

2 CARDIOVASCULAR SYSTEM

2.01 THIAZIDE, OSMOTIC & LOOP DIURETICS

- THIAZIDES [TD], POTASSIUM SPARING [PSD], LOOP DIURETICS [LD]

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Frusemide Inj 10mg/ml, 2ml (Lasix) [Furosemide] [LD]	<i>MSL</i> <i>EDL</i>	Acute pulmonary oedema: slow IV initially 20-50mg, if needed increase by 20mg steps every 2 hours; child 0.5-1.5mg/kg/DAY, max 20mg daily. IV inj: if single effective dose is < 50mg inject undiluted slowly over 1-2 min at max rate 0.5mg/kg/min; if > 50mg dilute 20mg in 20-100ml of WFI/NS, infuse 30-60 min at max rate of 4mg/min.
Frusemide Tab 40mg (Lasix) [Furosemide] [LD]	<i>MSL</i> <i>EDL</i>	Oedema initially 40mg in the morning; maintenance 20mg daily, resistant oedema up to 80mg daily; child 1-3mg/kg/DAY (max 40mg/day).
Hydrochlorothiazide Tab 25mg (Esidrex) [TD]	 <i>EDL</i>	Oedema 25-50mg daily in the morning; max 100mg daily, elderly initially 12.5mg daily. Hypertension 12.5-25mg daily in the morning; elderly initially 12.5mg daily.
Mannitol Inj 10% (10g/100ml) & 25% (25g/100ml) 500ml	 <i>EDL</i>	IV infusion 0.25-1g/kg of a 5-25% (5-25g/100ml) solution adjusted to response. Test dose: IV 200mg/kg of a 15-25% solution over 3-5 min to give a urine flow of 1ml/kg/HOUR at least, over the next 2-3 hours.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
* Spironolactone Tab 25mg (Aldactone) [PSD]	EDL	Oedema, 100-200mg daily, increased if needed to 400mg daily in resistant oedema; usual maintenance dose 75-200mg daily; child initially 3mg/kg/DAY in divided doses.

COMMENT/CAUTIONS:

- **Thiazides [TD]** have a fast onset (1-2 hrs) and prolonged action duration (12-24 hrs). Administer in the morning. May cause postural hypotension especially in the elderly.
- High doses of **thiazides [TD]** and **loop diuretics [LD]** can cause hypokalaemia. **IV frusemide** in large bolus doses may cause ototoxicity, so doses > 50mg should be diluted in 100ml of NS and given at a rate not exceeding 4mg/min.
- **Potassium-sparing diuretics [PSD]** such as spironolactone should be used cautiously in patients on ACE inhibitors as they may cause severe hyperkalaemia. Do not give concurrently with potassium supplements.

2.02 ANTIANGINAL DRUGS, NITRATES

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Atenolol Tab 50mg (Tenormin)	<i>MSL</i> EDL	Angina: 50-100mg in 1 or 2 divided dose.
Isosorbide Dinitrate Tab 20mg SR (Isordil)	EDL	Prophylaxis of angina: 20-40mg every 12 hours; left ventricular failure 40-160mg daily in divided doses.
Nitroglycerin Sublingual Spray 0.4mg/dose, 200 doses (Glytrin) [Nitroglycerin=Glyceryl trinitrate (GTN)]	<i>MSL</i>	When needed: spray 1-2 doses under tongue and then close mouth.
Nitroglycerin Inj 1mg/ml [Nitroglycerin=Glyceryl trinitrate (GTN)]		MI or severe ischaemia, by IV infusion, give 5-200ug/min titrated to patient response, diluted in D5/NS, max conc 400ug/ml.

2.03 ANTIHYPERTENSIVE DRUGS

2.03a CENTRALLY-ACTING & VASODILATOR ANTIHYPERTENSIVES

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
*Nitroprusside, Sodium Inj 50mg/5ml [Vasodilator] (Protect from light.)	EDL	Hypertensive crisis; IV infusion dilute 50mg in 500-1000mls of D5 to give conc of 50-100ug/ml, and infuse at an initial rate of 0.3ug/kg/min, titrate slowly according to response; max 10ug/kg/min. Note: use IV pump and monitor BP closely.

COMMENT/CAUTIONS:

- **Nitroprusside:** Avoid using for > 72 hrs as accumulation of cyanide metabolites occurs (cause tachycardia, sweating, hyperventilation, arrhythmias). Tail infusion off slowly over 10-30 min to avoid rebound effect. Stop if no marked response with max dose in 10 min. Protect the solution completely from light in storage and when in use.
- Most serious peripheral vascular disorders may be due to occlusion of vessels, either by spasm/sclerotic plaque. Advise patients on lifestyle changes including smoking cessation and exercise training, and consider low-dose aspirin to prevent cardiovascular events.

2.03b BETA-BLOCKERS – ANGINA, HYPERTENSION, CARDIAC ARRHYTHMIAS

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Atenolol Tab 50mg (Tenormin)	MSL EDL	Hypertension & angina, 50-100mg daily.
*Labetalol HCl Inj 100mg/20ml (Trandate)		IV Inj 50mg, repeat after 5 min <i>prn</i> ; IV infusion at a max rate of 2mg/min, titrate to response; max 200mg both routes. Inject slow IV undiluted over 1-2 min, for IV infusion further dilute 100mg with 100-200mls of D5/NS and infuse over 50-60min.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Metoprolol Tab 100mg (Betaloc/Lopressor)		50-100mg twice daily, max 300mg daily.
Propranolol HCl Inj 1mg/ml (Inderal/Avlocardyl)		Arrhythmias & thyrotoxic crisis: IV Inj 1mg (undiluted over 1 min); repeat every 2-4 minutes according to response; max 5mg.
Propranolol Tab 40mg (Inderal/Avlocardyl)	EDL	Hypertension, 80mg twice daily, max 320mg daily (half dose for portal hypertension). Angina, 40mg 2-3 times daily to 240mg/day. Arrhythmia & thyrotoxic crisis, 10-40mg 3-4 times daily. Child: 1-5mg/kg/DAY in divided doses every 6-12 hours. Max: 8mg/kg/DAY.

COMMENT/CAUTIONS:

- **Beta-blockers:** NOT if asthma or history of obstructive airways disease.
- **Labetolol:** Severe hepatocellular damage reported, monitor liver function.
- **Beta-blockers** may mask signs/symptoms of hypoglycaemia and affect glucose tolerance. Avoid in patients with frequent hypoglycaemic episodes or in those with poor blood glucose control.
- Risk of precipitating heart failure when beta-blockers used in conjunction with **verapamil**.

2.03c CALCIUM CHANNEL ANTAGONISTS

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Diltiazem HCl Cap 90mg SR, 120mg SR & 180mg SR (Tildiem Retard)	NF	Angina and mild to moderate hypertension: initially 90-120mg twice daily, max 360mg daily in divided doses. Non-modified release/non-SR formulations: initially 30mg 3 times daily (elderly patient 30mg twice daily); max 360mg daily in divided doses.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Nifedipine Tab 20mg SR (Adalat)	EDL	Initially 20mg-100mg daily with food in 1-2 divided doses, according to manufacturer's directions (different for each SR formulation)
Verapamil HCl Inj 5mg/2ml (Isoptin)	EDL	Arrhythmias: slow IV 5-10mg (over 2-4 min) of max conc 2.5mg/ml in NS/D5 with ECG monitoring; paroxysmal tachyarrhythmias: further 5mg after 5-10 min if needed. DO NOT administer to patients recently given beta-blockers (hypotension/asystole risk).
Verapamil HCl Tab 40mg or 80mg (Isoptin)	EDL	Arrhythmias: 40-120mg 3 times a day. Hypertension: 240-480mg daily in 2-3 divided doses.
Verapamil HCl Tab 240mg SR (Securon SR)		Angina or hypertension: 240mg daily, max 240mg twice daily. Prophylaxis after MI where beta-blockers are inappropriate: 240mg the morning & 120mg in the evening.

COMMENT/CAUTIONS:

- **Calcium Channel Antagonists** can cause dizziness, headache, peripheral oedema (worse than with verapamil and diltiazem). Most common: flushing, rash, and gingival hyperplasia. Constipation is more common with verapamil. Disturbances of cardiac conduction and disruption of left ventricular failure are more likely with either verapamil or diltiazem. Avoid abrupt withdrawal, may induce hypertensive crisis/rebound.
- **Contraindication (C/I):** concurrent intravenous beta-blocker therapy, CHF, hypersensitivity, hypotension.

2.03d ANGIOTENSIN CONVERTING ENZYME INHIBITORS

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Enalapril Maleate Tab 5mg (Renitec)		Initially 2.5-5mg in the morning (1 st dose at night), usual maintenance 10-20mg in the morning, max 40mg daily.

COMMENT/CAUTIONS:

- **ACE Inhibitors (ACE/I)** can cause very rapid falls of BP in volume-depleted patients, so discontinue diuretics or reduce dose 2-3 days before ACE/I initiation. Give first ACE/I dose at bedtime. Resume diuretics if needed after a few weeks. If diuretics cannot be stopped, supervise medically for 2 hrs after first ACE/I dose, or until stable BP.
- Monitor renal function (baseline creatinine) and assess within 1 week of initiating therapy. If >10% increase in creatinine levels review therapy. Reassess regularly (3-4 times/yr).
- Drug interaction – caution if used with calcium channel antagonists, see product leaflets.

2.04 OTHER DRUGS FOR ARRHYTHMIAS

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
*Amiodarone Inj 50mg/ml (Cordarone)		Advanced cardiac life support (ACLS): 300mg IV by rapid infusion; if necessary, supplementary doses of 150mg IV by rapid infusion may be considered; max 1.2g/DAY. Max IV rate 30 mg/min, usually at 1-6mg/ml; conc > 2 mg/ml via central line. Dilute 300mg in 300ml of D5 to give 1mg/ml conc.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Procainamide Inj 100mg/ml (Pronestyl)	EDL	<p>Antiarrhythmia: adult, IV initial 100mg diluted, given at max rate 50mg/min, repeat every 5 min until arrhythmia is controlled or up to max total dose of 1g; maintenance infusion diluted and given at rate 2-6mg/min. Alternatively, adult IM 50mg/kg/DAY in divided doses given every 3-6 hours.</p> <p>Child, IV slow 10-15mg/kg over 15min then 20-80ug/kg/min OR 50-100mg/kg/DAY in divided doses given q4h, max 2g/24h.</p> <p>Inject IM undiluted deep into a muscle mass. For IV injection further dilute 100mg with 25-50ml of D5, inject slowly over 2-5 min. For IV infusion, dilute 200mg with 50-100mls of D5, give over 30-100 min.</p>

COMMENT/CAUTIONS:

- All anti-arrhythmics are potentially pro-arrhythmic. If using more than one antiarrhythmic care is needed as fatal interactions can occur. Avoid rapid changes and combinations.
- **Amiodarone** is intended for use only in patients with life-threatening arrhythmias because of substantial toxicity.

2.05 CARDIAC GLYCOSIDES, INOTROPIC & VASOCONSTRICTOR SYMPATHOMIMETICS

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
*Digoxin Tab 250ug (Lanoxin)	EDL	Rapid digitalisation, 0.75-1.5mg in divided doses over 24 hrs; less urgent digitalisation/ maintenance 125-250ug daily; elderly half dose.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
*Digoxin Inj 500ug/2ml (Lanoxin)	EDL	<p>Loading dose for IV urgent cases (check patient has not received cardiac glycosides within 2 weeks before): 0.5-1mg in divided doses q4-8h, then 125-500ug daily orally.</p> <p>May be injected slow IV undiluted, or infused by further diluting 500ug with 500ml of D5/NS/WFI over 10-20min.</p>
Dopamine HCl Inj 200mg/5ml	EDL	<p>Cardiogenic shock: slow IV infusion via large vein 2-5ug/kg/min, increase in 5-10ug/kg/min increments adjusted according to response, max 50ug/kg/min.</p> <p>Dilute 200mg with 50-100mls of D5/NS/LR, max conc 6mg/ml, range 0.8-3.2mg/ml.</p>
Ephedrine HCl Inj 30mg/ml	EDL	<p>Hypotension prevention in epidural/spinal anaesthesia: slow IV Inj 3-6mg (max 9mg) repeated every 3-4 minutes, max cumulative dose 30mg</p> <p>Slow IV inj: further dilute 30mg with 10-20ml WFI, max conc 3mg/ml.</p>
Epinephrine Inj 1mg/ml [Adrenaline 1:1000]	MSL EDL	<p>Anaphylaxis: undiluted SC/IM, adult 500ug (0.5ml), 6-12 yo 250ug (0.25ml), 6 mth-6 yo 120ug (0.12ml), < 6 mth 50ug (0.05ml).</p>
Epinephrine Inj 100ug/ml (0.1mg/ml), pre-filled syringe 10mls (1mg/10mls) [Adrenaline 1:10 000]	MSL EDL	<p>Cardiac Arrest: slow IV bolus inj 1mg (undiluted) q3-5min, max 100ug/kg every 3-5 minutes; IM/SC 100-500ug (undiluted 1-5mls) every 10-15 minutes; or IV cont infusion in NS (max concentration 64ug/ml), at a rate of 1-10ug/kg/min. IV infusion: dilute 1mg with 50-100mls of NS.</p>

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Phenylephrine Inj 1% (10mg/ml) (Neosynephrine)		Acute mild-moderate hypotension: SC/IM undiluted 2-5mg, repeat dose at 10-15 min intervals, max total dose 10mg; slow IV 0.2-0.5mg (200-500ug), repeat dose at 10-15 min intervals, injected slow IV diluted in D5/NS as 1mg/ml solution, over 3 minutes.

COMMENT/CAUTIONS:

- **Digoxin:** hypokalaemia predisposes to digoxin toxicity. Use with caution in pregnancy, elderly and renal impairment, avoid rapid IV administration. Excessive dosage may cause nausea & vomiting, GI & visual disturbances, CNS & heart symptoms.

2.06 ANTICOAGULANTS & HAEMOSTATICS

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
*Acetylsalicylic Acid (Aspirin) Tab Soluble 100mg	EDL	75-300mg daily dissolved in a glass of water
Heparin Sodium Inj 5,000 units/ml, 5ml [NOT FOR IM INJECTION] [NB: These doses do not apply to LMWH.]	EDL	DVT/PE treatment: adult, IV loading dose 5000 units, then cont infuse 1000-2000unit/hr (15-25unit/kg/hr) or 5000-10000units IV Inj q4h or 15000 units SC q12h [Determine dose for maintenance by APTT time of 2-2.5 times of normal.] DVT/PE prophylaxis, SC 5000 units q8-12h post-surgery until patient is ambulant; in pregnancy, 10000 units given every 12 hours. The IV dose may be administered undiluted or diluted with 50-1000ml NS over 24 hours.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Heparin Sodium Inj 1,000 units/ml in 5ml [NOT FOR IM INJECTION]		SMALL ADULT/CHILD, IV infusion loading dose 50 units/kg, then 10-25 units/kg/HOUR, or SC 250units/kg q12h. Give IV undiluted or diluted with 50-1000ml NS over 24 hours.
Heparin Sodium 100units/ml units in NaCl Injection (Heparin Saline)	NF EDL	50-200 units administer as a flush through catheters or IV cannula, q4h or <i>prn</i> .
Low Molecular Weight Heparin (LMWH) – Nadroparin 7500AxalCU/0.3ml, 10 000 AxalCU/0.4ml, & 15,000 AxalCU/0.6ml (Fraxiparine)	NF	SC Inj. Surgical prophylaxis, for 10 days: General 0.3ml daily, 1 st Inj 2-4 hrs pre-surgery; orthopaedic 100 AxalCU/kg/DAY for 3 days, given 12 hrs pre- & post-surgery, then 150AxalCU/kg/DAY from 4 th post-op day onwards. Treatment 0.1ml/10kg q12h.
Phytomenadione (Vitamin K₁) Inj 10mg/ml [ADULT USE ONLY]	MSL EDL	Hypoprothrombinaemia or haemorrhage due to anticoagulant therapy: IM 10-20mg. Slow IV inj ONLY for potentially fatal haemorrhage from warfarin overdose, 2.5-25mg, max 50mg (not > 1mg/min). CHECK: Some commercial preps unsuitable for IV use.
Protamine Sulphate Inj 10mg/ml, 5ml	EDL	Slow IV Inj (undiluted or dilute in D5/NS) over 10 min, 1mg neutralises 80-100 units heparin when given within 15 min; if longer, less protamine needed (heparin excretion rapid), max 50mg total dose.
Streptokinase Inj 1 500 000 units vial		MI: infuse IV 1 500 000 units over 60 min. Reconstitute vial with 5mls of D5/NS and further dilute in 45mls of D5/NS. Use reconstituted solution within 8 hours.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Tranexamic Acid Inj 100mg/ml, 5ml (Transamin/Exacyl)		Haemorrhage from excessive fibrinolysis: Slow IV undiluted 1g q8h or 10-15mg/kg q8h, max rate 100mg (1ml) per minute.
Warfarin Sodium Tab 2mg, 3mg & 5mg	EDL	Loading dose: 10mg on day 1, 5mg on days 2 and 3. Subsequent dosages determined by INR values. For rapid effect consider heparin IV/SC for first 2-3 days. NOTE: See current guidelines for warfarin dosing details.

COMMENT/CAUTIONS:

- **Aspirin C/I:** active peptic ulceration, haemophilia/bleeding disorders.
- Treatment using full dose unfractionated heparin should be controlled by monitoring of coagulation parameters. Monitor platelet counts if patient on for more than 5 days. Heparin may cause haemorrhage; effects are reversible by protamine sulphate.

2.07 ANTIHYPERLIPIDAEMIC AGENTS

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Simvastatin Tab 20mg (Zocor)	NF	10mg at night, adjusted at intervals of not less than 4 weeks; max 80mg/day.

COMMENT/CAUTIONS:

- Rhabdomyolysis associated with lipid-regulating drugs may be increased in patients with renal impairment, hypothyroidism, and patients on concomitant ciclosporin treatment. Concomitant treatment with a fibrate and a statin may also increase risk of serious muscle toxicity. Advise patients to report promptly unexplained muscle pain, tenderness, and weakness.