotensin II receptor blocker (ARB), in preference to an angiotensin-converting enzyme (ACE) inhibitor. See hypertension guideline.
3. Titrate to the maximum tolerated dose in heart failure or MI if target dose cannot be reached
4. Generic perindopril erbumine may be used on the advice of a stroke physician for secondary prevention of stroke and other cardiovascular events
5. Perindopril arginine is '**Do Not Prescribe (DNP)**' – not recommended or commissioned locally
6. No patient should receive three drugs which block the renin-angiotensin-aldosterone system as hyperkalaemia and renal dysfunction will be common. The safety and efficacy of combining an ACE inhibitor, an ARB and mineralocorticoid receptor antagonist (MRA) is uncertain and the use of these three drugs together is not recommended

2.5.5.2 Angiotensin-II receptor antagonists (AIIRAs or angiotensin receptor blockers ARB)

Losartan tabs 12.5, 25, 50, 100mg — *First choice AIIRA for all indications (except HF)*
Candesartan tabs 2, 4, 8, 16mg — *First choice AIIRA for heart failure*

1. Not for use in pregnancy. Use in women who are planning pregnancy should be avoided unless absolutely necessary. See MHRA December 2007.
2. Should be reserved for those patients who definitely need an ACEI and are truly intolerant. RCTs suggest that this should be around 10% of ACEI use.
3. When choosing antihypertensive drug treatment for adults of black African or African–Caribbean family origin, consider an angiotensin II receptor blocker (ARB), in preference to an angiotensin-converting enzyme (ACE) inhibitor. See hypertension guideline.
4. No patient should receive three drugs which block the renin-angiotensin-aldosterone system as hyperkalaemia and renal dysfunction will be common. The safety and efficacy of combining an ACE inhibitor, an ARB and mineralocorticoid receptor antagonist (MRA) is uncertain and the use of these three drugs together is not recommended.

5. Sacubitril/valsartan is **Green** specialist initiation, titration and stablisation see local heart failure guideline (NICE TA 388 for treating symptomatic chronic heart failure with reduced ejection fraction).

	Heart Failure target doses of preferred ACEi & ARB – if tolerated
Lisinopril	20-35mg OD
Ramipril	10mg once daily or 5mg twice daily
Enalapril	10-20mg BD
Losartan	150mg OD
Candesartan	32mg OD

Doses taken from CKS Heart failure- chronic

ACEi and A2RAs in combination

- MHRA June 2014 advice that the combination use of medicines from two classes of the renin-angiotensin hormone system blocking agents (this includes ACEi, A2RAs and aliskiren) is **not** recommended.
- Prescribers are advised not to give patients with diabetic nephropathy an ACEi with an A2RA since they are particularly prone to developing hyperkalaemia.
- The combination of aliskiren with an ACEi or A2RA is contraindicated in patients with kidney impairment or diabetes.

ACEi and A2RA in combination for heart failure

- Some patients with heart failure may have a medical need for treatment with an ACEi and an A2RA. Candesartan (and Valsartan) are licensed as add-on therapy to ACEi for people with symptomatic heart failure who require such a combination despite optimal therapy.
- The triple combination of an ACEi, A2RA and mineralocorticoid receptor antagonist (e.g. aldosterone) or other potassium-sparing diuretic is **not** recommended.

SGLT2i in heart failure

Dapagliflozin or empagliflozin is recommended as an add on treatment option for heart failure as per NICE TA679/ TA773. Treatment with SGLT2i for HF is initiated by the specialist and stabilised before transferring the patient to primary care. Not to be used in patients with type 1 diabetes. See local heart failure guideline.

2.6 NITRATES, CALCIUM CHANNEL BLOCKERS, AND OTHER ANTIANGINAL DRUGS

2.6.1 Nitrates

GTN pump spray cfc-free 180 dose
GTN s/l tabs 500, micrograms
Isosorbide mononitrate (ISMN) tabs 10, 20, 40mg

1. When initiating ORAL NITRATES, start with a low dose and gradually increase the dose upwards.
2. Isosorbide mononitrate – to be given twice daily, the second of the two daily doses should be given after about 8 hours rather than after 12 hours to allow a nitrate-free period, to help avoid tolerance developing. Practically this would mean doses being taken at breakfast and lunchtime or breakfast and teatime.
3. Once daily preparations of isosorbide mononitrate can be much more expensive and should be avoided unless cost-effective choices such as Monomil XL and Tardisc XL are used.

2.6.2 Calcium channel blockers (CCBs)

Amlodipine tabs 5mg, 10mg
Diltiazem slow release (Zemtard caps 120,180,240,300mg are a cost-effective option)
Nifedipine MR caps 10mg, 20mg, 30mg, 60mg (Coracten SR or XL is the most cost-effective option)
Verapamil slow release 120mg, 240mg

1. The Medicines Control Agency recommends prescribing diltiazem slow-release preparations by brand name. This is to avoid patient confusion and because of potentially different side effect profiles. This is also good practice for verapamil SR preparations.
2. Immediate release diltiazem - Tildiem 60 tablets is a cost-effective option.

3. Verapamil should not normally be prescribed to patients taking beta-blockers (including eye-drops) by any route. When used together they may precipitate profound bradycardia or hypotension.
4. Nifedipine immediate release preparations are classified as **GREY** for patients with Raynaud's phenomenon who cannot tolerate modified release preparations. They are not recommended for angina or long-term hypertension.
5. See appendix 1 for pharmacological treatment of angina. Coracten SR or XL is the cost-effective brand where slow release nifedipine is recommended.

2.6.3 Other Antianginal Drugs

Nicorandil 10mg, 20mg — 3rd or 4th line treatment of angina which is not adequately controlled despite combination therapy

1. MHRA January 2017 – Nicorandil can cause serious ulceration, including gastrointestinal ulceration which may progress to perforation, haemorrhage, fistula or abscess.
2. Ivabradine
   - **GREEN only on consultant/specialist initiation** for the following indications:
     a. Heart Failure- as per NICE TA267
     b. Angina if the person cannot tolerate beta-blockers and calcium channel blockers or both are contraindicated – as per NICE CG126
   - MHRA December 2014 - when using ivabradine to treat symptoms of chronic angina:
     - Only start ivabradine if the resting heart rate is at least 70 beats per minute.
     - Do not prescribe ivabradine with other medicines that cause bradycardia, such as verapamil, diltiazem or strong CYP3A4 inhibitors
     - Monitor patients regularly for atrial fibrillation. If atrial fibrillation occurs, carefully reconsider whether the benefits of continuing ivabradine treatment outweighs the risks
     - Consider stopping ivabradine if no or only limited symptom improvement after 3 months
   - The MHRA also remind prescribers of the following:
     - Ivabradine is used to treat symptoms of chronic angina in patients unable to tolerate or with a contraindication to beta-blockers. It can also be used in combination with beta-blockers in patients for whom an optimal beta-blocker dose is not enough
     - The recommended starting dose is 5mg twice daily
     - Do not exceed the maximum maintenance dose of 7.5mg twice daily
     - Down titrate the dose if resting heart rate decreases persistently below 50 beats per minute or if the patient experiences symptoms of bradycardia. The dose can be down-titrated to 2.5mg twice daily if necessary
     - Stop ivabradine treatment if the resting heart rate remains below 50 beats per minute or symptoms of bradycardia persist.
3. Ranolazine is a **GREY** drug – for limiting angina as confirmed by a cardiologist. For further information about exceptionality see traffic light database

2.7.2 Vasoconstrictor sympathomimetics

See guideline on the prescribing of midodrine.

2.8 ANTICOAGULANTS

2.8.1 Parenteral Anti-coagulants

See Low Molecular Weight Heparin prescribing (Enoxaparin & Tinzaparin) guidance.

2.8.2 Oral anti-coagulants

Non-Vitamin K Antagonist Oral Anti-Coagulant (NOAC)

These are first line for use in AF patients (edoxaban is the preferred choice- see AF guidance), or options after specialist initiation for VTE. See shared care pathology guideline on management of suspected DVT

Edoxaban tabs 30mg, 60mg — *1st line NOAC for AF*
Rivaroxaban tabs 10mg, 15mg, 20mg
Apixaban tabs 2.5mg, 5mg
Dabigatran caps 110mg, 150mg

1. Where a NOAC is considered to be the most appropriate anticoagulant, edoxaban is to be used first line for patients with NVAF unless there is a specific clinical reason not to do so.

2. Extended prevention (beyond 6 months) for recurrent DVT and PE may be recommended by specialist. Rivaroxaban 10mg- 20mg dose may be used for this indication.
3. NOACs are not recommended in patients with antiphospholipid syndrome, particularly high-risk patients (those who test positive for all 3 antiphospholipid tests — lupus anticoagulant, anticardiolipin antibodies, and anti-beta 2 glycoprotein I antibodies). See MHRA June 2019
4. Interaction to erythromycin (MHRA Dec 2020) - erythromycin may interact with rivaroxaban and increase the risk of bleeding. Reduce dose of edoxaban is recommended for patients on concomitant erythromycin. For dabigatran and apixaban concomitant administration of P-gp inhibitors (and for apixaban, also CYP3A4 inhibitors) is expected to result in increased plasma concentrations and that blood concentrations were raised when used concomitantly with clarithromycin.

Vitamin K Antagonist

Warfarin tabs *Use of the 1mg strength is recommended to minimise confusion*

1. See local warfarin guideline. Warfarin is initiated with a loading dose. The use of loading doses of medicines can be complex and error prone. Incorrect use of loading doses or subsequent maintenance regimens may lead to severe harm or death.
2. Reports of calciphylaxis. Calciphylaxis is a very rare but serious condition causing vascular calcification and skin necrosis. Patients should consult their doctor if they develop a painful skin rash. See MHRA, July 2016 for further details.
3. Warfarin is the oral anticoagulant of choice in breastfeeding women. See SPS guidance Using oral anticoagulants in breastfeeding women.

Indication for anticoagulation with antiplatelet

- When considering treatment for patients who have an indication for anticoagulation, take into account:
  - bleeding risk
  - thromboembolic risk
  - cardiovascular risk

People existing on anticoagulation who have had an MI

- Continue anticoagulation and add **clopidogrel** for up to 12 months in people who have undergone PCI with bare-metal or drug eluting stents.
- Unless there is a high risk of bleeding, continue anticoagulation and add **aspirin** (or clopidogrel for people with contraindication for aspirin) for up to 12 months in people who have:
  - had their condition managed medically, **OR**
  - undergone balloon angioplasty, **OR**
  - undergone CABG surgery
- **Do NOT** routinely offer anticoagulation in combination with prasugrel or ticagrelor (except on advice of cardiologist).
- After 12 months since the MI, continue anticoagulation and take into consideration the need for ongoing antiplatelet therapy, taking into account all of the following:
  - the indication for anticoagulation,
  - thromboembolic risk,
  - bleeding risk,
  - cardiovascular risk,
  - the person's wishes

NICE NG185

2.9 Antiplatelet agents (See appendix 4)

Aspirin 75mg dispersible tabs
Clopidogrel tabs 75mg *prescribe generically*
Aspirin 25mg + dipyridamole 200mg
Prasugrel tabs 5mg, 10mg **GREEN** – Cardiologist initiation
Ticagrelor tabs 90mg **GREEN** – Cardiologist initiation

1. Aspirin
   - Recommended as the first-choice antiplatelet therapy in patients for secondary prevention of CVD. **Aspirin or clopidogrel are not recommended for primary prevention** of CV events, including in people with hypertension or diabetes.
   - There is no evidence to suggest that aspirin is effective in treating people with vascular dementia (Cochrane, 2012).
   - Aspirin 75mg dispersible contains very low levels of sodium.
   - Enteric coated aspirin should not be routinely used. There is no evidence to suggest that aspirin EC has a lower GI bleed risk than dispersible aspirin. Aspirin EC is also more expensive.
   - What to do in patients suffering dyspepsia on low dose aspirin
     - Take aspirin with food
     - Reduce dose of aspirin to the minimum effective dose (75mg)
     - Consider co-prescribing antacid or low dose proton pump inhibitor
2. Clopidogrel
   - Recommended as the first-choice antiplatelet therapy in patients who have had an ischaemic stroke, TIA (N.B. unlicensed indication, therefore not included in NICE TA 210 but supported by Derbyshire stroke physicians and ratified by JAPC) or have peripheral arterial disease or multivascular disease.
   - Clopidogrel and a PPI given concurrently may interact, resulting in reduced effectiveness of the clopidogrel. See local PPI guideline. This is the agreed advice supported by local cardiologists:
     - Is gastroprotection actually required i.e., is the patient at high risk of bleeding e.g., history of GI tract bleeding?
     - If a PPI is required lansoprazole* or pantoprazole are preferred options.
   - MR Dipyridamole remains a treatment option as per NICE TA210.
3. Dual antiplatelet therapy in the treatment of acute coronary syndrome is covered under local guideline. Stop dates for ticagrelor, clopidogrel and prasugrel should be stated on discharge and documented in the patient notes and in the repeat prescribing section of patient medication records.
4. Ticagrelor 60mg classified **GREY** after specialist initiation as per NICE TA420 which recommends ticagrelor 60mg BD plus aspirin as an option for preventing atherothrombotic events in adults who had a MI and who are at high risk of a further event. Treatment should be stopped when clinically indicated or at a maximum of 3 years. This would be considered on case-by-case basis by secondary care and communicated to primary care with clear stop date.

2.11 ANTIFIBRINOLYTIC DRUGS AND HAEMOSTATICS

Tranexamic acid tabs 500mg *Included for the management of menorrhagia*

2.12 LIPID-REGULATING DRUGS

See lipid modification therapy guidelines- Familial Hypercholesterolaemia (FH) and non-FH

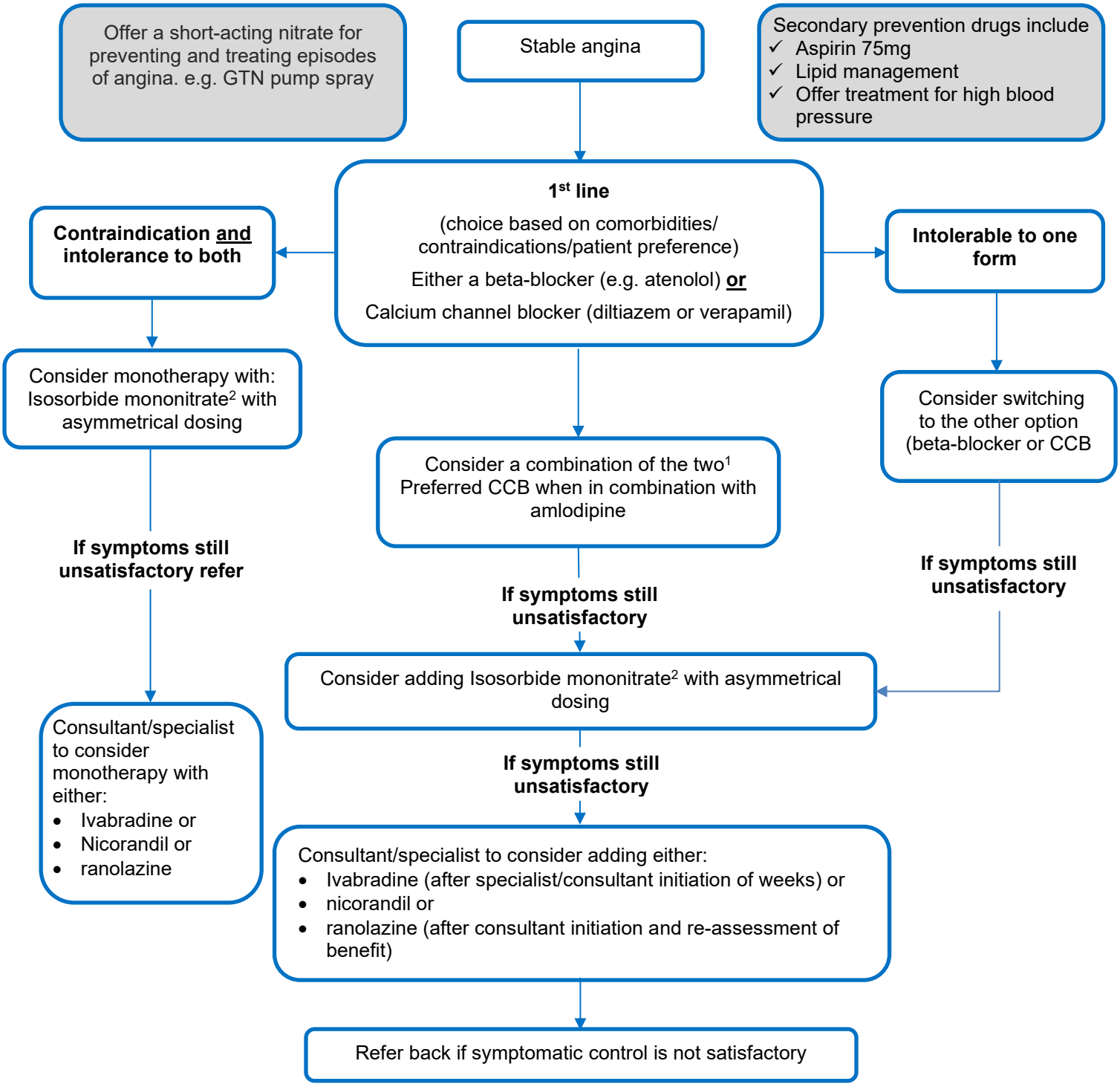
Atorvastatin tabs 10mg, 20mg, 40mg, 80mg *as per NICE CG181*
Simvastatin tabs 20mg, 40mg, 80mg
Pravastatin tabs 10mg, 20mg, 40mg

1. Existing patients on simvastatin or pravastatin will still be deriving clinical benefit through achieving target cholesterol. If so, there is no need to switch to atorvastatin.
2. Atorvastatin chewable tablet is an option for patients with swallowing difficulties.
3. MHRA in August 2012 updated its advice on interacting drugs and contraindications of simvastatin. See link for more details.
4. Rosuvastatin is **GREY** 2nd line to atorvastatin for FH. May be used in patients who have complete intolerance of atorvastatin or partial tolerance of other statins at low-moderate doses (simvastatin 40mg, pravastatin 40mg and atorvastatin 20mg max tolerated dose) but not reaching target lipid reduction. See FH guideline for further detail.
5. Ezetimibe is **GREY** as per NICE TA385. Ezetimibe monotherapy is a treatment option in patients truly intolerant to statins; Ezetimibe in combination with a statin is a limited treatment option following intensification of statins.
6. Bempedoic acid is **Grey** as per NICE TA694- for primary hypercholesterolaemia or mixed dyslipidaemia when a statin is contraindicated or not tolerated, and ezetimibe alone does not control low-density lipoprotein cholesterol well enough.
7. Inclisiran is **RED** as per NICE TA733- see traffic light for detail.

8. Alirocumab and evolocumab are **RED** as per NICE TA393 & 394 as options for treating primary hypercholesterolaemia or mixed dyslipidaemia in selected patients, after statin/ ezetimibe treatment have been optimised. They are only recommended by lipid specialist and are supplied through hospital via homecare; GPs may be asked to prescribe statin in conjunction.
9. NICE CG181 does **not** recommend the routine use of fibrates or Omega-3 fatty acid compounds for the prevention of CVD to any of the following:
    - People who are being treated for primary or secondary prevention
    - People with CKD
    - People with type 1 diabetes or type 2 diabetes
10. Omega - 3 fatty acid compounds - classified **GREY** after consultant lipid specialist recommendation in patients with severe hypertriglyceridaemia (triglycerides >10mmol/L) after trial of fibrates +/- statin.
11. Ciprofibrate has been classified as **Do Not Prescribe (DNP)** less cost effective than standard therapy e.g. Fenofibrate.
12. Inegy (simvastatin and ezetimibe) is **Do Not Prescribe (DNP)** – more cost effective if prescribed separately.

Appendix 1 – Pharmacological Treatment of Angina

Identify and manage other risk factors: cholesterol, smoking, hypertension, diabetes. Titrate anti-angina medications against the person's symptoms up to the maximum tolerated dosage. Review the person's response to treatment, including any side-effects, 2-4 weeks after starting or changing drug treatment. The aim of treatment is to reduce symptoms to the point that they are easy for the patient to manage.



1. When combining a calcium channel blocker with a beta blocker, use a dihydropyridine calcium channel blocker, for example, amlodipine
2. Modified-release preparations are more expensive than standard-release preparations, but this is minimised if prescribed as a cost effective brand such as Tardisc XL or Monomil XL. They may be useful for people who find it difficult to comply with the asymmetric dosing required with an immediate release preparation which is necessary to avoid nitrate tolerance.

Calcium channel blockers

Monotherapy – expert opinion suggests using a rate-limiting calcium-channel blocker (CCB) (diltiazem or verapamil) in preference to a dihydropyridine CCB, reasons include:

- Rate-limiting CCBs, such as verapamil and diltiazem, have the additional action of decreasing myocardial contractility and heart rate.
- Dihydropyridine CCBs can sometimes cause reflex tachycardia, which may increase angina symptoms, although this is more likely to be a problem with short-acting dihydropyridines than with longer-acting preparations

As Combination therapy

- People taking a beta-blocker: prescribe a dihydropyridine CCB (amlodipine)
- People not taking a beta-blocker: a rate-limiting CCB may be preferred

If the person has concomitant heart failure: prescribe amlodipine

Beta-blockers

There is no good evidence that any one beta-blocker is better than any other in the management of stable angina. If clinically indicated, cardioselective beta-blockers (such as atenolol) can be used in people with chronic obstructive pulmonary disease, but caution should be used if disease is severe.

Titrate the dose of beta-blocker to the target dose (or maximum tolerated dose), according to the person's response and heart rate control (at rest and during exercise). Atenolol 100mg once a day or 50mg twice a day (twice-daily dosing may provide better symptom control).

Appendix 2 – Blood Pressure targets

Clinic blood pressure (hypertension including type 2 diabetes) (NICE NG136)

- People aged under 80 years: maintain below 140/90mmHg
- People aged over 80 years: maintain below 150/90mmHg

Daytime home readings (or ABPM) (hypertension including type 2 diabetes) (NICE NG136)
– where white coat hypertension (>20/10mmHg difference at home)

- People aged under 80 years: maintain below 135/85mmHg
- People aged over 80 years: maintain below 145/85mmHg

Type 1 Diabetes with hypertension (NICE NG17)

- In people with CKD with ACR<70mg/mmol: maintain below 140/90mmHg (systolic target range: 120-139mmHg)
- In people with CKD with ACR≥70mg/mmol: maintain below 130/80mmHg (systolic target range: 120-129mmHg)
- In adults aged 80 or more (regardless of ACR): maintain below 150/90 mmHg (systolic target range 140 -149 mmHg)

Appendix 3 – Antihypertensive drug treatment – CKD

Treat as per NICE NG203 recommendations:

Indications	Actions
Diabetes ACR >3mg/mmol with or without hypertension or CKD stage[1]	Offer ACE inhibitors/ARB
Type 2 diabetes and ACR >30 mg/mmol	offer an SGLT2 inhibitor (in addition to the ACE inhibitor or ARB)
Type 2 diabetes and ACR >3 mg/mmol (NICE NG28)	consider an SGLT2 inhibitor (in addition to the ACE inhibitor or ARB)
No diabetes Hypertension and ACR <30mg/mmol	Offer choice of antihypertensive treatment according to NICE NG136, 2019
Hypertension and ACR ≥30mg/mmol[1]	Offer ACE inhibitor/ARBs
ACR ≥ 70mg/mmol with or without hypertension or cardiovascular disease[1]	Refer for nephrology assessment and offer ACE inhibitor/ARBs
[1]Two different ACR thresholds are given here for initiating ACE inhibitor treatment in people with CKD and proteinuria. The potential benefit of ACE inhibitors in this context is greatly increased if the person also has diabetes or hypertension and, in these circumstances, a lower threshold is applied.	

- Treat with ACE inhibitor first, move to ARBs if ACE inhibitors are not tolerated.
- Inform of the importance of reaching the optimal dose, and of monitoring to achieve this safely.
- Titrate ACE inhibitors/ARBs to the maximum tolerated therapeutic dose before adding a second-line agent
  - MHRA June 2014 recommend not prescribing the combination of an ACEI with an ARB (A2RA) or aliskiren; not to give patients with diabetic nephropathy an ACEI with an A2RA since they are particularly prone to developing hyperkalaemia; and also the combination of aliskiren with an ACEI or ARB (A2RA) is contraindicated in patients with kidney impairment or diabetes.
- Test eGFR and serum potassium before treatment starts and repeat after 1-2 weeks of treatment and after each dose increase

Other issues in CKD:

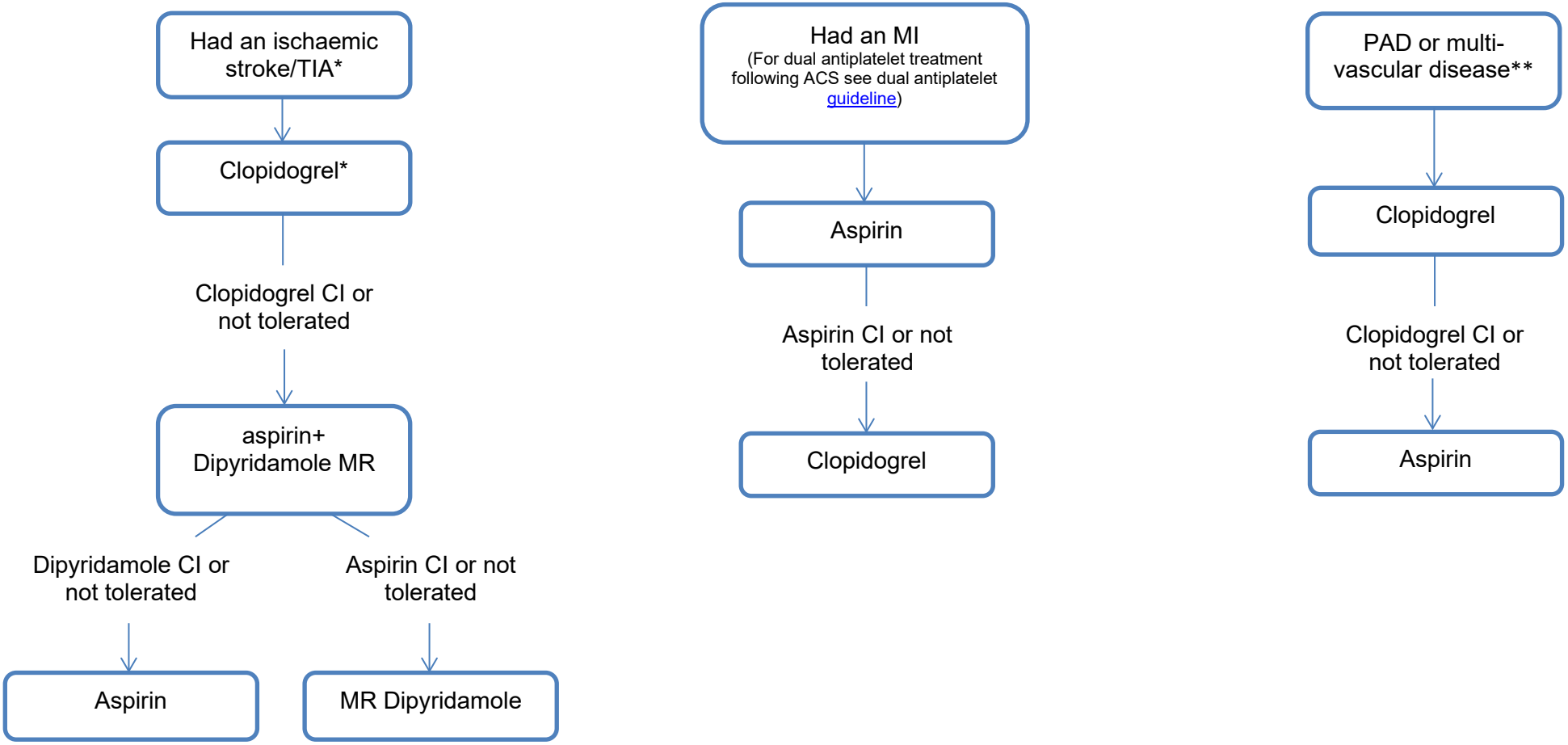
- If eGFR <30 then thiazides may not be effective and loop diuretics may be considered
- Ankle swelling with dihydropyridine calcium channel blockers (e.g., amlodipine, felodipine) may be an issue in CKD and should be reviewed in light of any fluid retention

Kidney disease improving global outcomes GFR categories

GFR category	eGFR (ml/min/1.73m$^{2)}$	Terms
G1	≥90	Normal or high
G2	60-89	Mild reduction*
G3a	45-59	Mild to moderate reduction
G3b	30-44	Moderate to severe reduction
G4	15-29	Severe reduction
G5	<15	Kidney failure
*Relative to young adult level		

(NICE NG203, Nov2021)

Appendix 4 – Antiplatelets for the prevention of occlusive vascular events (based on NICE TA 210)



* Clopidogrel is not licensed for use in TIA (and therefore use following TIA is not included in NICE TA 210) but this treatment pathway is supported by Stroke Physicians in Derbyshire and ratified by JAPC December 2012 and further endorsed in February 2014.
**People with cardiovascular disease who have disease in more than one vascular site are said to have multivascular disease

See here for local advisory guidance on when to initiate a PPI with an NSAID (or antiplatelet)